Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

French subject islands

Empirical and formal approaches

Elodie Winckel

Empirically Oriented Theoretical Morphology and Syntax

language science press

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Empirically Oriented Theoretical Morphology and Syntax

Chief Editor: Stefan Müller
Consulting Editors: Berthold Crysmann, Ana R. Luís

In this series:

1. Lichte, Timm. Syntax und Valenz: Zur Modellierung kohärenter und elliptischer Strukturen mit Baumadjunktionsgrammatiken.
2. Bîlbîie, Gabriela. Grammaire des constructions elliptiques: Une étude comparative des phrases sans verbe en roumain et en français.
3. Bowern, Claire, Laurence Horn & Raffaella Zanuttini (eds.). On looking into words (and beyond): Structures, Relations, Analyses.
4. Bonami, Olivier, Gilles Boyé, Georgette Dal, Hélène Giraudo & Fiammetta Namer. The lexeme in descriptive and theoretical morphology.
5. Guzmán Naranjo, Matías. Analogical classification in formal grammar.
6. Flick, Johanna. Die Entwicklung des Definitartikels im Althochdeutschen: Eine kognitiv-linguistische Korpusuntersuchung.
7. Crysmann, Berthold & Manfred Sailer (eds.). One-to-many relations in morphology, syntax, and semantics.
8. Zinova, Yulia. Russian verbal prefixation: A frame semantic analysis.
9. Müller, Stefan, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig. Head-Driven Phrase Structure Grammar: The handbook.
10. Diewald, Gabriele & Katja Politt (eds.). Paradigms regained: Theoretical and empirical arguments for the reassessment of the notion of paradigm.

ISSN: 2366-3529

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

French subject islands

Empirical and formal approaches

Elodie Winckel

language
science
press

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Elodie Winckel. 2023. *French subject islands: Empirical and formal approaches* (Empirically Oriented Theoretical Morphology and Syntax). Berlin: Language Science Press.

This title can be downloaded at:
http://langsci-press.org/catalog/book/362
© 2023, Elodie Winckel
Published under the Creative Commons Attribution 4.0 Licence (CC BY 4.0):
http://creativecommons.org/licenses/by/4.0/
ISBN: no digital ISBN
no print ISBNs!
ISSN: 2366-3529
no DOI
Source code available from www.github.com/langsci/362
Errata: paperhive.org/documents/remote?type=langsci&id=362

Cover and concept of design: Ulrike Harbort
Fonts: Libertinus, Arimo, DejaVu Sans Mono
Typesetting software: XƎLaTeX

Language Science Press
xHain
Grünberger Str. 16
10243 Berlin, Germany
http://langsci-press.org

Storage and cataloguing done by FU Berlin

Freie Universität Berlin

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Contents

Acknowledgments **xi**

Collaborative work **xv**

I Subextraction from subjects: State of the art **1**

1 Introduction **3**
1.1 Some definitions 3
1.2 Extractions in French 6
1.3 Some remarks on subject extraction 10
1.3.1 Extraction of the subject in relative clauses 10
1.3.2 Extraction of the subject in interrogatives 11
1.4 A definition of "islands" 12
1.4.1 Notion of "islands" over time 12
1.4.2 Definition adopted in this work 14
1.4.3 Identifying islands through empirical work 14
1.5 The structure of this book 15

2 Syntactic approaches to the "Subject Condition" **19**
2.1 The Sentential Subject Constraint of Ross (1967) 20
2.2 The Subject Condition: subextraction from subject NPs 22
2.2.1 The start: Chomsky (1973) 26
2.2.2 The subject is a non-complement: The CED and its successors 30
2.2.3 The subject is a specifier: The Connectedness Condition and other "specifier"-based analyses 34
2.2.4 The subject is moved: Freezing analyses 40
2.3 The Subject Island Constraint cross-linguistically 44
2.3.1 The discussion around French 44
2.3.2 Other cross-linguistic counterexamples 53
2.4 Criticisms of the syntactic approach 56
2.4.1 Non-syntactic factors increasing the acceptability 56

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

2.4.2 "Parasitic" gaps . . . 57
2.4.3 Gradient grammaticality . . . 59
2.5 The Subject Island Constraint in HPSG . . . 62

3 Processing approaches 65
3.1 General mechanisms of processing associated with extractions . 65
3.1.1 Processing cost for the filler . . . 65
3.1.2 Processing cost for the gap . . . 66
3.2 Dependency-length minimization . . . 67
3.2.1 Dependency Locality Theory (DLT) . . . 69
3.2.2 Dependency Grammar . . . 70
3.3 Processing accounts based on surprisal . . . 72
3.3.1 Processing difficulty of subjects . . . 72
3.3.2 Valency Completeness . . . 75
3.4 Definiteness, referentiality and specificity . . . 76

4 Discourse-based approaches 81
4.1 Information structure . . . 82
4.1.1 Topic and comment . . . 83
4.1.2 Focus . . . 84
4.1.3 Background (and presuppositional content) . . . 87
4.2 General principles: from Erteschik-Shir's dominance constraint on extraction to Goldberg's "Backgrounded Constituents are Islands" . . . 89
4.2.1 The Focus approach . . . 89
4.2.2 The Topic approach . . . 90
4.2.3 The salience approach (reconciling Focus and Topic approaches) . . . 91
4.3 The subject island constraint from a functional perspective . . . 92
4.4 The BCI revisited: the Focus-Background Conflict constraint . . 93

5 Concluding remarks on the state of the art 97

II Empirical studies on French subject subextractions 99

6 Preliminary remarks on the empirical data 101

7 Previous experimental work on subextraction from subjects 107
7.1 Interrogatives . . . 107

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

7.2 Other constructions 118
7.3 Sentential subjects 120

8 Empirical data on *dont* relative clauses 123
8.1 Corpus studies on *dont* 124
8.1.1 Motivation 124
8.1.2 A previous exploration of *dont* in the FTB (Candito & Seddah) 128
8.1.3 Procedure 128
8.1.4 Results and analysis 131
8.1.5 General conclusion on the corpus studies on *dont* 143
8.2 Experiment 1: Acceptability Judgment study on *dont* relative clauses with different linear distances 145
8.2.1 Material and design 145
8.2.2 Predictions 147
8.2.3 Procedure 148
8.2.4 Participants 149
8.2.5 Results and analysis 150
8.2.6 Discussion 157
8.3 Experiment 2: Speeded Acceptability Judgment study on *dont* relative clauses with different linear distances 159
8.3.1 Material and design 160
8.3.2 Experimental method 161
8.3.3 Predictions 162
8.3.4 Procedure 162
8.3.5 Participants 163
8.3.6 Results and analysis 163
8.3.7 Discussion 168
8.4 Experiment 3: Eye-Tracking study on *dont* relative clauses with different linear distances 170
8.4.1 Material and design 170
8.4.2 Experimental method 172
8.4.3 Predictions 173
8.4.4 Procedure 176
8.4.5 Participants 177
8.4.6 Results and analysis 177
8.4.7 Discussion 182

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.5 Experiment 4: Acceptability Judgment study on *dont* relative clauses with long distance dependencies . . . 183
8.5.1 Material and design . . . 183
8.5.2 Predictions . . . 185
8.5.3 Procedure . . . 186
8.5.4 Participants . . . 186
8.5.5 Results and analysis . . . 187
8.5.6 Discussion . . . 192

9 Empirical data on *de qui* relative clauses 195
9.1 Corpus studies on *de qui* . . . 196
9.1.1 Motivation . . . 197
9.1.2 Procedure . . . 197
9.1.3 Results and analysis for relative clauses . . . 199
9.1.4 Results for interrogatives . . . 207
9.1.5 Results for *c'est*-clefts . . . 211
9.1.6 General conclusion on the corpus studies on *de qui* . . . 212
9.2 Experiment 5: Acceptability Judgment study on *de qui* relative clauses with an animate antecedent and an animacy mismatch between subject and object . . . 213
9.2.1 Material and design . . . 213
9.2.2 Predictions . . . 214
9.2.3 Procedure . . . 214
9.2.4 Participants . . . 216
9.2.5 Results and analysis . . . 216
9.2.6 Discussion . . . 220
9.3 Experiment 6: Acceptability Judgment study on *dont* relative clauses with an animate antecedent and an animacy mismatch between subject and object . . . 221
9.3.1 Material and design . . . 222
9.3.2 Predictions . . . 223
9.3.3 Procedure . . . 223
9.3.4 Participants . . . 223
9.3.5 Results and analysis . . . 223
9.3.6 Discussion . . . 227
9.4 Experiment 7: Acceptability Judgment study on *de qui* relative clauses with animate subject and object . . . 228
9.4.1 Material and design . . . 230
9.4.2 Predictions . . . 232

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.4.3 Procedure 232
9.4.4 Participants 232
9.4.5 Results and analysis 232
9.4.6 Discussion 238
9.5 Experiment 8: Acceptability Judgment study on *dont* relative clauses with an animate antecedent and animate subject and object 241
9.5.1 Material and design 241
9.5.2 Predictions 243
9.5.3 Procedure 243
9.5.4 Participants 243
9.5.5 Results and analysis 244
9.5.6 Discussion 249
9.6 Experiment 9: Self Paced Reading study on *de qui* relative clauses with an animate antecedent and animate subject and object 250
9.6.1 Material and design 250
9.6.2 Experimental method 251
9.6.3 Predictions 252
9.6.4 Procedure 253
9.6.5 Participants 254
9.6.6 Results and analysis 255
9.6.7 Discussion 260

10 Corpus studies on other relative clauses 261
10.1 Corpus study on *duquel* 261
10.1.1 Motivation 261
10.1.2 Procedure 261
10.1.3 Results and analysis 263
10.1.4 Conclusion 268
10.2 *Avec* + *wh-* in Frantext 268
10.2.1 Motivation 268
10.2.2 Procedure 269
10.2.3 Results and analysis for relative clauses 270
10.2.4 Results for interrogatives 276
10.2.5 Results for *c'est*-clefts 278
10.2.6 Conclusion 278

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

11 Empirical data on questions **281**
11.1 *De quel* in Frantext . . . 282
11.1.1 Motivation . . . 282
11.1.2 Procedure . . . 282
11.1.3 Results and analysis . . . 283
11.1.4 Conclusion . . . 286
11.2 Attested extractions out of the subject in interrogatives . . . 286
11.2.1 Examples with a pre-defined set of alternatives . . . 286
11.2.2 Questions with a pre-defined answer (rhetorical question) 287
11.2.3 Conclusion on the attested extractions out of subjects found on Internet . . . 289
11.3 Experiment 10: Acceptability Judgment study on *de quel* *wh*-questions with *wh*-extraction . . . 289
11.3.1 Material and design . . . 290
11.3.2 Predictions . . . 292
11.3.3 Procedure . . . 292
11.3.4 Participants . . . 292
11.3.5 Results and analysis . . . 294
11.3.6 Discussion . . . 299
11.4 Experiment 11: Acceptability Judgment study on *de quel* *wh*-questions with the *wh*-word in-situ . . . 300
11.4.1 Material and design . . . 301
11.4.2 Predictions . . . 302
11.4.3 Procedure . . . 303
11.4.4 Participants . . . 304
11.4.5 Results and analysis . . . 304
11.4.6 Discussion . . . 309
11.5 Experiment 12: Acceptability Judgment study on *de qui* *wh*-questions with *wh*-extraction . . . 311
11.5.1 Material and design . . . 311
11.5.2 Predictions . . . 312
11.5.3 Procedure . . . 312
11.5.4 Participants . . . 313
11.5.5 Results and analysis . . . 313
11.5.6 Discussion . . . 320
11.6 Experiment 13: Acceptability Judgment study on *de quel* *wh*-questions with long-distance dependencies . . . 321
11.6.1 Material and design . . . 321
11.6.2 Predictions . . . 323

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

11.6.3 Procedure . . . 323
11.6.4 Participants . . . 324
11.6.5 Results and analysis . . . 324
11.6.6 Discussion . . . 329

12 Experiment on *c'est*-clefts 331
12.1 Information structure of *c'est*-clefts . . . 331
12.2 Experiment 14: Acceptability judgment study on *c'est*-clefts . . . 334
12.2.1 Material and design . . . 334
12.2.2 Predictions . . . 336
12.2.3 Procedure . . . 338
12.2.4 Participants . . . 338
12.2.5 Results and analysis . . . 338
12.2.6 Discussion . . . 344

13 Experiments on infinitival subjects 345
13.1 Experiment 15: Acceptability Judgment study on subextraction from infinitivals with *où* . . . 346
13.1.1 Material and design . . . 346
13.1.2 Predictions . . . 347
13.1.3 Procedure . . . 349
13.1.4 Participants . . . 349
13.1.5 Results and analysis . . . 349
13.1.6 Discussion . . . 353
13.2 Experiment 16: Acceptability Judgment study on subextraction from infinitivals with *que* . . . 354
13.2.1 Material and design . . . 354
13.2.2 Predictions . . . 355
13.2.3 Procedure . . . 356
13.2.4 Participants . . . 356
13.2.5 Results and analysis . . . 356
13.2.6 Discussion . . . 360

14 Conclusions on the empirical data 363
14.1 Extractions out of the NP and extractions out of the subject . . . 363
14.2 Cross-construction difference . . . 364
14.2.1 Relative clauses . . . 365
14.2.2 Focalizations (interrogatives and *c'est*-clefts) . . . 366
14.2.3 Extractions out of a verbal subject . . . 368

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

14.3 Discourse clash . . . 369
14.4 Verb types . . . 370
14.4.1 Extractions out of the subject of transitive verbs . . . 370
14.4.2 Remark on psychological verbs . . . 370
14.5 Remark on hanging topics . . . 375
14.6 A cross-linguistic perspective . . . 377

III Formal analysis **379**

15 General discussion **381**
15.1 Clarifications about the FBC constraint . . . 381
15.2 The FBC in long distance dependencies . . . 384
15.3 The puzzle of *it*-clefts . . . 386
15.3.1 The information structure of the that-clause . . . 386
15.3.2 A problem for the FBC constraint? . . . 388
15.3.3 Other extractions out of the that-clause . . . 389
15.3.4 Assumptions of this book . . . 390

16 A French HPSG fragment **391**
16.1 General principles of an HPSG grammar . . . 392
16.1.1 Syntax . . . 394
16.1.2 Semantics . . . 402
16.1.3 Information structure . . . 406
16.2 Extraction in HPSG . . . 416
16.2.1 A traceless analysis . . . 416
16.2.2 *Wh*-questions . . . 420
16.2.3 Relative clauses . . . 427
16.2.4 *C'est*-clefts . . . 434
16.2.5 Long distance dependencies . . . 440

17 Extractions out of subject NPs **443**
17.1 Noun dependents in French . . . 443
17.2 The subject as Designated Topic . . . 447
17.3 Formalization of the Focus-Background Conflict constraint in HPSG . . . 449
17.3.1 Implementing the FBC constraint . . . 450
17.3.2 The FBC constraint in interrogatives . . . 451
17.3.3 The FBC constraint in *c'est*-clefts . . . 455

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

17.3.4 The FBC constraint in relatives 455

18 Extractions out of infinitival and sentential subjects 461
18.1 Sentential subjects 462
18.2 Infinitival subject 464

19 Conclusion 467

IV Concluding remarks 469

Appendix A: Corpus studies annotation guidelines 475

Appendix B: Semantic relations in relative clauses (corpus studies) 477
1 *Dont* relatives in the French Treebank 481
2 *Dont* relatives in Frantext 2000–2013 482
3 *Dont* relatives in Frantext 1900–1913 484
4 *De qui* relatives in Frantext 2000–2013 486
5 *De qui* relatives in Frantext 1900–1913 487
6 *Duquel* relatives in Frantext 2000–2013 489
7 Conclusion 490

Appendix C: Numerus, definiteness and restrictiveness in relative clauses (corpus studies) 491

Appendix D: Exclusion criteria for participants' data 495

Appendix E: Experiment 3, detailed results and analysis 497
1 Total reading time 497
2 Regressions in region 3 (subject) 499
3 First fixation and regression path durations in region 4 (verb) . . 503
4 Regressions in region 5 (object) 505
5 Regressions in the extraction site (subject/object) 509
6 Regressions in region 2 (relative word) 510

References 515

Index 543
Name index 543

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Acknowledgments

Prof. Stefan Müller was not only my earliest advisor for the joined thesis that underlies this book, but also my very first introduction into the wonderland of linguistics, back in 2007 when I took his MA class on morphology. Meeting him literally changed my life, and I owe him so much that it is ridiculous even to attempt to make a list (which I'm attempting nevertheless): He has been my gateway to formal linguistics, to formal syntax and to HPSG; has been through his works an example of scientific discipline and intellectual honesty; and has allowed me to finance this Ph.D. thesis by hiring me on his scientific staff (which, as trivial as it may sound, has not been the least important). My gratitude to him is $+\infty$.

I am so honored that Prof. Anne Abeillé agreed to be my thesis advisor in 2017, despite my uttermost ignorance of French linguistics at that time. She is the origin of the strong bend of this thesis toward an experimental approach. I am immensely grateful for all the time she invested in me and this piece of work, as well as for the long hours of discussion she never seemed in a hurry to put an end to. I have been able to ask her any silly question that came to my mind, and always got an answer.

She was also the one who suggested I apply for a binational cotutelle. Thanks to that, I had the opportunity to be part of the great Laboratoire de Linguistique Formelle at the Université de Paris. From this team, I want to thank especially Prof. Olivier Bonami, who directed the lab during most of the time I was there and always made me feel welcome and a full member of the lab. I am grateful for having met and worked with Prof. Barbara Hemforth who taught me a lot about the methodology of experiments and statistical analyses. Many thanks to Prof. Danièle Godard and Prof. Berthold Crysmann, who gave me so much good advice regarding my research and the formalization of my analysis. I also wish to thank all members of the lab that supported me in my research: Dr. Céline Pozniak, Prof. Caterina Donati, Prof. Heather Burnett, Dr. Yair Haendler, Prof. Pascal Asmili; and the cheering group of Ph.D. students who helped me survive through the process[1]: Suzanne Lesage, Gabriel Thiberge, Dr. Bujar Rushiti, Quentin Dénigot, Saida Loucif and Antoine Simoulin.

[1]Mostly, I must say, because they fed me. A lot.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

At the Humboldt-Universität zu Berlin, which I joined in 2016, I wish to thank all the members of the chair of Syntax for their support, especially Prof. Elisabeth Verhoefen, Dr. Marc Felfe, Paula Fritz Huechante and Chenyuan Deng. I also thank Prof. Pia Knoeferle and her whole staff, with which I enjoyed a lot talking about our respective research. Most of this work was funded by the Deutsche Forschungsgemeinschaft (DFG) as I worked in the project *Long-distance dependencies in French*, with Prof. Guido Mensching, Franziska Werner and Esma Tanis. I thank them all for their help and advice.

For some part of my time as a Ph.D. student, I was also employed at the Freie Universität Berlin. I have met so many people there during my years as a MA and as a Ph.D. student, who were of so much importance in my life, that I can't make a complete list. I wish first of all to thank Prof. Horst Simon and his whole crew (especially Dr. Tanja Ackermann and Dr. Christian Zimmer) for their warmth and support. I am very grateful to Dr. Felix Bildhauer who had supervised my M.A. thesis with much consideration and whose doctoral dissertation has been an important early inspiration for my work. I was also lucky enough to meet at the FU my dear colleague and friend Dr. Naomi Truan, who gave me very good advice for finding my way in the cotutelle maze. Finally, I wish to express a (very) big thank-you to Viola Auermann for her support and patience.

A special elbow bump goes to my Dr.uder Antonio Machicao y Priemer and to Dr. Aixiu An, my thesis "siblings". They made the journey so much more interesting and fun. Thank you for the countless hours of chatting. And just in general for everything.

A great deal of this work relies on the valuable data that I was able to collect. I cannot thank the French language itself for being so amazing, but I can at least thank all of those who participated in the (mostly unpaid) experiments, shared the experiments in order to help me, and did not even complain that rating strange sentences was such a boring task to do. I also thank the staff and colleagues who helped set up the experiments.

Two thesis reporters, Rui Chaves and Dominique Sportiche, and two anonymous reviewers made excellent comments and remarks, that forced me to rethink several sections of the book, but helped improve the final manuscript. I wish to express my gratitude to the people who have helped me proofread the thesis and make sure that I wasn't writing complete nonsense. Some of them have already been mentioned before, but I should furthermore thank especially Prof. Maryvonne Gerin, but also Simon Luck. It goes without saying that all remaining errors are mine.

Writing the thesis was not only a great intellectual adventure but also a tough time that I managed to overcome thanks to three very special people. Stephanie

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Gagne was somehow always virtually here with me from the very start and until the very end, and Zina Cohen was literally always here with me (talking about food and statistics, my two favorite topics). And of course, before anything else, I thank Antoine Laslier for his unconditional love and unconditional support.[2]

Finally, I want to thank my mother, because she's just the best. I'm convinced that no one ever had such a wonderful, patient and supportive mother as I do. And where comes my mother, the rest of my family must of course follow. That is, going around the table: Gisèle, Francise, Jean-Jacques, Michèle, Dédé, Jeannine, Olivier, Ingrid, Jean-Christophe, Béatrice, Mathieu, Élise, Alexandre, Sophie, Julien, Aurélie, Paul, Mathias, Charlotte, Sarah, Paul, Emma, Jules, Antoine, Hortense, Victor, Claire, Raphaël and Benjamin. I love y'all to the moon and back.

The experiments conducted for this thesis were approved by the CERES, (Conseil d'évaluation éthique pour les recherches en santé) of the University of Paris Descartes.

My work over the last year has been supported by the German Research Foundation (DFG) as part of the research program "Long-distance Dependencies in French: Comparative Analyses (HPSG and the Minimalist Program)", G. Mensching, Göttingen (ME 1252/14-1)/S. Müller, Berlin (MU 2822/9-1). It was also supported by a public grant overseen by the French National Research Agency (ANR) as part of the program "Investissements d'Avenir" (reference: ANR-10-LABX-0083). It contributed to the IdEx Université de Paris Cité (ANR-18-IDEX-0001). Finally, part of this work has been conducted as part of a research position at the Freie Universität Berlin.

[2]Example (8.19b) is dedicated to you.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Collaborative work

The corpus studies presented in this book have all been conducted with my supervisor Anne Abeillé. Barbara Hemforth also collaborated on the corpus study that we published in Abeillé et al. (2016).

The extraction of the data from the corpus was made by Anne Abeillé for the French Treebank, and by myself for Frantext. We agreed on the guidelines for the annotation. After this, the annotation was almost entirely done by me, but Anne Abeillé would help me to make a decision on uncertain cases. The statistical analysis was entirely done by me, with useful comments from Barbara Hemforth, Anne Abeillé and many other scholars that discussed my work with me during many conferences and workshops. The final decision on the statistical methods and interpretation of the results remained my own.

The experiments have all been conducted with my supervisor Anne Abeillé, and many of them in collaboration with Barbara Hemforth and Ted Gibson.

For most studies, the material was first constructed by me, and then discussed and modified with Anne Abeillé before we agreed on a final version. Sometimes, Ted Gibson constructed English material, that was then discussed and modified with our remarks, and translated into French by me or Anne Abeillé to construct a parallel experiment in French. I only present the French experiments in this work, but the interested reader will find a short discussion of the English experiments in Section 14.6 and is otherwise referred to Abeillé et al. (2020).

Internet experiments with Acceptability Judgment tasks were set up by one Ph.D. student from the Laboratoire de Linguique Formelle (Aixiu An, Céline Pozniak or myself) on the Ibex Platform (Drummond 2010). Lab experiments were set up by Etienne Riou (Speeded Acceptability Judgment), Céline Pozniak (Eye-Tracking) and Aixiu An (Self-Paced Reading).

The statistical analysis was entirely done by me, with useful comments from Anne Abeillé, Ted Gibson, Barbara Hemforth, Céline Pozniak, Yair Haendler and many other scholars that discussed my work with me on many conferences and workshops. The final decision on the statistical methods and interpretation of the results remained my own.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Part I

Subextraction from subjects: State of the art

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

1 Introduction

French is a language with a relatively fixed word order. Declarative sentences in French display typically a SVO word order. Though it is nevertheless more free than the English word order in some respects, but less so than German word order – to name just a few neighboring languages which otherwise have many similarities. Obviously, however, word order in any language is necessarily constrained in some respect. In this work, I will discuss some constraints on non-declarative word order that is usually named "extraction", or more technically referred to as "unbounded dependency". In the 60s, John R. "Haj" Ross came up with a very pictorial and poetic word to refer to this kind of constraint, calling them "islands". The idea underlying this concept is that some structures build units out of which it is very difficult, if not utterly impossible, for constituents to escape. Islands are nowadays one of the most important concepts in syntax. The questions that I am addressing in this work are the following: Do the constraints on locality really have a syntactic origin? Are these constraints universal, i.e. cross-linguistically valid, and if so, what does it reveal about human language?

In this work, the discussion mostly concentrates on subject islands, and thus on non-declarative positions of elements that syntactically depend on the subject and may – or may not – have the possibility to appear outside of the subject. The empirical studies that I present are on French. But the implications of what I discuss go beyond the scope of French, or even of subject islands. I will argue that the mechanisms at play in extractions out of the subject in French have deep roots in our cognitive capacities and in the way we treat information as humans. Therefore it is not specific to a particular language or to subjects alone.

1.1 Some definitions

Before we start dealing with the topic of subextractions from subjects, it is necessary to define some core concepts used in this work. In "extractions", one element occupies a position at the leftmost edge of a clause, as in (1.1), where the relevant element is written in bold. In this respect, it differs from scrambling, that is the free permutation of (verbal) dependents inside a clause, as in the German example (1.2) and in the French example (1.3).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(1.1) a. I recently saw **a woman** with a parrot on her shoulder. [SVO declarative]

b. **Who** did you recently see with a parrot on her shoulder? [extraction]

c. **Who** did Mark pretend he saw with a parrot on her shoulder? [extraction]

(1.2) a. Gestern hielt Kristin eine bewegende Rede bei der Demo.
yesterday held Kristin a moving speech at the protest

b. Gestern hielt Kristin bei der Demo eine bewegende Rede.
yesterday held Kristin at the protest a moving speech

c. Gestern hielt eine bewegende Rede Kristin bei der Demo.
yesterday held a moving speech Kristin at the protest

d. Gestern hielt bei der Demo Kristin eine bewegende Rede.
yesterday held at the protest Kristin a moving speech

e. Gestern hielt eine bewegende Rede bei der Demo Kristin.
yesterday held a moving speech at the protest Kristin

f. Gestern hielt bei der Demo eine bewegende Rede Kristin.
yesterday held at the protest a moving speech Kristin

'Yesterday, Kristin gave a moving speech during the protest.'

(1.3) a. (Hier) Capucine a (hier) donné (hier) un livre
yesterday Capucine has yesterday given yesterday a book
(hier) à son fils (hier).
yesterday at her son yesterday
'Capucine gave a book to her son (yesterday).'

b. (Hier) Capucine a (hier) donné (hier) à son fils
yesterday Capucine has yesterday given yesterday at her son
(hier) un livre (hier).
yesterday a book yesterday
'Capucine gave her son a book (yesterday).

Extrapositions, i.e. the non-canonical position of an element at the rightmost edge of a clause, is also treated as an extraction by some scholars, but they are bound to a clause and cannot build long distance dependencies (Guéron 1980), that is why I will not talk about these cases in the present work. Some other phenomena are sometimes treated as a "movement", and therefore as a kind of

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

extraction (e.g. the canonical position of verbs in main clauses in German), but again, it is not what I will refer to as "extraction" in the following sections.

I will refer to the canonical position of the extracted element as a the "gap", and identify it in the examples with an underscore (_). This notation is common in linguistic works, and very practical in order to help the reader identify the kind of dependency that is meant without too much explanation, especially in very complicated examples. Additionally, the gap will be coindexed with the extracted element, which helps identify the actual extraction at play, especially when there are multiple extractions.[1] However, this annotation should not be interpreted as presupposing that extractions leave anything at the canonical position. As a matter of fact, traditional accounts of generative grammar assume that the extracted element leaves a "trace" at its canonical position, where they assume it to be base-generated in the deep structure. In HPSG also, extractions are sometimes analysed with empty categories, and thus the assumption is that there is an empty element at the canonical position of the extracted element. Nevertheless, I wish to make clear that it is not what the notation means here. At the end of this work, I propose an HPSG analysis that does not use empty categories (Sag & Fodor 1994, Sag & Godard 1994, Sag et al. 2007, Sag 2010).

I will refer to the position of the extracted element as the "filler". As said previously, this position is then at the leftmost position of a clause. Consequently, I will refer to the relation between the filler and the gap as "filler-gap dependencies". I will sometimes talk about "filler-gap dependencies" in structures in which there is no actual filler, because there is no realization of the filler. What "filler-gap dependency" means in these cases is that the sequence of words gives the addressee some cues that they have to identify a missing element, i.e. a gap, in the rest of the utterance. For example, in example (1.4), the presence of the word *you* signals the beginning of a relative clause, and the reader will start looking for the gap, even though there is no actual filler in the relative clause.[2]

(1.4) The woman you ... saw with a parrot on her shoulder.

I will make a distinction between "short distance" and "long distance" filler-gap dependencies. Short distance dependencies are dependencies that do not cross the limit of the clause in which the gap is directly situated. For example, example

[1] Most of the time, the co-indexation also means that both the missing element and the extracted element refer to the same semantic variable. However, as we will see later, complementizers are not per se extracted. Nevertheless, I will use a co-indexation in examples involving complementizers for the sake of readability.

[2] Notice that *the woman* is not the filler, but the antecedent of the relative clause. These details are discussed extensively in the rest of the book, and especially in the formal analysis.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(1.5a) is a short distance dependency. In long distance dependencies on the other hand, the dependency crosses one or more clause boundaries. Example (1.5b) is a long distance dependency, because the filler is not situated at the leftmost limit of the embedded clause, but at the leftmost limit of the matrix clause. By definition, long distance dependencies hence involve at least a matrix and an embedded clause.

(1.5) a. Who$_i$ did you recently see $__i$ with a parrot on her shoulder?

b. Who$_i$ did Mark pretend [that he saw $__i$ with a parrot on her shoulder]?

When an extraction takes place out of a phrase, I will refer to it as a "subextraction". For example (1.6) is a subextraction from a direct object. The main topic of this work are subextractions out of subjects, i.e. extractions in which only part of the NP subject, part of the verbal subject or part of the sentential subject is extracted.

(1.6) the parrot [whom$_i$ I saw [the owner of $__i$]$_{\text{NP}}$ running away]

1.2 Extractions in French

Three extractions constructions are discussed in depth in this work: relatives clauses, interrogatives, and *it*-clefts. In French, relative clauses are noun modifiers that are introduced either by a relative word as in (1.7b) or by a filler phrase containing a relative word as in (1.8b).

(1.7) a. Nous avons parlé **de Gaetan** hier. [canonical word order]
we have talked of Gaetan yesterday
'We talked about Gaetan yesterday'

b. Gaetan, [dont$_i$ nous avons parlé $__i$ hier] [relative clause]
Gaetan of.which we have talked yesterday
'Gaetan, whom we talked about yesterday'

(1.8) a. Nous avons parlé **du perroquet d' Agate** hier.
we have talked of.the parrot of Agate yesterday
[canonical word order]
'We talked about Agate's parrot yesterday'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. Agate, [[du perroquet de qui]$_i$ nous avons parlé $__i$ hier]
Agate of.the parrot of who we have talked yesterday
[relative clause]
'Agate, whose parrot we talked about yesterday'

The use of a relative word to build a relative clause is common in European languages, though not very common cross-linguistically. Comrie & Kuteva (2013) list only 12 to 13 languages using this morpho-syntactic strategy. This is, however, the only strategy available in French. The gap strategy exemplified in (1.4) is not available in French:

(1.9) * le perroquet [tu as vu _ hier]
the parrot you have seen yesterday

Clefts in French are either presentational (and are then similar to *here*-clefts in English) or focalizing (and are then similar to *it*-clefts in English). I will refer to them as *c'est*-clefts. Both are constructions following the pattern [*ce* ('it') + copula + XP + S]. The XP is either the referent introduced in presentationals, like (1.10a), or the focussed element in focalizing *c'est*-clefts, as in (1.10b).

(1.10) a. C' est le perroquet [dont$_i$ nous avons parlé $__i$ hier].
it is the parrot of.which we have talked yesterday
[pointing to the parrot]
'Here is the parrot whom we talked about yesterday.'

b. C' est du perroquet d' Agate [que$_i$ nous avons parlé $__i$
it is of.the parrot of Agate that we have talked
hier](, pas du perroquet de Gaetan).
yesterday not of.the parrot of Gaetan
'It's Agate's parrot whom we talked about yesterday (not Gaetan's parrot).'

The last element of the construction S is the one showing an extraction, with a relative word or a relative phrase at its leftmost edge. It is hence very similar to a relative clause, but I will argue in my HPSG analysis that it is not always one. I leave aside constructions with *il y a*, like (1.11), which are often referred to as clefts as well in the literature (Lambrecht 1994, Doetjes et al. 2004, Karssenberg & Lahousse 2018) and also involve an extraction.

(1.11) Il y a des enfants [qui$_i$ $__i$ aiment le fromage]. (Karssenberg
it there has DET children who like the cheese
& Lahousse 2018: 517)
'There are some children who like cheese.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

I also leave aside *wh*-clefts (1.12a) and their French counterparts (1.12b), that are different from the syntactic and functional point of view.

(1.12) a. What the woman had on her shoulder was a parrot.

b. Ce que mes enfants aiment, c' est le fromage.
it that my children like it is the cheese
'What my children like is cheese.'

Whereas extraction in relative clauses and *it*-cleft is mandatory, extraction in interrogatives is optional (Obenauer 1976) – at least from the syntactic point of view, but see Section 11.4 for the potential pragmatic factors implied by extracted vs. in situ *wh*-words.

(1.13) a. [De qui]$_i$ avez - vous parlé $_{-i}$?
of who have you talked
'Whom did you talk about?'

b. Vous avez parlé **de qui**?
you have talked about who
'You talked about whom?'

Further constructions involving an extraction are not discussed in this work, even though of course they are assumed to be affected by the island constraints, as any extraction is. For example, French also has complement fronting (1.14a), exclamatives (1.14b), comparative correlatives (1.14c), topicalisation (1.14d), concessives (1.14e) and so-called *tough* constructions (1.14f).[3]

[3]For an HPSG analysis of complement fronting in French, see Abeillé et al. (2008). For a typology and HPSG analysis of exclamatives in French, see Marandin (2008). For an HPSG analysis of comparative correlatives in English, French and other languages, see Abeillé & Borsley (2008). See also Godard (1988: 40–42) and Cinque (1990: 106–107) on some infinitival complements in French that involve an unbounded dependency without extraction in French (and an overview of this same construction in other Romance languages in Mensching 2000):

(i) Qui crois - tu être intelligent? (Mensching 2000: 76)
who think you be.INF intelligent
'Who do you believe to be intelligent?'

(ii) *Tu crois Richard être intelligent.
you believe Richard be.INF intelligent
'You believe Richard to be intelligent.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(1.14) a. [Huit ans]$_i$ je devais avoir $__i$. (Abeillé et al. 2008: 306)
eight years I must.PAST have.INF
'Eight years, I must have had.'

b. [Quel chapeau]$_i$ il portait $__i$! (Marandin 2008: 438)
what hat he wore
'What a hat he was wearing!'

c. Plus je lis _, plus je comprends _. (Abeillé & Borsley 2008: 1148)
more I read more I understand
'The more I read, the more I understand.'

d. [De tout cela]$_i$, nous reparlerons $__i$ demain.
of all that we will.talk tomorrow
'About all this, we will talk tomorrow.'

e. Aussi difficile [que$_i$ ce problème soit $__i$], tu pourras le
as difficult that this problem be you can.FUT MASC.ACC
résoudre.
resolve
'As difficult as this problem may be, you'll be able to solve it.'

f. une nouvelle$_i$ [difficile à croire $__i$]$_{\text{AdjP}}$
a news hard at believe.INF
'news (that is) hard to believe'

An overview of all unbounded dependencies can be found for French in Godard (1988: chapter 1.2.2) and for English in Sag (2010: chapter 2) and Chaves & Putnam (2020: chapter 2).

Notice that combinations are of course possible: a sentence may display several extractions, and even extractions out of extracted elements – even though this is subject to constraints (see below). Also, one single filler (or equivalent) may correspond to several gaps, see example (1.15).

One filler may be coindexed with more than one gap (which can, but must not, be coindexed with each other).

(1.15) There's no engine [[which]$_i$ Geoff can't disassemble $__i$, clean $__i$, and put $__i$ back together without disparaging $__i$ or complaining about $__i$]. (Chaves & Putnam 2020: 7)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

1.3 Some remarks on subject extraction

The subject is extracted in French with the relative word *qui*. Subject-*qui* and *que* are two relative words that are traditionally not considered as pronouns, but as complementizers. On page 47, I come back to the distinction between complementizers and pronouns.

Because French is an SVO language with a relatively fixed subject-verb order (subject-verb inversion is only allowed in very specific cases, see Bonami & Godard 2001), the filler in short distance dependencies is located just before the subject. When the wh-phrase is the subject, it is then impossible to know if it is extracted (wh-phrase followed by a gap) or not (subject in situ). In the context of this book, I assume, however, that the subject is undergoing extraction, as illustrated by (1.16), for several reasons.

(1.16) les enfants [qui$_i$ $_{}_i$ aiment le fromage]
the children who like the cheese
'children who like cheese'

I will mention some arguments that apply to French, but the interested reader should refer to Chaves & Putnam (2020: 28–32) for further cross-linguistic arguments.

1.3.1 Extraction of the subject in relative clauses

First, there is no Indo-European language with postnominal relative clauses with relative words in situ.[4] Why would subjects be an exception to this rule? Hence I assume that extraction in relative clauses is obligatory.

The second argument comes from the so-called *que-qui*-rule (see a.o. Kayne 1974, 1976, Pesetsky 1982, Koopman & Sportiche 2014). The relative word *qui* is used to relativize the subject, as in (1.16). But in long-distance dependencies with an intervening complementizer *que*, it becomes obvious that *qui* is in this case only a variant of *que* that appears before an extracted subject. In example (1.17b), the relative word is *que* (and not *qui*, even though the subject is relativized), while *qui* can only be introducing the sentential complement of *pense* ('think'). Sentential complements are introduced by *que* if there is no extraction of the subject.

[4]For Downing (1978), the fact that relative pronouns are never realized in situ belongs to the universal properties of relative clauses. However, Vries (2002: 37) mentions a few languages from West Africa in which this rule is not true. If I correctly understand their findings, both are talking about relative words (in contrast to resumptives) in general (e.g. not about relative pronouns in contrast to complementizers).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(1.17) a. Je pense que tes enfants aiment le fromage.
I think that your children like the cheese
'I think that your children like cheese'

b. les enfants [que$_i$ je pense [qui $_{-i}$ aiment le fromage]]
the children that I think that like the cheese
'the children who I think that (they) like cheese'

Because *qui* is the relative word in short distance dependencies, we must assume that there is an extraction in short distance dependencies. The *que-qui* rule will be described and analysed in more detail in Section 16.2.

1.3.2 Extraction of the subject in interrogatives

One type of French interrogatives is built with *est-ce que* (lit. 'is it that'), which is considered by Abeillé et al. (2012) to be a complementizer. Interrogatives in *est-ce que* cannot have their interrogative word in situ, as the following example shows:

(1.18) a. Tu vas où?
you go where

b. Où$_i$ est - ce que tu vas $_{-i}$?
where is it that you go

c. * Est - ce que tu vas où?
is it that you go where

d. * Tu vas où$_i$ est - ce (que)?
you go where is it that
'Where are you going?'

Since interrogatives with *est-ce que* can be used to question the subject, there must be an extraction in (1.19). And if extraction is allowed in these interrogatives, there is no reason to assume that extraction is not possible in interrogatives in general.

(1.19) Qui$_i$ est - ce qui $_{-i}$ aime le fromage?
who is it that likes the cheese
'Who likes cheese?'

Since in situ questions are allowed in French, it follows that in situ questions must be possible to question the subject. Therefore, we must assume that the example (1.20) is syntactically ambiguous.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(1.20) a. Qui aime le fromage?
who likes the cheese

b. Qui$_i$ $__i$ aime le fromage?
who likes the cheese

'Who likes cheese?'

1.4 A definition of "islands"

There are lots of "islands" or "syntactic islands" identified in the literature – rightly or wrongly. I invite the reader who wants a broader overview of all these types of islands to consult Chaves & Putnam (2020). In the present book, I focus exclusively on a particular type of island called subject island. This being said, it seems to me that many of the findings I present have some significance for the general theory on islands. I focused my work on subject islands because taking the time to explore in-depth a particular case of islands was necessary in order to account for its complexities and nuances. Even so, and as the reader will realize, I am far from exhausting the question of extractions out of the subject.

I will first define what I mean by islands, before dealing with the particular case investigated in this work.

1.4.1 Notion of "islands" over time

It has been noticed that extractions cannot cross certain boundaries, even though there is virtually no limit to the linear length of filler-gap dependencies. For example, in coordinations, extraction of one of the conjunct is impossible, as illustrated by (1.21).

(1.21) a. * Who did [your father and $__i$] buy a parrot?

b. * Qu$_i$' est - ce que tes enfants aiment [le fromage et $__i$]?
what is it that your children like the cheese and

'What do your children like cheese and?'

This led linguists, starting with the seminal work of Ross (1967)[5], to postulate syntactic constraints on extractions, called "islands". The constraint illustrated by example (1.21) is referred to as the Coordinate Structure Constraint.

There is currently still a debate regarding island effects in non-extractions condition, especially in languages in which *wh*-questions do not necessarily require

[5]An anonymous reviewer traces this discussion back to Chomsky (1964).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

filler-gap dependencies (like French), or never involves filler-gap dependencies (like Mandarin Chinese, see Huang 1982, Aoun & Li 1993, Lu et al. 2020 a.m.o.). Even though, in the present book, I will mostly talk about islands in the context of filler-gap dependencies, I will come back to the questions of wh-in situ interrogatives in Section 11.4.

In their first definition by Ross, island constraints were syntactic in nature, and a violation of island constraints leads to ungrammaticality.[6] Even though the discussion about islands mostly originates from observations concerning extraction constructions, islandhood was not only a matter of extraction, but "the maximal areas in which syntactic process of a designated sort could apply" (Ross 1987: 258). Very soon after however, Erteschik-Shir (1973) proposed that islands are not caused by syntactic factors, but have a functional (discourse-based) explanation. This proposal has been followed by processing (Kluender 1998) or semantic accounts (Szabolcsi & Zwarts 1990). Island constraints are therefore no longer considered as being only a matter of syntax. Furthermore, as island constraints became a vividly discussed topic among linguists, light was cast on novel data from various languages. This included exceptions to some of Ross's original islands, and to some other islands added afterwards to the list of islands structures by various scholars. Cinque (1990) and Rizzi (1990) introduced a distinction between "strong" and "weak" islands (Kluender 1998, Szabolcsi 2006). In a nutshell, strong islands correspond to the original definition of islands, as blocking any kind of extractions. Weak islands, on the other hand, are cases in which only the extraction of some constituents is ruled out.[7] Some consider that violations of weak islands are also more acceptable than violations of strong islands, but this diverges a lot from the original definition of islands. Almeida (2014) even talks about "subliminal islands" in order to refer to (weak) island configurations that do not lead to unacceptability in a given language but still display a disadvantage when compared to another similar non-island structure. However, multiplying the degrees of severity of islands with notions like "weak" or "subliminal" is-

[6]Notice that, for Ross (1967), islands did not necessarily reflect universal constraints. In his original definition, islands could be language-specific.

[7]For Cinque (1990), the distinction between strong and weak islands was that extraction (without resumptive pronoun) was never allowed out of strong islands while extraction of PPs (but not of DPs) was allowed out of weak islands. Another definition can be found in Huang (1982) and Chomsky (1986), who draw the line between arguments extraction (extraction of arguments was never allowed out of any island) and adjuncts extraction (weak islands allow the extraction of adjuncts, but strong islands don't). In general, though, scholars agree that strong island are "absolute" (they are always valid) while weak islands are "selective" (some elements are sensitive to the island and some are not). See Szabolcsi (2006) for an overview of the debate around weak islands.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

lands is a move away from what motivated the notion of islands in the first place, which is that some configurations are not possible even though nothing seems to prevent them. The question of islands should not refer to the preference for one configuration over another, but to the fact that not everything is possible in a given language and that some of these impossible things are particular to extractions (and eventually also to binding).

1.4.2 Definition adopted in this work

In this work, I adopt a definition of islands closer to the one formulated by Ross, but without postulating that islands are necessarily syntactic in origin. A more complete defense of this definition can be found in Liu et al. (2022).

An island is a particular configuration, involving a construction with extraction, that most speakers consider unacceptable. By configuration I mean that it is not an isolated example, but that one can identify a series of examples that are syntactically similar and similarly unacceptable.

I add that extraction is a necessary condition for making these examples unacceptable: it is possible to construct acceptable examples that differ from the unacceptable examples only by the absence of extraction. If this condition is not met, the unacceptability does not come from the extraction, but can come from any feature of the sentence, and it is not caused by the existence of an island (Chaves & Putnam 2020: 77–78).

Islands can be language-specific, although most researchers implicitly (and sometimes explicitly) assume that islands are universal constraints.

1.4.3 Identifying islands through empirical work

The main issue, therefore, is to find out what makes it possible to identify an island. It is generally assumed that the agrammaticality of a sentence goes hand in hand with its unacceptability. This is why great importance is given in this work to experimental data, under the assumption that the speakers of a language are the real experts as to what structures are allowed or not in a language. There are of course well-known exceptions in experimental linguistics, such as grammatical illusions: sentences that many speakers spontaneously perceive as acceptable, even though they are agrammatical (e.g., from an agreement point of view in the case of agreement attraction). It seems to me, however, that it is impossible to consider that a sentence can be both an island violation and a grammatical illusion, since the principle of islands is that some configurations are systematically ill-formed even though nothing seems to prevent them from being well-formed.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

In grammatical illusions, the reason for their being ill-formed is easy to identify (so easy that it is surprising that speakers do not judge accordingly).

From the experimental point of view, Sprouse (2007a) – and following works by Sprouse and his colleagues – has proposed a superadditivity design as a diagnostic for islandhood. I will describe this design in detail in Section 6, but the idea, in a nutshell, is to build and test minimal pairs comparing island structures with non-island structures, in extractions and non-extractions conditions. Participants should give lower ratings to sentences with an extraction in an island configuration than to sentences in a non-island configuration or without extraction. Although very useful, this diagnostic only applies to experimental data. I will indeed use Sprouse's (2007a) superadditivity design in a series of experiments that I present in part 3 and talk about "island effect" to describe the superadditivity effect described by Sprouse in these experiments. Of course, this experimental method can only deliver a good diagnostic for islandhood if the investigator was successful in eliminating the impact of unrelated factors. That's why a superadditivity effect is not necessarily synonymous with islandhood.

I should add that we expect that native speakers do not produce sentences that violate an island constraint (or very marginally, for speech errors can of course appear in spontaneous speech). This is why, in addition to experimental data, I look at islands in speech production. In the second part, I present a series of corpus studies on well-edited written French (newspaper articles and texts from French literature), in which I expect errors to be rare.

1.5 The structure of this book

The **first part** of the book introduces the previous theoretical approaches to what is generally known as "subject island". In the **second part**, we move on to the empirical data on French: I present a series of corpus studies and experiments that helps understand the phenomenon. Finally, the **third part** proposes a formal HPSG analysis of extractions, short and long distance dependencies and the extraction out of the subject in French.

Part I: In Section 2, I present the three general kinds of explanations based on syntax. I explain that, for traditional syntactic accounts, extractions out of the subject are not only dispreferred but they are ruled out by syntax. Scholars in the syntactic tradition do not agree on the reasons that cause subject islands, but they agree that these reasons are universal and are based on innate properties of language. Some syntactic accounts treat subject islands and adjunct islands (the ban on subextraction out of adjuncts)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

as one single phenomenon (e.g. Huang 1982) and claim that only extraction out of complements is acceptable. Other syntactic accounts claim that subjects are special because they are in the Specifier position, which is already at the edge of the phrase (e.g. Chomsky 2008). Finally, a third kind of syntactic account claims that subjects are the result of the movement of some elements to the subject position, and that any movement out of a moved element is ruled out (e.g. Uriagereka 2012). I also explore the French data and the syntactic analyses of French subject island that have been presented in the literature. In Section 3, I present accounts based on processing. In general, work on the processing of filler-gap dependencies shows that it is easier to parse shorter distances between the extracted phrase and the gap. If this is the case, then subextractions from (preverbal) subjects should be easier to process than subextractions from objects because the distance is shorter. But scholars have also proposed processing-based accounts of the subject island: Kluender (2004) have theorized than complex subjects are dispreferred for processing reasons and that therefore a subextraction is unexpected. In Section 4, I talk about discourse-based accounts of islands in general, which assume in a nutshell that extraction makes an element more salient, and that it presupposes that the extracted elements have the possibility of being salient in the first place (e.g. Erteschik-Shir 1973). I then present a new account based on information structure, called the Focus-Background Conflict (FBC) constraint, which states that the part of a backgrounded constituent cannot be focalized. Contrary to previous accounts, this constraint predicts different possibilities of extracting for extractions that imply a focalization (like interrogatives and *it*-clefts) and extractions that imply a topicalization (like relative clauses).

Part II: After this, I present eight corpus studies and 13 experiments on the extraction out of the subject. The corpus studies are based on two different corpora of written French: the French Treebank (Abeillé et al. 2003, 2019) and Frantext (https://www.frantext.fr/). Thirteen of the experiments are Acceptability Judgment tasks, one is a Speeded Acceptability Judgment task, one is a Self Paced Reading task and one is an Eye-Tracking experiment. The empirical data on relative clauses confirm what Godard (1988) said about extractions out of the subject: relativizations out of the subject are very frequent and generally accepted by native speakers. In the corpus we observe a clear distinction between subextractions out of subjects in relatives and in interrogatives. There is indeed not a single example of extraction out of the subject in interrogatives, a result supported by

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the experimental data on interrogatives in which participants reject extractions out of the subject. One experiment on *c'est*-clefts shows more contrasted results, but in general extractions out of the subject seem problematic there as well. Two experiments are on extractions out of infinitival subjects. Subextractions from infinitival subjects display surprisingly high acceptability judgments, even though they are dispreferred compared to extractions out of infinitival complements. Comparing this empirical evidence with the different accounts on subject islands, I conclude that the FBC constraint explains the data best, especially the strong distinction between relative clauses on one hand and interrogatives and *it*-clefts on the other hand.

Part III: Part 3 offers an HPSG analysis of the FBC constraint. In Section 15, I first discuss some details about the implications of the FBC constraint. In Section 16, I describe a small fragment for the analysis of French sentences in HPSG. I explain how syntax, semantics and information structure are represented in HPSG and interact with each other. I then present in more detail the three main constructions involving extraction that I explored in the empirical parts, i.e. interrogatives, relative clauses and *c'est*-clefts. In Section 17, I formalize the FBC constraint inside my HPSG fragment for French. Finally, in Section 18, I show how verbal and sentential subjects are analyzed and how subextractions out of verbal and sentential subjects are analyzed.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

2 Syntactic approaches to the "Subject Condition"

The first and still most well-known approaches to the phenomenon known as "subject island" propose that the ban on extraction out of subjects – sentential and verbal subjects and/or NP subjects – is caused by the syntactic properties of subjects. In this section, I will present the original constraint in Ross (1967) for sentential subjects, and the subsequent early analysis by Chomsky (1973) for all subjects, which have been very popular and influential among linguists. It is unfortunately impossible to review all syntactic approaches to the subject island constraint: there have been and still are a profusion of different analyses. I will therefore only present three main lines of explanation that have been adopted over the years. They are all based on one of the properties of subjects: the subject/complement distinction (those approaches usually treat the subject island together with the adjunct island[1] as one single phenomenon), being a specifier and having to move to Spec,TP/IP. I will present after that the major criticisms that have been brought against syntactic approaches. One of the most important ones is that it has been shown that extraction out of the subject is possible in many languages (Stepanov 2007). Of particular interest for this study is the work on French done by Godard (1988), which has shown that subextractions from subjects are possible with the relative word *dont*. I will present the French

[1]The adjunct island was not part of Ross's original islands, but it has been associated with the island constraints principally by Cattell (1976) (as the "Adjunct Island Condition"). It is claimed to be a strong island.

(i) a. * a person$_i$ who$_i$ I think that [while informing $__i$ about my work] I could be embarrassed. (Longobardi 1985: 168)

b. * [une] décision$_i$ [que$_i$ vous savez bien que [s' ils prenaient $__i$] nous n'
a decision that you know well that if they take.COND we NEG
aurions d' autre choix que de partir d' ici] (Godard 1988: 43)
have.COND of other choice that of leave.INF of here
'a decision that you know very well that if they make (it) we would have no other choice than departing'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

data, the debate around French, and explain how Tellier (1990, 1991) and Heck (2009) have tried to account for these data while still maintaining the Subject Island Constraint for French. Finally, I will briefly present an historical survey on how the subject island constraint has been treated in HPSG.

2.1 The Sentential Subject Constraint of Ross (1967)

Ross appears to have been the first linguist to notice that extraction[2] out of subjects undergoes certain constraints in English. His rule is reproduced in (2.1). (Ross 1967: 243)

(2.1) No element dominated by an S may be moved out of that S if that node S is dominated by a NP which itself is immediately dominated by S.

The Sentential Subject Constraint accounts for the visible contrast between extractions out of sentential subjects and out of sentential complements, as illustrated in (2.2).

(2.2) a. The teacher [who$_i$ the reporters expected [that the principal would fire $__i$]] is a crusty old battleax.

b. * The teacher [who$_i$ [that the principal would fire $__i$] was expected by the reporters] is a crusty old battleax. (examples from Ross 1967: 241)

In order to understand why (2.1) correctly rules out (2.2b), it is necessary to know that Ross assumes sentential complements to be NPs directly embedding a S, as shown in Figure 2.1 on page 21 for a sentential complement and in Figure 2.2 on page 22 for a sentential subject.

In (2.2a), whose syntactic tree is given in Figure 2.3 on page 23, the complement (an NP embedding the *that*-clause) is embedded under a VP, thus not directly embedded under the S of the relative clause. Therefore, the Sentential Subject Constraint does not apply and the sentence is felicitous.

In (2.2b), whose syntactic tree is given in Figure 2.4 on page 24, the subject (again an NP embedding the *that*-clause) is directly embedded under the S of the relative clause. The Sentential Subject Constraint is therefore violated, and the sentence is ungrammatical.

Ross also notices that the Sentential Subject Constraint is in competition with a "general output condition on performance" reproduced in (2.3).

[2] in his terminology – following a transformational approach – *reordering*

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.1: Syntactic tree for "The reporters expected [that the principal would fire some teacher]." (Baseline of extraction in (2.2a)) according to Ross's analysis

(2.3) Grammatical sentences containing an internal NP which exhaustively dominates S are unacceptable unless the main verb of that S is a gerund. (Ross 1967: 251)

In (2.3), "internal" means that the element is neither at the beginning nor final. In this respect, $[[\textit{that the principal would fire}]_S]_{NP}$ in (2.2b) violates (2.3), because it is neither at the beginning nor end of the sentence, and because its verb is finite. Any subextraction from a finite sentential subject will per definition fall within this case, because Ross analyses sentential subjects as being S immediately dominated by an NP, and because the sentential subject will necessarily at least stand between the filler and a verb. However, Ross makes a clear distinction between the unacceptability caused by the violation of (2.3) and the ungrammaticallity caused by the violation of (2.1). For him, ungrammatical sentences, unlike unacceptable sentences, are "beyond intonational help" (Ross 1967: 247). Rule (2.3) was designed to account for the unacceptability of examples like (2.4b).

(2.4) a. I told [a man who had a kind face] [that we were in trouble].
b. ? I told [that we were in trouble] [a man who had a kind face]. (Ross 1967: 53)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.2: Syntactic tree for "[That the principal would fire some teacher] was expected by the reporters." (Baseline of extraction in (2.2b)) according to Ross's analysis

It is not clear why Ross does not consider (2.2a) unacceptable, given that it seems to violate (2.3) too, but the rule in (2.3) certainly does not account for the contrast noticed between (2.2b) and (2.2a).

2.2 The Subject Condition: subextraction from subject NPs

Ross's Sentential Subject Constraint was very soon extended to all kinds of subjects, including NP subjects.[3] This is what is usually meant by "the Subject Island" constraint in the literature. According to Erteschik-Shir (1973: 158), the first proposal to extend the Sentential Subject Constraint to subject NPs was made by Horn (1972).

The contrast between subject NPs and object NPs is often brought up as evidence that there is an "island effect" when subextracting from subjects. The extracted element is a PP dependent of the noun.[4] In languages allowing prepo-

[3]Yet, Ross (1967) explicitly disagreed with this possibility, which made false predictions in his opinion. He gives the following example:

(i) [Of which car]$_i$ were [the hoods $___i$] damaged by the explosion? (Ross 1967: 242)

This evidence has been dismissed by Chomsky (2008) as being an extraction out of the subject of a passive, thus of an underlying object, see below.

[4]In Section 7.1, I present a handfull of studies that looked at extraction of the specifier. Here an example of the material tested by Jurka et al. (2011):

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.3: Syntactic tree for "the teacher [who$_i$ the reporter expected [that the principal would fire $__i$]]" according to Ross's analysis

sition stranding like English, the NP may be extracted alone, leaving the preposition in situ inside the subject or object NP. Example (2.5) is an illustration of this contrast between subextraction from the subject NP (2.5b) and from the object NP (2.5a). Chomsky's (1973) introspective judgement is that the former is ungrammatical whereas the latter is grammatical. Most linguists working on this topic agree that the former is at least degraded compared to the latter.

(2.5) a. Who$_i$ did you hear [stories about $__i$]? (Chomsky 1973: 248)
b. * Who$_i$ did [stories about $__i$] terrify John? (Chomsky 1973: 249)

It is traditionally assumed that the very same contrast holds when the whole PP complement is extracted, like in (2.6). We will refer to this kind of extraction as pied-piping extractions, as opposed to preposition stranding extractions like in

(i) Was$_i$ hat [$__i$ für ein Käfer] denn den Beamten gebissen? (Jurka et al. 2011: 125)
what has for a beetle indeed the clerk bitten
'What kind of beetle bit the clerk?'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.4: Syntactic tree for "the teacher [who$_i$ the reporters expected [that the principal would fire $__i$]]" according to Ross's analysis

(2.5). Again, most works agree that (2.6b) is at least degraded compared to (2.6a). In Section 7.1, I present studies that have tested this contrast in wh-questions.

(2.6) a. [Of which car]$_i$ did they find [the driver $__i$]? (Chomsky 2008: 147)

b. * [Of which car]$_i$ did [the driver $__i$] cause a scandal? (Chomsky 2008: 153)

Still, Chomsky (1986: 32) acknowledges that subextraction from the subject is "more acceptable" with pied-pipping, as in (2.7). This observation is barely addressed by minimalists working on subject islands, and Chomsky does not mention it in his subsequent works.

(2.7) He is the person [[of whom]$_i$ [pictures $__i$] are one the table]. (Chomsky 1986: 32)

In their chapter about the location of gap, Huddleston & Pullum (2002: 1093–1094) mention that gaps in a subject NP are only possible as pied-pipping, and give (2.8) as an example.

(2.8) They have eight children [[of whom]$_i$ [five $__i$] are still living at home]. (Huddleston & Pullum 2002: 1093)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Notice that (2.7) and (2.8) are relative clauses, and not interrogatives like the examples cited before. Chomsky (1986: 32) notices that violations are "less severe" in relative clauses than in interrogatives, "for unclear reasons".[5] This remark has never been addressed again by Chomsky or any syntactic account of subject islands – probably because the violation of the Subject Condition is considered to be present in (2.7), and the effect therefore negligible. I suppose that example (2.7) should be marked as barely acceptable (marked with ??) in Chomsky's view.

Chomsky (1973) assumed that PRO subjects are not available for subextraction, as in (2.9). In this example, *stories about who*, even though it is grammatically the direct object of *expect*, is the underlying subject of *terrify*. It also plays the role of the stimulus of *terrify*, the semantic role associated with the subject for this experiencer-object psych verb. Being an underlying subject, this NP is an island to extraction, according to him.

(2.9) * Who$_i$ do you expect [stories about $__i$] to terrify John? (Chomsky 1973: 249)

Subject-to-object raising verbs (or verbs with Exceptional Case Marking in minimalist's terms) should allow however the extraction out of the raised argument NP (Chomsky 2005: 20; Gallego & Uriagereka 2007; Jiménez-Fernández 2009).

(2.10) [Of which car]$_i$ did they believe [the driver $__i$] to have caused a scandal? (Jiménez-Fernández 2009: 109)

Existential constructions like (2.11a) involve an expletive, a copula and a predicative. The predicative is often considered a subject in minimalist works.[6] Some scholars (e.g. Stepanov 2007, Uriagereka 2012) consider that subextraction out of this predicative NP as in (2.11b) is grammatical, but disagree on the reason why the Subject Island Constraint does not apply in this case.

(2.11) a. There is [a picture of Grace Kelly] on the wall.

[5]Chomsky attributes the remarks on the amelioration through pied-pipping and relativization to Kuno (1972), even though I can find no reference to it in this article.

[6]Even though the details of the analyses differ from one scholar to the other, the general idea is that (i) and (2.11a) share the same deep structure:

(i) [A picture of Grace Kelly] is on the wall.

In (i), the subject is base-generated in VP (or vP) and moves to Spec,TP (or Spec,IP). In (2.11a), the subject does not move, and a dummy pronoun occupies Spec,TP (or Spec,IP) in order to fulfil the Extended Projection Principle (the requirement that every verb has a subject).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. Who$_i$ is there [a picture of $__i$] on the wall? (Stepanov 2007: 102)

There is some disagreement about the subject of passives. For some authors, it is more felicitous – or completely acceptable – to extract out of NP subjects of passives than for example out of subjects of transitives. Following Chomsky (2008), this is because they are underlying objects and therefore not constrained by the Subject Island Constraint.

(2.12) a. ? What$_i$ were [pictures of $__i$] seen around the globe? (Kluender 1998: 268)

b. It was the CAR (not the TRUCK) [of which]$_i$ [the driver $__i$] was found. (Chomsky 2008: 147)

c. [Of which car]$_i$ was [the driver $__i$] awarded a prize? (Chomsky 2008: 147)

But others disagree, and think that extraction out of the subject of a passive is ungrammatical:

(2.13) a. * Who$_i$ was [a picture of $__i$] painted by Picasso? (Erteschik-Shir 1973: 157)

b. ?* Who$_i$ was [a friend of $__i$] arrested? (Stepanov 2007: 85)

c. * It's of success [that$_i$ [our hopes $__i$] would be well rewarded]. (Wexler & Culicover 1980: 325)

There is a similar disagreement about acceptability judgments for extractions out of subjects of unaccusatives. These disagreements seem to indicate that the data is in a grey zone as far as acceptability is concerned. In general, the syntactic approaches in which subjects are islands to extraction assume that extractions out of subjects are ungrammatical (it would be the reason why the sentences are unacceptable). Depending on the analysis for "subject islands" adopted, the theory predicts subjects of passives or unaccusatives to fall under the constraint or not (see below). Since the 2010s, we can observe several attempts to gather empirical data in order to test the theory's predictions. I will present some of them in Section 7. But first, I will sketch the different lines of analyses that assume a syntactic origin to the contrast in (2.5).

2.2.1 The start: Chomsky (1973)

As far as subextraction from the subject is concerned, Chomsky (1973) treats separately the case of long distance dependencies and the case of short distance

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

dependencies. In his proposal, subextractions from the subject in short distance dependencies like (2.5b) are ruled out by the Subject Condition, and subextractions from the subject in long distance dependencies like (2.9) are ruled out by Subjacency.

The Subject Condition is a part of a series of rules on transformation. The Subject Condition is quite straightforward: no XP embedded in a subject may be subextracted from the subject (even though he does not use yet the term "extraction" in Chomsky (1973), for the phenomenon is conceived in terms of transformation).

More precisely, the Subject Condition states that there can be no transformational dependency if the element to be transformed – what we call in this work the "gap position" – is L-contained in a subject. For an XP to be L-contained in a YP, there must be at least one lexical element in YP that is not in XP: this ensures on one hand that the extraction of a whole NP subject is possible, and on the other hand that, for example, the NP-complement of a preposition does not fall under the Subject Condition (for reasons that do not concern us in this work).

The Subject Condition seems ad hoc, because it accounts only for the Subject Island phenomenon and is not based on any independent evidence. It also seems arbitrary, because it is never justified in terms of cognitive processes.

Extractions out of the subject in long distance dependencies are ruled out by a more general rule based on Subjacency. Here is the definition of Subjacency given by Chomsky:

> [I]f X is superior to Y in a phrase marker P, then Y is "subjacent" to X if there is at most one cyclic category C ≠ Y such that C contains Y and C does not contain X. (Chomsky 1973: 247)

That X is superior to Y means that it is higher in the syntactic tree: therefore, X is what we call in this work the filler position, whereas Y is what we call the gap position. Cyclic nodes are maximal projections in a sentence where syntactic information is processed and passed to PF and LF. For Chomsky (1973), S and NP are the two kinds of cyclic nodes in human language. To paraphrase Chomsky with our terminology, if it is true for more than one of such nodes in the sentence that it contains the gap position but not the filler position, then the gap is not subjacent to its filler.

One of the general rules on transformation states that an extraction can only take place if the gap is subjacent to its filler. If the gap is not subjacent to its filler, the extraction is blocked. Let us illustrate this constraint with an example of subextraction from the subject of an embedded clause, namely (2.9). The

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

tree in Figure 2.5 gives the underlying (or deep) structure of (2.9), namely (2.14), in which cyclic nodes are circled. Notice that, following the traditional view in Transformation Grammar, the subject is considered as being base-generated outside of VP (Chomsky 1965). In order to build an interrogative, the *wh*-word *who* should occupy the position under the leftmost COMP. There are two cyclic nodes containing the *wh*-word but not the landing site, and they are indicated in red. The NP *who* is therefore not subjacent to the highest COMP, and the transformation is blocked: (2.9) is ruled out.

(2.14) you expect stories about who to terrify John [Underlying structure of (2.9)]

Notice, however, that the transformation would be ruled out for any subextraction from an NP in the embedded clause, so that this is not strictly speaking a "subject island" effect (there would be no contrast with a subextraction out of an NP object).

Contrary to the Subject Condition, constraints on Subjacency are ultimately explained in terms of cognitive capacities (the cyclic nodes allow to unburden the memory). They are also independently motivated, because the same mechanism is used to account for other putative islands, among which subextractions from embedded questions. Embedded questions are often called "wh-islands". Ross (1967) was the first to remark that these constructions were special with respect to extraction, but he also noticed that the restrictions were not absolute. For this reason, they belong to the weak islands for scholars that adopt this distinction (e.g. Cinque 1990).

The constraints in Chomsky (1973) are problematic, because they are too restrictive. The so-called *wh*-islands have been shown to have many exceptions, depending on many different factors: the function of the extracted element (extraction of the adjunct is degraded compared to the extraction of the indirect or direct object, see (2.15)), the nature of the filler of the embedded interrogative (Kluender & Kutas 1993b), the finiteness of the embedded question, and the specificity of the extracted element or of the *wh*-filler of the embedded question (Kluender 1998).[7] And yet, all extractions out of an embedded question should be excluded by Subjacency to the same degree.

(2.15) a. * How$_i$ did they ask you [who$_j$ $__j$ behaved $__i$]? (Cinque 1990: 1)

[7]For a discussion about French data and the difference in acceptability between the extraction of an adjunct, an indirect object and a direct object on one hand, and extraction out of *wh*-embedded question and *si*-embedded question (similar to English *if*-embedded questions) on the other hand, see Hirschbühler & Valois (1992).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.5: Syntactic tree for "you expect stories about who to terrify John" according to Chomsky (1973)

b. [To whom]$_i$ didn't they know [when to give their present $__i$]? (Cinque 1990: 1)

c. [Which problem]$_i$ did John ask [how to phrase $__i$]? (Szabolcsi 2006: 494)

More genuinely, the constraint on Subjacency stated above also rules out subextraction out of a dependent of the dependent of a noun like (2.16).

(2.16) * What$_i$ do you receive [requests for [articles about $__i$]]? (Chomsky 1973: 248)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

This is problematic, because felicitous examples of such structures are very easy to find. Ross (1967) cites example (2.17a) for English. I was also able to find many of such examples for French in the corpus frWaC (Baroni et al. 2009). Example (2.17b) is one of many attested examples.

(2.17) a. [What books]$_i$ does the government prescribe [the height of [the lettering of $__i$]]? (Ross 1967: 15)

b. Il présente cependant les défauts traditionnels des textes
it has however the flaws traditional of.the texts
internationaux [dont$_i$ [la réalité de [l' application $__i$]] est
international of.which the reality of the application is
très rarement contrôlée].
very rarely controlled
'It has the traditional flaws of international texts, the reality of the application of which is rarely controlled.'

Since Chomsky (1973), there has been a vast number of syntactic approaches of the Subject island constraint. I suggest that they can be gathered into three principal groups, which I will now present briefly.

2.2.2 The subject is a non-complement: The CED and its successors

2.2.2.1 The Condition on Extraction Domain

Huang (1982) introduces another island into the list proposed by Ross (1967): the Adjunct Island. For him, the ban on extraction out of adjuncts like (2.18) is parallel to the ban on extraction out of subjects.

(2.18) * Who$_i$ did Mary cry [after John hit $__i$]?

For him, the Subject Condition is only "a special case of an even more general asymmetry between complements on the one hand and non-complements (subjects and adjuncts) on the other" (Huang 1982: 503). He subsumes Chomsky's (1973) Subject Condition with Kayne's (1981) Empty Category Principle in a constraint called the "Condition on Extraction Domain" that is reproduced in (2.19).

(2.19) **Condition on Extraction Domain** (Huang 1982: 505) A phrase A may be extracted out of a domain B only if B is properly governed.

Since objects are complements of V, they are c-commanded by a lexical head, and thus "properly governed". For this reason, extractions out of NP objects or

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

sentential complements are possible. Subjects and adjuncts are not c-commanded by V, and it follows that subextractions out of subjects and adjuncts are blocked, following Huang.

Huang's (1982) CED inspired a lot of subsequent works on subject islands, and started the tradition of considering the Subject Island and the Adjunct island under the same constraint. An important successor of Huang's (1982) CED is the concept of "Barriers" in Chomsky (1986).

2.2.2.2 Barriers

In the 80's, Chomsky model for sentence construction had changed compared to Chomsky (1973). In between, the operation MOVE had been introduced. In Chomsky (1986), he assumes that a moved element leaves a trace (*t*) under the position it occupies in the deep structure, and under any position occupied during movement. The movement of *wh*-words (*wh*-movement) is indeed cyclic, and the landing site of each cyclic movement must be a specifier position. Notice also that the subject is considered as being base-generated in Spec,IP (this view has been abandoned since, see below). The tree in Figure 2.6 illustrates how (felicitous) movement works in Chomsky's (1986) account: *who* first moves from its initial position to the Specifier position of VP and from the Specifier position of VP to the Specifier position of CP (notice that the Specifier position of IP is not available for movement, Chomsky 1986: 32). Another movement is involved here: the head-movement of *did* from I to C, but this is not a *wh*-movement.

(2.20) Who did you hear stories about? [see (2.5a)]

"Cyclic categories" of Chomsky (1973) have now been replaced by "blocking categories" and "barriers". Any maximal projection which has not been directly assigned a θ-role by a lexical category is a blocking category for any element it contains. A blocking category becomes a barrier for movement[8] under certain conditions given in 2.21.

(2.21) γ is a barrier for β iff (a) or (b):
(a) γ immediatly dominates δ, δ a [blocking category] for β
(b) γ is a [blocking category] for β, $\gamma \neq$ IP

Subjacency receives a new definition based on the concept of barriers as defined in (2.21): an element is 0-subjacent to a (dominating) landing site if there

[8]Other rules apply for blocking other kinds of government that we will not discuss here.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.6: Syntactic tree for "Who did you hear stories about?" according to Chomsky (1986)

is no barrier between them; it is 1-subjacent if there is one barrier crossed, 2-subjacent if there are two barriers, etc. In Figure 2.6, the blocking category is circled black. The initial position of *who* is 0-subjacent to its landing position, because NP_2, being directly assigned a θ-role by V, is not a blocking category; VP is per definition lexical and thus not a blocking category; and IP, even though it is a blocking category, is not a barrier because of (2.21b).

The tree in Figure 2.22 illustrates what happens, however, when extracting out of a subject. Blocking categories are circled black, and barriers circled red.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(2.22) Who did stories about terrified John? [see (2.5b)]

Figure 2.7: Syntactic tree for "Who did stories about terrified John?" according to Chomsky (1986)

The initial position of *who* is here 2-subjacent to its landing position. PP is directly assigned a θ-role by N and is therefore not a blocking category. But NP_1, being base-generated outside of VP, is not directly assigned a θ-role[9] and is a blocking category and a barrier because of (2.21b). IP furthermore is a blocking category, and also a barrier because of (2.21a).

Subjacency is then linked to acceptability: the more subjacent the trace relative to its landing position, the less acceptable the sentence. Hence, Chomsky (1986) introduces a notion of gradation of the acceptability in his theory, while the distinction used to be categorial. In general, if we follow acceptability judgements

[9]Indeed, subjects are only indirectly θ-marked (cf. Chomsky 1986: 13), because they receive their θ-marking from VP and not from the head V of VP (Chomsky 1981: 37). Only lexical words can l-mark their arguments, not phrases.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

in the work, it seems that 0-subjacent dependencies are acceptable, 1-subjacent dependencies awkward (?) and 2-subjacent dependencies ungrammatical or unacceptable (*).

Stepanov (2007: 82) criticizes the theory of barriers, because "θ-theory and bounding theory (responsible for the locality of movement including extraction) are different modules of core grammar, driven by separate sets of principles".

Deane (1991), on the other hand, noticed that the definition of Barriers, like the Subjacency of Chomsky (1973), is too strong. It excludes acceptable examples like (2.23), in which the relative word crosses one IP and two NPs. Example (2.23) reminds us of example (2.17a) cited before.

(2.23) Nixon was one president that$_i$ [$_{IP}$they had no trouble getting [$_{DP}$votes for [$_{DP}$the impeachment of $_{-i}$]]]. (Deane 1991: 10)

For French, counterexamples similar to (2.23) have been produced by Godard (1988). Yet, none of them is a subextraction from a subject or an adjunct.

(2.24) a. La pièce$_i$ que$_i$ [l' évolution de la situation politique donnait
the play that the evolution of the situation political gave
[l' impression [qu' on pouvait enfin monter $_{-i}$]$_{IP}$]$_{NP}$ n'
the impression that one could finally create NEG has
a pourtant pas été autorisée. (Godard 1988: 38)
yet not been allowed
'The play that the political development gave the impression that it would be finally possible to create (it) has yet not been allowed.'

b. un problème$_i$ auquel$_i$ il me semble [qu' on m' a
a problem at.which it 1.SG.DAT seems that one 1.SG.ACC has
dit [que tu t' étais attaqué $_{-i}$]$_{IP}$]$_{IP}$ (Godard 1988: 59)
told that you REFL were tackle
'a problem that I believe that someone told me that you tackled'

2.2.3 The subject is a specifier: The Connectedness Condition and other "specifier"-based analyses

2.2.3.1 The Connectedness Condition

Contrary to Chomsky and Huang, Kayne (1983) does not assume that all languages undergo the subject island constraint. Indeed, as noticed already by Ross

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(1967), Japanese seems to allow extraction out of subjects. Instead of assuming that the constraint is language-specific, as Ross did, Kayne assumes that it is a consequence of the canonical government configuration which differs between English and French on one side and Japanese on the other side. In English and French, which are SVO languages, the verb canonically governs its complement on the right; while in Japanese, which is an SOV language, the verb canonically governs its complement on the left.

Following Kayne (1983: 225), an extracted element must be inside an XP that is canonically governed by the verb. In Japanese, the subject is on the left of the V, and therefore canonically governed, and subextraction out of the subject is possible. In English and French, the subject is on the left of the V, and is therefore not canonically governed, and for this reason subextractions out of the subject are banned.

With this rule, Kayne (1983) does not only account for the subject island, but also for the Left Branch Condition in Ross (1967: 207–217), which stated that no leftmost element of an NP may be extracted out of the NP.

(2.25) a. We elected [the boy's guardian's employer]$_{NP}$ president.

b. * The boy [[whose guardian's]$_i$ we elected [$_{-i}$ employer] president] ratted on us.

c. * The boy [whose$_i$ we elected [$_{-i}$ guardian's employer] president] ratted on us. (examples from Ross 1967: 208)

Indeed, elements in the specifier position of NPs are not canonically governed following the Connectedness Condition.

Longobardi (1985) takes over Kayne's (1983) Connectedness Condition and applies it to the adjunct island. It is relatively straightforward that extractions out of an AdvP that is situated on the left of V are ruled out by the Connectedness Condition. But even AdvP on the right of the verb are analyzed by Longobardi (1985) as being sisters of the VP, and thus not c-commanded by the verb (see ex. 14 in Longobardi 1984: 157). Subextraction would then be ruled out.

2.2.3.2 Phase Impenetrability

A good starting point for going into the concept of phrase impenetrability is Chomsky's (2001) decision to make the notion of "phases" a core concept of his analysis. This new turn is known as the Phase Theory. Phases are comparable to barriers. I will summarize here the analysis in Chomsky (2008), but, even though the theory has evolved since 2001, the general idea of the phase impenetrability has remained unchanged.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Some maximal projections, namely v*P and CP, are phases. Sentence formation happens in a bottom-up fashion, such that the lower phases are formed before the higher ones, one at a time. At the Edge of a given phase, the information inside this maximal projection is transferred to the phonetic and semantic interface. After the transfer, the phase remains impenetrable for heads higher in the tree, and no element can move out of the phase. The only solution for an element to undergo movement higher in the syntactic tree is to move to the Edge of the maximal projection prior to the Transfer.[10] Figure 2.8 on page 37 illustrates a simple extraction out of the object following the Phase Theory. Phases are identified with red circles.[11]

Since Chomsky (1995), following a proposal by Kitagawa (1986) and Koopman & Sportiche (1991), Chomsky assumes that (some) subjects are base-generated in the specifier position of the functional projection vP (or v*P). No movement from a specifier to the Edge of the same maximal projection is allowed. That's why extraction out of these subjects is not allowed: as illustrated in Figure 2.9 on page 38, the complement of the subject noun cannot move to the Edge of the v*P, and is therefore transferred to the phonetic and semantic interface where it is not accessible anymore for C. The subextraction is hence ungrammatical.

The verbal projection v*P is only built for verbs that require an external argument, like transitive verbs. When subjects are internal arguments (underlying objects), there is no v*P, and therefore no phase. That is why subextractions out of the subject of passives, like (2.26), are acceptable. The analysis is illustrated by Figure 2.10 on page 39. For the same reason, extractions out of subjects or unaccusatives are predicted to be grammatical.[12]

[10] Chomsky (2008), to my knowledge, never explicitly describes what the Edge is exactly. In the following, I assume that the Edge is a sister of XP (or X') situated on its left, some sort of second Specifier above the Specifier.

[11] It is generally assumed that at least the agentive subjects are base-generated under Spec,vP (or VoiceP, which is roughly similar to vP). For example, Kratzer (1996) assumes that there are two different VoicePs, one for licensing agentive subjects and one for licensing holder subjects, and Alexiadou et al. (2015: Chapter 2) propose three different VoicePs, so that causer subjects are also external arguments. This implies that some subjects, such as experiencer subjects, would be internal arguments. Does this mean that these analyses do not predict an island effect for non-agentive/non-holder/non-causative subjects? As far as I know, this is not a question that is discussed by these authors. In any case, the answer to this question has no bearing on the interpretation of the empirical data that I present in Part II. I will argue this point in Section 14.4.2.2, in which I briefly return to the issue of experiencer subjects.

[12] This prediction of the Phase Theory is not addressed by Chomsky, but has been underlined by Polinsky et al. (2013) and Haegeman et al. (2014). Perlmutter (1978) proposed the distinction among intransitive verbs between unaccusatives and unergatives, based on their distinct syntactic behavior that correlates with distinct semantic properties. This hypothesis has been

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.8: Syntactic tree for "Who$_i$ did you hear [stories about $__i$]?" according to Chomsky (2008)

(2.26) Who$_i$ were [stories about $__i$] written down?

2.2.3.3 Spell out

The analysis of Spell out developed in Nunes & Uriagereka (2000) and Uriagereka (2012) (a.o.) borrows some elements from the Phase Theory, while taking into account the linear incremental processing of sentences. I will summarize here the analysis in Uriagereka (2012), which assembles many of the elements developped in previous works by Uriagereka and his colleagues. The starting point of this

formalized in the GB framework by Burzio (1986). In his approach, and as far as deep structure is concerned, unergative verbs take an external argument (subject) and no internal argument, while unaccusative verbs take an internal argument (object) and no external argument. For both kinds of verbs, the argument appears outside of VP, in the subject position. The consequence for the Phase Theory, as Polinsky et al. notice, is that extraction out of subjects of unergatives should be ungrammatical and the extraction out of subjects of unaccusatives should be grammatical. They designed an experiment to test this prediction, see Section 7.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.9: Syntactic tree for "Who$_i$ did [stories about $__i$] terrify John?" according to Chomsky (2008)

analysis is the Linear Correspondence Theorem (LCT), which states, in a nutshell, that asymmetrical branching (i.e. a binary branching with one terminal node and one non-terminal node) (Uriagereka 2012: 53) and a configuration in which the terminal node precedes the non-terminal one (Uriagereka 2012: 56) is easier to parse than its corollaries.[13] This is illustrated by Figure 2.11 on page 40: the tree in (b) has a first binary branching with two non-terminal nodes and thus violates the first part of the LCT (Finite State Limit); the tree in (c) has its non-terminal nodes preceding the terminal ones and thus violates the second part of the LCT (Linear Correspondence Axiom).

Whenever we have to parse a syntactic structure that does not follow the LCT, the tree is chunked into different sub-trees that are in accordance with the LCT and are then parsed in parallel. A sentence with a complex subject is similar to the tree (b) in Figure 2.11. The NP subject is then parsed as a unit: this is the operation called Spell out. After Spell out, the structure is no longer phrasal, but

[13]The Binary Principle (Culicover & Wexler 1977) was a very similar idea.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.10: Syntactic tree for "Who$_i$ were [stories about $__i$] written down?" according to Chomsky (2008)

it is treated as a word. The mechanism is illustrated by Figure 2.12 on page 40. The internal structure of the subject is hardly accessible, because of Spell out.

Subextracting out of the subject implies that the subject is complex, and thus subextraction is made very difficult by Spell out. The same applies to Adjuncts, which are considered to modify maximal projections: the VP and the adjunct XP are built in parallel.

Ultimately, the cause of the Subject island constraint according to Uriagereka (2012) is the fact that the subject is in a Specifier position, but for reasons different from the proposal of Kayne (1983) or of Chomsky (2008). Contrary to these previous analyses also, the subject is not completely opaque for subextraction. It is merely making hard for the parser to interpret it, because "any extraction from there [the subject] will involve material within something that is not a syntactic object" (Uriagereka 2012: 92–93). Furthermore, a subextraction out of some subjects may face an additional difficulty, which I explore further in the next section.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2.11: Illustration of the Linear Correspondence Theorem; Tree (a) is in accordance with the Linear Correspondence Theorem; Tree (b) violates the Finite State Limit; Tree (c) violates the Linear Correspondence Axiom

Figure 2.12: Spell out for a sentence with a complex subject

2.2.4 The subject is moved: Freezing analyses

A historical overview of the analysis of Freezing effects can be found in Corver (2006). He finds the origin of these analyses in Ross's (1967) constraint on extraposition and Heavy NP shift: no subextraction can take place out of an element that has moved to the right. I present here three influential approaches that see the origin of the difficulty to extract out of a subject in the fact that the subjects typically move to Spec,IP, a view commonly adopted in Minimalism (see above).

2.2.4.1 The Freezing Principle

The Freezing Principle was originally formalized in Wexler & Culicover (1980). The part of the Freezing Principle that is relevant for our topic is the Raising Principle, reproduced in (2.27).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(2.27) If a node A is raised, then no node that A dominates may be used to fit a transformation.[14] (Wexler & Culicover 1980: 341)

Wexler & Culicover used the Raising Principle to account for a ban on extraction out of extraposed elements like (2.28b).[15]

(2.28) a. [A suspicion $__i$] has arisen [that you have been holding back on the IRS]$_i$.

b. * The IRS is the government agency [[that]$_j$ [a suspicion $__i$] has arisen [that you are holding back on $__j$]$_i$]. (examples from Wexler & Culicover 1980: 341–342)

Based on some evidence from German and Dutch, Müller (1998) proposed to generalize the Freezing Principle to any kind of movement. For example, in German, extraction out of an element that has scrambled rightward from its canonical position in the Mittelfeld is degraded compared to the same subextraction from the canonical position. Compare extraction out of the scrambled object NP in (2.29a) with extraction out of the object NP in situ in (2.29b).

(2.29) a. * Worüber$_i$ hat [ein Buch $__i$]$_j$ keiner $__j$ gelesen?
about.what has a book nobody read

b. Worüber$_i$ hat keiner [ein Buch $__i$] gelesen? (examples from Müller 1998: 20)
about.what has nobody a book read

'About what did nobody read a book?'

Gallego & Uriagereka (2007) discuss what they consider to be a similar contrast in English:

(2.30) a. ?* Who$_i$ does [a picture of $__i$] hang on the wall? (Stepanov 2007: 80)

b. Who$_i$ is there [a picture of $__i$] on the wall? (Stepanov 2007: 102)

[14] Or, in other words: "If a node has been raised, it is frozen; that is, further transformations may not analyze nodes below the raised node." (Wexler & Culicover 1980: 28).

[15] The extraposed sentential complement in (2.28b) is "raised" because Wexler & Culicover (1980) define raising as a movement from inside a cyclic category (NP or S) to inside another cyclic category higher in the syntactic tree. In (2.28a), the cyclic category of the sentential complement is the subject NP. In (2.28b), Wexler & Culicover (1980) assume that the sentential complement has moved to a sister position of V; its cyclic category is hence the matrix S, which is higher in the tree.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

According to them, in (2.30a), the NP *a picture of who* first undergoes a movement to Spec,TP, and for this reason the successive movement from *who* from Spec,TP to Spec,CP is ruled out. On the contrary, the subject NP *a picture of who* in (2.30b) does not undergo the movement to Spec,TP. Instead, Spec,TP is occupied by *there* in order to fulfil the EPP requirement, and the movement of *who* to Spec,CP is felicitous.

Boeckx (2003: 103) explains Freezing by the principle of feature checking. A movement is triggered by the need for an element to check its features: the subject moves because of the Case-feature. Once an element has checked his features, it becomes "inert". For this reason, agreement and extraction are not possible anymore.

Notice however that Müller (1998) still assumes Subjacency, because he considers that extraction out of in situ subjects is ungrammatical:

(2.31) * [Über wen]$_i$ hat [ein Buch $__i$] den Karl beeindruckt? (Müller 1998: 30)
about who has a book the.ACC Karl impressed
'About whom did a book impress Karl?'

In example (2.31), the subject was not scrambled, so Freezing cannot be the reason of the ungrammaticality.[16] Gallego & Uriagereka's (2007) explanation for the grammaticality of (2.30b) is therefore not compatible with Müller's (1998) analysis.

2.2.4.2 Chain Uniformity

Takahashi (1994) defines two main constraints on movement, that are reproduced in (2.32).

(2.32) a. Shortest Movement Condition (SMC): Make the Shortest Movement. (Takahashi 1994: 8)
b. Uniformity Corollary on Adjunction (UCA): Adjunction is impossible to a proper subpart of a uniform group where a uniform group is a nontrivial chain or a coordination. (Takahashi 1994: 25)

[16]For subjects of passives, which according to Müller (1998) are underlying objects and do not need to move to a subject position in German, the extraction out of the subject is felicitous.

(i) Worüber$_i$ ist von keinem [ein Buch $__i$] gelesen worden? (Müller 1998: 124)
about.what AUX by nobody a book read been
'About what was a book read by nobody?'

Such subjects are not freezed and they are internal arguments.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Let us add a few explanations in order to better understand the constraints in (2.32). In his definition of SMC, Takahashi assumes cyclic movements, in which the extracted element is copied in the nearest appropriate position, then in the nearest one, and so on until the final position. Lower copies of an element are deleted in surface structure. The *wh*-movement is seen as a movement to a Specifier position (cyclically from Specifier to Specifier). Furthermore, *wh*-movement (extraction) is seen as an adjunction mechanism rather than a substitution mechanism, and a nontrivial chain means that the element has a copy, hence that it has moved. That's why the UCA is ultimately similar to Freezing, except that it also accounts for the Coordinate Structure Constraint.

In order to extract out of a subject that has moved from Spec,VP to Spec,IP[17], there are two possibilities: (i) the closest Specifier position is Spec,DP of the subject DP – but UCA prevents this from happening – (ii) or there is an adjunction of the copy to Spec,IP – which violates SMC. Hence, there is no possibility to have a fully acceptable subextraction from a subject.

Uriagereka (2012) combines the constraints on Spell out (see above) with Takahashi's (1994) SMC and UCA in order to account for subject island effects. Remember that the effects of Spell out are not seen as categorical: extracting out of a complex NP in a specifier position makes the parsing more complicated, but not impossible. Shortest Move is also considered by Uriagereka as a preference, but not as a rule. According to him, this explains a contrast found in Spanish when extracting out of a subject between preverbal and postverbal subjects.

(2.33) a. ?? [De qué artistas]$_i$ han herido tu sensibilidad [las obras $_{-i}$]?
of what artists have.3PL hurt your sensibility the works

b. * [De qué artistas]$_i$ [las obras $_{-i}$] han herido tu sensibilidad?
of what artists the works have.3PL hurt your sensibility

In both (2.33a) and (2.33b), the subject is in a Specifier position, and the subextraction is degraded because of Spell out. But in (2.33a), the subject is in situ in Spec,VP, while in (2.33b), the subject has moved from Spec,VP to Spec,TP. The subextraction in (2.33b) is hence violating two principles, and that's why this

[17]Takahashi assumes this movement for English and French subjects (Takahashi 1994: 28), but not for Japanese subjects (Takahashi 1994: 65), hence the acceptability in extracting out of the subject in Japanese, see below.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

example is degraded compared to (2.33a), which violates only one principle. As the reader can see, Uriagereka (2012) and Müller (1998) have very similar views, even though the details of their analyses differ.

2.3 The Subject Island Constraint cross-linguistically

Ross himself insisted that the Sentential Subject Constraint in (2.1) only applied to some languages.

> This constraint [i.e. (2.1)], though operative in the grammars of many languages other than English, cannot be stated as a universal, because there are languages whose rules are not subject to it. (Ross 1967: 243)

But subsequent accounts based on syntax explicitly or implicitly assume that the constraints that cause subject island effects are universal constraints. Of course, many counterexamples have been produced by various scholars and discussed over the years. That is one of the reasons why the syntax-based analyses became more and more sophisticated, taking advantage of cross-linguistic properties that would explain why some languages can "escape" the subject island constraint.

2.3.1 The discussion around French

Most of the time, the discussion on extractions out of an NP in French addresses the extraction of a specific kind of French complement of the noun: *de*-phrases (or *de*-PPs). These PP are introduced by the preposition *de* ('of') that express almost all kinds of possible relations holding between the NP inside the PP and the N head it is the complement of. For example, the most direct reading for (2.34a) is that the *de*-phrase express a possession, but it could also be a more unspecific and context-dependent relation (for example, the house Thérèse always talks about). There are also part-of-whole relations for body parts like (2.34b), etc.

(2.34) a. la maison de Thérèse
the house of Thérèse

b. la main d' Adrien
the hand of Adrien

These *de*-PPs are not only used as complement of a noun, but also as complement of a verb, of an adjective, etc. All *de*-PPs can be extracted with *dont*

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

("of which'), *de qui* ('of who'), *de quoi* ('of what'), *duquel* ('of which' [+masculin,+sg]), *desquels* ('of which' [+masculin,+pl]), *de laquelle* ('of which' [+feminin,+sg]), *desquelles* ('of which' [+feminin,+pl]) or *de quel(le)(s)* + N ('of which +N').

The French relative word *dont* is used exclusively to introduce relative clauses with an antecedent or *c'est*-clefts, see example (2.35a), (2.35b), (2.35c) and (2.35d). It cannot be in situ and cannot be the complement of a preposition: it is therefore not used in pied-piping, as illustrated in (2.35e) where *loin* ('far') is a French preposition.

(2.35) a. cet homme [dont$_i$ on m' a dit du bien $_{-i}$]
this man of.which one me.ACC has told some good
intended: 'this man who I heard good things about'

b. * Je me souviens [dont$_i$ on m' a dit du bien $_{-i}$].
I myself remember of.which one me.ACC has told some good
intended: 'I remember who(ever) I heard good things about.'

c. * Dont$_i$ as - tu dis du bien $_{-i}$?
of.which have you told some good
intended: 'About who did you say good things?'

d. C' est cet homme [dont$_i$ on m' a dit du bien $_{-i}$].
it is this man of.which one me.ACC has told some good
intended: 'It's this man who I heard good things about'

e. * cet homme [[loin dont]$_i$ je suis $_{-i}$]
this man far of.which I am
intended: 'the man who I am far from'

In some circumstances, the relative word *dont* is not linked to a gap, but to a resumptive pronoun (Godard 1988, Abeillé & Godard 2007). In this work, we will concentrate on *dont* relatives clauses in which *dont* is linked to a gap. In these cases, *dont* is only appropriate for a *de*-PP gap. In example (2.36), the verb *assister* ('to attend') requires a PP complement introduced by *à*, and *dont* cannot be used for the extraction.

(2.36) a. Jeannine assiste à une conférence.
Jeannine attends at a conference
'Jeannine attends a conference.'

b. * la conférence [dont$_i$ Jeannine assiste $_{-i}$]
the conference of.which Jeannine attends
intended: 'the conference that Jeannine attends'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

For this reason, *dont* can roughly be translated in English as 'of which', and will systematically be glossed that way. But *dont* also can be used in partitive verbless relative clauses like (2.37) where *dont* means something like 'among which'.[18] In these cases, *dont* is not linked to a gap.

(2.37) Pierre a plusieurs passions, dont le ski.
Pierre has several hobbies of.which the skiing
'Pierre has many hobbies, among which skiing.'

The combination *de* ('of') + *qui* ('who') is another possibility to extract a *de*-PP, provided that the head noun is animate.

(2.38) a. l' homme [[de qui]$_i$ / dont$_i$ il parle $_{-i}$]
the man of who of.which he talks
'the man he talks about'

b. l' ordinateur [[*de qui$_i$] / dont$_i$ il parle $_{-i}$]
the computer of who of.which he talks
'the computer he talks about'

Apart from that, it is less restricted than *dont*, because it can be used in relative clauses with an antecedent like (2.39a) or free relative clauses (like 2.39b), but also in interrogatives like (2.39c), *c'est*-clefts like (2.39d) or exclamatives. It can also be the complement of a preposition and thus appears in pied-piping constructions, as (2.39e) illustrates.

(2.39) a. cet homme [[de qui]$_i$ on m' a dit du bien $_{-i}$]
this man of who one me.ACC has told some good
'this man who I heard good things about'

b. Je me souviens [[de qui]$_i$ on m' a dit du bien $_{-i}$].
I myself remember of who one me.ACC has told some good
'I remember who(ever) I heard good things about.'

c. [De qui]$_i$ as - tu dis du bien $_{-i}$?
of who have you told some good
'About who did you say good things?'

d. C' est cet homme [[de qui]$_i$ on m' a dit du bien $_{-i}$].
it is this man of who one me.ACC has told some good
'It's this man who I heard good things about'

[18] see Bîlbîie & Laurens (2010) for a detailed description of these partitive verbless relative clauses

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

e. cet homme [[loin de qui]$_i$ je suis $_{}_i$]
this man far of who I am
'the man who I am far from'

Following a proposal of Godard (1988), there is a general consensus among linguists that French *dont* is a complementizer, as are *que* and the subject-subordinate variant of *qui*[19], whereas the other fillers used in relative clauses – including *de qui* – are pronouns (Tellier 1990, Abeillé & Godard 2007, Le Goffic 2007). The distinction between relative pronouns and complementizers relies on four main contrasts. First, complementizers are invariable, whereas most relative pronouns have to agree in gender and number with their antecedent (even though this is not the case for *de qui*). Second, relative pronouns may semantically constrain their antecedent (like *de qui*, which does not allow for inanimate antecedent), whereas complementizers do not. Third, complementizer cannot be used in pied-piping constructions (as stated before, *dont* cannot but *de qui* can be used in pied-piping). And finally, relative pronouns may introduce an infinite relative clause, but complementizers require a tensed verb: this is only marginally true for *dont*, which allows infinitivals to some extent.

(2.40) a. ? une personne [dont dire du bien]
a person of.which tell.INF some good

b. une personne [de qui dire du bien]
a person of who tell.INF some good
'a person one can speak well about'

c. * un restaurant [qu' apprécier]
a restaurant that appreciate.INF
'a restaurant one can appreciate'

Godard (1988) cited many examples with relativization out of the subject using *dont* like examples in (2.41), challenging the general tradition on subject islands.

(2.41) a. J' ai rencontré Paul, [dont$_i$ [la maison $_{}_i$] est à vendre].
I have met Paul of.which the house is at sell.INF
(Godard 1988: 109)
'I met Paul, whose house is for sale.'

[19]In French, Abeillé & Godard (2007) assume two lexical entries for *qui* ('who'): one is a complementizer and is used only in subordinate clauses when followed by a subject gap, the other is a pronoun and is used in all other cases.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. J' ai rencontré Paul, [dont$_i$ il semblerait [que [la maison $__i$] est à vendre]]. (Godard 1988: 109)
I have met Paul of.which it would.seem that the house is at sell.INF
'I met Paul, of whom it seems that the house is for sale.'

c. la jeune femme [dont$_i$ [le portrait $__i$] est à la fondation Barnes] (Godard & Sag 1996: 63)
the young woman of.which the portrait is at the foundation Barnes
'this young lady, of which the portrait is at the Barnes foundation'

Her conclusion is that the Subject Island constraint does not apply to NP subjects in French. However, she still thinks that extracting out of a verbal subject is impossible, as illustrated by (2.42). Example (2.42a) is an extraction out of an infinitival, and example (2.42b) is an extraction out of a finite sentential subject.

(2.42) a. * Paul [[à qui]$_i$ il apparaissait que [confier ce qui s' était réellement passé $__i$] était malheureusement impossible], serait certainement très en colère. (Godard 1988: 43)
Paul at who it appeared that entrust it that REFL was really happened was unfortunately impossible would.be certainly very in rage
'Paul, to who it appeared that, unfortunately, to entrust what really happened was impossible, would certainly be very upset.'
(i.e. It appeared that, unfortunately, to entrust what really happened to Paul was impossible, and Paul would certainly be very upset.)

b. * Strasbourg [où$_i$ on sait que [la décision de fixer le siège du Parlement européen $__i$] n' est pas encore acquise] a pourtant effectué de grands travaux dans cette perspective. (Godard 1988: 43)
Strasbourg where one knows that the decision of settle.INF the seat of.the Parliament European NEG is not yet definitive has nevertheless made of big works in this respect
'Strasbourg where it is known that the decision to settle the seat of the European Parliament is not yet definitive has nevertheless already undertaken big works in that respect.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(i.e. It is known that the decision to settle the seat of the European Parliament in Strasbourg is not yet definitive, but Strasbourg has nevertheless already undertaken big works in that respect.)

As Godard (1988: 56) points out, the fact that extraction out of NP subjects is allowed in French is a major problem for the general theory: "It is explicitly expected that the [Subject Island] Constraint has a general scope and applies to French".[20]

As a response to Godard (1988), Tellier (1990, 1991) hypothesizes that the reason why extractions out of the subject are possible with *dont* is that it is a complementizer. Consequently, according to Tellier, subextractions out of the subject are not allowed with *de qui*, as examples in (2.43) show.

(2.43) a. le diplomate [dont$_i$ [la secrétaire _] t' a
the diplomat of.which the secretary you.ACC has
téléphoné] (Tellier 1990: 307)
called
'the diplomat of who the secretary called you'

b. * le diplomate [[de qui]$_i$ [la secrétaire _] t' a
the diplomat of who the secretary you.ACC has
téléphoné] (Tellier 1990: 307)
called
'the diplomat of who the secretary called you'

The acceptability judgements for (2.43) reflect her acceptability judgements. The traditional cue of a subject island effect, namely the contrast between subextraction from subject and subextraction from object, would arise as expected by the Subject Island Constraint when using *de qui* instead of *dont*. This is illustrated by (2.44), again with her acceptability judgements.

(2.44) a. ?* C' est un linguiste [[de qui]$_i$ [les parents _$_i$] ont déménagé à
it is a linguist of who the parents have moved at
Chartres]. (Tellier 1991: 89)
Chartres
'this is a linguist of whom the parents have moved to Chartres'

[20]Translation. Original quote: "Or, il est explicitement prévu que la Contrainte ait une portée générale et s'applique au français." (Godard 1988: 56)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. C' est un linguiste [[de qui]$_i$ vous avez rencontré [les parents $__i$]]. (Tellier 1991: 90)
it is a linguist of who you have met the parents
'this is a linguist of who you have met the parents'

Tellier's (1990) analysis is based on the notion of "barriers", as defined in Chomsky (1986) (this notion is explained in chapter 2.2.2.2 page 31ff.). In her analysis, an extraction out of the subject with *de qui* undergoes the usual subject island constraint, illustrated in Figure 2.13, similar to the English example (2.22).

Figure 2.13: Syntactic tree for "[de qui]$_i$ [la secrétaire $_$] a téléphoné" ('of who the secretary called') according to Tellier

Remember that following Chomsky (1986) NP is not directly θ-marked by V[21] and thus is a blocking category and a barrier for the PP-complement of the noun.

[21] see fn. 9

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

IP is not assigned a θ-role either, and because it contains a blocking category (the NP), it is also a barrier for the PP. The *wh*-movement of *de qui* encounters two barriers, and is therefore unacceptable.

Tellier (1990: 308–309) says that the genitive PP-complement of the subject noun moves to the specifier of CP, where it agrees with the head (i.e., *dont*) and is then deleted. This is how *dont* is assigned a genitive case. Because of this genitive case, the complementizer *dont* is l-marked (i.e. it is lexical).[22] Tellier stipulates (i) that an l-marked C head "θ-marks its complement IP" and (ii) that a lexical α "L-marks β iff β agrees with the head of τ that is θ-governed by α". Her analysis is illustrated by Figure 2.14:

Figure 2.14: Syntactic tree for "dont$_i$ [la secrétaire $_{}_i$] a téléphoné" ('of who the secretary called') according to Tellier

[22]She assumes that the overt genitive case "assigns to the complementizer sufficent lexical weight" in order to be treated as a lexical word (Tellier 1990: 309).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Because *dont* is lexical, C assigns a θ-role to IP (i), which is thus not a blocking category. Additionally, *dont* l-marks IP (ii) and IP in turn assigns a θ-role to NP (i), which is thus not a blocking category either. The consequence is that there is no barrier in Figure 2.14 (the movement is 0-subjacent), and the extraction out of the subject with *dont* is therefore acceptable.

There are several problems with Tellier's (1990) analysis. The fact that *dont* can assign θ-role to IP seems very stipulative and ad hoc, such that this rule is only applicable to subextractions from the subject. There is also no explanation for why the complementizer cannot receive other cases than a genitive – for example when extracting out of a sentential subject. Leaving aside the details of the analysis, the premises are problematic as well. The metalinguistic judgements on the (un)acceptability of examples in (2.43) and (2.44) are Tellier's, and are not supported by quantitative empirical data so far. Especially, Godard (1988: 56) cites some felicitous examples of extractions out of a subject NP with *de qui* and dismisses the potentiality of an analysis along the lines of Tellier (1990)[23].

(2.45) a. un homme [de qui]$_i$ [la force de travail $_{-i}$] est étonnante
a man of who the power of labour is astonishing
(Godard 1988: 56)
'a man whose labour power is astonishing'

b. [De qui]$_i$ te semblait - il que [la force de travail $_{-i}$] est
of who you.DAT seemed it that the power of labour is
étonnante ? (Godard 1988: 56)
astonishing
'Of who did it seem to you that the labour power is astonishing?'

To conclude, French challenges the subject island in Minimalist accounts in various ways. First, the subject is by definition not a complement, so according to the accounts based on a distinction between complement and non-complement, extraction out of the subject should be impossible – except if extraction can only take place out of underlying objects, and this possibility should be tested empirically. Second, French is an SVO language, and the subject is considered to be base-generated at a specifier position (of IP, VP, vP or v*P depending on the analysis), which means that Specifier-based accounts do not expect subextraction from the subject in French to be acceptable – except from subjects that are underlying objects, as just mentioned. Third, these accounts assume a movement

[23] "Il ne sert à rien de dire qu'il s'agit là d'une particularité de la forme *dont* par opposition aux mots *qu*" (Godard 1988: 56) ('There is no use in saying that this is a peculiarity of the form *dont* as opposed to *wh*-words.')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

of the subject from Spec,VP to Spec,IP so that analyses based on Freezing cannot explain why subextractions out of the subject are acceptable – except if extractions out of the subject happened to be restricted to postverbal subjects, but the examples discussed by Godard (1988), Tellier (1990, 1991) or Heck (2009) are not.

2.3.2 Other cross-linguistic counterexamples

French is not the only language that challenges the syntax-based accounts, and I now present briefly some other interesting data from the literature. The goal of this section is not to provide a complete list of interesting languages with respect to the Subject island Condition, but only to show that French is not exceptional.

2.3.2.1 The subject as a non-complement

As mentioned before, Ross never intended the Sentential Subject Constraint as a universal constraint, because of data from Japanese, in which subextraction out of sentential subjects seems to be felicitous.

(2.46) **Japanese**:
Kore wa [[Mary ga _ kabutte ita koto] ga akiraka na] boosi da.[24]
this Mary wearing was thing obvious is hat is
(Ross 1967: 244)
'This is the hat which that Mary was wearing (it) was obvious.'

Huang (1982) explained cases like Japanese and Chinese by proposing that Infl in these languages is lexical. The subject would then be properly governed, which would explain why extraction out of the subject is possible.

More cross-linguistic counterexamples to the subject island constraint, with felicitous extractions out of subject NPs, infinitival subjects and sentential subjects have been brought in to the debate. Stepanov (2007) proposes a very complete recollection of these counterexamples. His main goal in doing this is to show that accounts like the CED, based on a distinction between complements and non-complements, cannot be correct. Indeed, according to him, languages that allow extraction out of the subject still exclude extractions out of adjuncts. If Huang's (1982) explanation was correct, then adjuncts should be properly governed to the same degree as subjects, and subextractions from adjuncts should be acceptable.

[24]There is no relative pronoun in Japanese relative clauses, hence the lack of filler coindexed with the gap in (2.46).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Since then, the existance of Adjuncts islands has been challenged as well (Truswell 2011), but Stepanov's (2007) argument against these accounts remains valid, because extraction out of subjects (and of adjuncts) should be completely ungrammatical. Especially, felicitous examples from English like (2.8) cited on page 24 are a problem. Santorini provides many attested examples for extractions out of NP subjects and Huddleston & Pullum and Chaves (2012: 17–18) attested examples for extraction out of infinitival subjects.

(2.47) **English**:

a. a letter [[of which]$_i$ [every line $__i$] was an insult] (Jane Austen[25]cited by Santorini 2017)

b. virginity and sans serif typeface, [[of which]$_i$ [the definition $__i$] must begin with negatives] (David Quammen[26]cited by Santorini 2017)

c. The eight dancers and their caller, Laurie Schmidt, make up the Farmall Promenade of nearby Nemaha, a town [that$_i$ [to describe $__i$ as tiny] would be to overstate its size]. (Huddleston & Pullum 2002: 1094)

d. The [...] brand has just released their S/S 2009 , [which$_i$ [to describe $__i$ as noticeable] would be a sore understatement]. (internet example cited by Chaves 2012: 18)

2.3.2.2 The subject as a specifier

As explained previously, Kayne's (1983) Connectedness Condition was explicitly designed to account for the Japanese data, and in general for extraction out of the subject in SOV languages.

But felicitous counter-examples from the SVO Romance languages like (2.48) are problematic for the Specifier-based accounts, because Romance languages are considered SVO.

(2.48) a. **Italian**:

questo	autore,	[[di cui]$_i$	so		[che	[il	primo	libro $__i$]	è
this	author	of which	know.1SG		that	the	first	book	has

[25]Jane Austen. 1981. *The complete novels*. New York: Gramercy. p 84.

[26]David Quammen. 1985. *Natural acts. A sidelong view of science and nature*. New York: Laurel. p 176.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

stato pubblicato recentemente]] (Rizzi 1982: 61)
been published recently
'this author, of which I know that the first book has been published recently'

b. **Spanish**:
¿[De qué cantante]$_i$ parece [que [algunas fotos $_{-i}$] les
of which singer seems that some photos them.ACC
han escandalizado]? (Jiménez-Fernández 2009: 103)
have shocked
'Of which singer does it seem that some photos have shocked them?'

It has been then proposed that extractions out of subjects in Romance languages and the other languages cited by Stepanov (2007) are grammatical because they are not really extractions out of subjects (Rizzi 1990, Uriagereka 2012). Indeed, these languages are all languages that allow a null subject. Felicitous extractions out of the subject in Romance languages (2.48), Japanese (2.46), Turkish and many other languages would in fact be special instances of a null subject.[27] French is an interesting case for this reason also, because it is a Romance language without a null subject.

Notice also that the data from English in (2.47) is also a problem for these approaches.

2.3.2.3 The moved subject (freezing analyses)

Lasnik & Saito (1992) adopt an analysis based on freezing and account for Japanese data by assuming that the subject in Japanese is always in situ and does not leave VP.[28]

As mentioned previously, Gallego & Uriagereka (2007) claim that in Spanish extractions from preverbal subjects are ruled out, while extractions from postverbal subject are felicitous. They take this as evidence that the subject island phenomenon is caused by freezing effects: the movement of the subject

[27] Huang (1984) also proposes something similar for Mandarin. He assumes that acceptable extractions out of an island are not actual extractions, and the gap is not an actual gap, but rather a null pronoun licensed by the fact that its anaphoric referent is the last NP encountered by the parser. His analysis works particularly well for subject islands, since the (false) gap is by definition near the filler. For a refutation of Huang (1984), see Dong et al. (2021: 2–3).

[28] As pointed out by Stepanov (2007), the θ-role assignment must then be completely reconsidered.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

to Spec,TP blocks the subsequent *wh*-Movement from the subject to Spec,CP. Jiménez-Fernández (2009) criticizes this distinction between preverbal and postverbal subjects in Spanish, see examples in (2.48).[29] There is therefore a disagreement on the data from Romance languages and on a possible asymmetry between preverbal and postverbal subjects.

Also, the analyses based on Freezing expect that subjects of passives are moved (except in some languages like German in which the movement is optional) and thus that extractions out of subjects of passives are ungrammatical. On the other hand, many of the other analyses expect that subjects of passives are grammatical. This results in a disagreement on the data for passives as well: see examples (2.11) and (2.12) on page 25.

Finally, an interesting point is raised by Chaves & Putnam (2020): not only subextraction from moved subjects, but also subextractions out of extracted elements should be impossible according to freezing. But this is not always the case, as the following example shows:

(2.49) This is the handout [which$_i$ I can't remember [[how many copies of $__i$]$_j$ we have to print $__j$]]. (Chaves & Putnam 2020: 52)

2.4 Criticisms of the syntactic approach

We already saw that there is some disagreement on the data about the subject island cross-linguistically and on extraction out of certain kinds of subjects. This is not only due to a lack of empirical data, but also, where there is some, to a problem of interpreting the data. As a matter of fact, it is hard to draw the line between "good" extractions and "bad" extractions, because there are numerous ways to make an infelicitous subextraction from a subject better. But precisely this point is problematic, for several reasons that I elaborate on in this section.

2.4.1 Non-syntactic factors increasing the acceptability

Especially scholars working on sentence processing have been criticizing for a long time syntactic analyses of islands. Without going into the detail of their work, as it will be the focus of Section 3, I can summarize their principal claim, which is that an island caused by a syntactic constraint should not be able to

[29] Notice that the extracted element in (2.48b) is specific, and that the subject is an indefinite, two factors that contribute to make the sentence more acceptable. I will come back to this aspect in Section 3.4.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

get better judgments by manipulating anything but syntactic factors. If non-syntactic factors ameliorate an island, this means that the superadditivity effect is not caused by a syntactic constraint. This criticism of islands in general was formulated by Kluender (1991: and later works), then adopted by Hofmeister & Sag (2010: and later works) and is now supported by Chaves (2013: and later works).

About the subject island in particular, Chaves has shown that many non-syntactic factors can ameliorate extractions out of subjects (especially, but not exclusively, subject NPs).

1. Semantic factors like definiteness and specificity help improve subextraction from NPs in general, not only for subjects (Jiménez-Fernández 2009, Chaves 2013, Simonenko 2015, see Section 3.4). Notice that for some scholars with a syntactic-based approach, definite and indefinite NPs lead to different syntactic structures, so that these factors can be addressed by a syntactic analysis.

2. Appropriate prosody can help identify the gap more easily and make sentences containing an extraction out of the subject more acceptable (Chaves & Dery 2014).

3. Change in material without changing the syntactic structure can help change the proposition expressed by the utterance and make the extraction more felicitous, because the purpose of the utterance (e.g. why one may need to ask such a question) is easier to understand (Chaves & Dery 2019).

4. With repeated exposure to extractions out of the subjects, naive speakers increasingly accept the structure (Chaves & Dery 2014, Do & Kaiser 2017). This effect is known as "satiation" effect, or "habituation" effect. Ungrammatical sentences usually do not show habituation effects (Sprouse 2007b).

2.4.2 "Parasitic" gaps

An early observation made about subextractions from subjects in English is that the extraction of the subject is far more acceptable if the gap is related to another gap situated in a non-island environment. For example, in (2.50), we see that subextracting out of the subject is more felicitous if there is a second gap in the object.[30]

(2.50) a. * What$_i$ did the attempt to repair $__i$ ultimately damaged the car?

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. What$_i$ did the attempt to repair $__i$ ultimately damaged $__i$? (examples from Chaves 2013: 303)

The syntactic-based accounts of subject islands have all accounted for this contrast. They usually assume that only the gap in the non-island environment is a "real" gap. The first missing element in the subject phrase would be a null pronominal that is only felicitous because of the actual extraction. This phenomenon is known as "parasitic gap": the gap in the subject is "parasitic" because it takes advantage of the presence of the legitimate gap. Adjuncts are also claimed to allow parasitic gaps, for similar reasons.

Chaves worked a lot on the so-called parasitic gaps and presents many examples that are problematic for syntactic-based accounts. I reproduce here only a small number, but I invite the interested reader to read Chaves (2013) and Chaves & Putnam (2020) for further discussions of the phenomenon.

It is true that a second and coindexed gap is capable of improving the acceptability of an unacceptable gap. For example, in example (2.51a), the second gap requires an NP, while the filler is a PP, but since the filler is felicitous for the first gap, the sentence is unproblematic. But the contrast with (2.51b) shows that it is better that the filler-gap mismatch is on the second gap and not on the first one.

(2.51) a. It was **on Sue** [that$_i$ I think Sam relied $__i$ the most but didn't thank $__{i?}$ nearly enough in his speech].

b. * It was **on Sue** [that$_i$ I think Sam thanked $__{i?}$ the most but didn't rely $__i$ nearly enough in his speech]. (examples from Chaves & Putnam 2020: 62, my emphasis)

Given that subjects precede objects, the subject gap is the first one, and hence unlikely to be parasitic. Indeed, if a speaker reading or hearing an extraction out of the subject does not consider that there might be a gap in the subject, it

[30]This is supposed to hold cross-linguistically and for all constructions that involve an extraction. Tellier gives the following contrast for French:

(i) * un enfant [[de qui]$_i$ [les parents $__i$] ont déménagé]
a child of who the parents have moved
'a child whose parents have moved'

(ii) un enfant [[de qui]$_i$ [les parents $__i$] se méfient $__i$] (examples from Tellier 1991: 122)
a child of who the parents REFL beware
'a child whom the parents of beware'

Whether the contrast between (i) and (ii) really exists has not been tested empirically so far. See also Godard (1988: 117–119) on so-called "parasitic gaps" in French.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

is then too late when they encounter the second gap (which is what happens in 2.51b). Even if this were the case, it would require a re-analysis, and in-line measurements would show a slowdown. According to Chaves & Dery (2019), this is not the case.

The contrast between (2.52c) and (2.52a) is the same as the contrast in (2.50). The extraction out of the subject is improved again by the presence of a second gap. However, in (2.52a), the second gap is inside an adjunct. Since extractions out of adjuncts are not felicitous (and supposedly a violation of an island constraint), as shown by example (2.52b), none of the gaps can be "parasitic" to another legitimate gap. This example shows that what is at stake is the reactivation of the filler, which makes the structure easier to process. It cannot be explained by parasitism.

(2.52) a. * [What kinds of books]$_i$ do [authors of $_{}_i$] argue about royalties after writing malicious pamphlets?

b. ?? [What kinds of books]$_i$ do authors of malicious pamphlets argue about royalties [after writing $_{}_i$]?

c. [What kinds of books]$_i$ do [authors of $_{}_i$] argue about royalties [after writing $_{}_i$]? (examples from Chaves 2013: 305)

In example (2.53) also, the extraction out of the object phrase causes the extraction out of the subject phrase to be more acceptable. But since the two gaps are not coindexed, the gap in the subject cannot be a parasitic gap.

(2.53) [People that sensitive]$_i$, I never know [[which topics]$_j$ [jokes about $_{}_j$] are likely to offend $_{}_i$]. (Chaves 2013: 305)

Instead of a parasitism analysis, Chaves proposes that the need to fill a gap reactivates the referent in the comprehender's memory, such that accessing this piece of information is facilitated when the second gap is encountered (Chaves 2013, Chaves & Dery 2014, 2019). This view is supported by independent evidence from processing in Vasishth & Lewis (2006).[31]

2.4.3 Gradient grammaticality

Finally, I cannot avoid the sensitive topic of the gradient acceptability of islands structures in general (Hofmeister & Sag 2010, Hofmeister et al. 2013), and of subject island in particular (see Part II of this book). It seems that judgments on

[31]Furthermore, having a second gap where the gap is most expected, as in (2.50b), avoids a potential filled-gap effect, see Section 3.1.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

subextractions from the subject vary from case to case, and range from absolutely unacceptable to perfectly acceptable and everything in between. But scholars differ in how they interpret this variation.

The problem is rooted in the relation between acceptability and grammaticality.[32] Everyone agrees that there must be at least a correlation between acceptability and grammaticality. Generally speaking, a sentence that (i) is licensed by syntactic rules, (ii) is not semantically incoherent, and (iii) is consistent with pragmatic principles such as Grice's maxims; is also an acceptable sentence in all but exceptional cases – like center-embedded structures, whose unacceptability can likely be explain by cognitive processing capacities. However, is the reverse also true? And especially: Is a sentence that is ungrammatical from the syntactic point of view unacceptable? And where to put the threshold between acceptability and unacceptability? When is a given sentence acceptable enough in order to falsify a syntactic hypothesis?

A common criticism against syntactic approaches is that they would not be able to explain acceptability judgement in the grey area between acceptability and non-acceptability. Syntax would be discrete, such that a sentence either belongs to a given language or it does not belong to it. Erteschik-Shir expresses it in the following terms:

> Violations of syntactic constraints necessarily cause strong grammaticality infractions, thus resulting in ungrammatical sentences. (Erteschik-Shir 2006: 335).

Erteschik-Shir's opinion is shared by many others (e.g. Chaves 2013, Hofmeister & Sag 2010, Abeillé et al. 2020), and even by some supporters of the syntactic approaches (Sprouse 2007b). Since judgments on (some) islands are gradient, their conclusion is that syntactic approaches to these islands cannot account for the gradience of the actual data.[33] An alternative are processing-based and

[32] I will not discuss in detail the exact definition of grammaticality and acceptability, which has been discussed at length by other scholars (a.o. Schütze 2016). Let us only assume that acceptability is the graded subjective judgment that reflects the perception of a native speaker of a given utterance, regardless of the reason why the sentence may be good or bad in their perception. Grammaticality on the other hand, is a theoretical construct following which a given sentence may or may not follow the syntactic, semantic and pragmatic rules of a given language and be part of the (potentially infinite) set of sentences that belong to this language.

[33] As far as experimental data are concerned, Sprouse (2007b), who argues in favor of syntax-based accounts of subject islands, denies the gradience of the data, and says that a distinction between acceptability and unacceptability judgements can be observed if one uses the adequate methodology.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

discourse-based accounts, which can straightforwardly explain this gradience (see Section 3 and 4).

And yet, the question of the gradience of grammar is very often explicitly addressed by the linguists who develop the syntactic accounts. For example, Subjacency was first categorical (Chomsky 1973) but was soon formulated as a constraint that explicitly expects a graded grammaticality proportional to the number of barriers crossed during the movement (Chomsky 1986).

> Rules of grammar do not simply apply or fail to apply; rather they apply to a degree. [...] Grammatical constructions are not simply islands or non-islands; rather they may be islands to a degree. (Lakoff 1973: 271)

The real problem is hence the fact that these linguists did not manage to explain convincingly to their detractors how their syntactic rules predict that ungrammatical structures can be acceptable, or how violation of the constraint can lead to half-grammaticality. In syntactic theories that make a distinction between syntax, LF and PF, syntactic constraints should block the transfer to LF. It follows that a sentence that violates a syntactic rule cannot be interpreted at all, since the transfer that enables the interpretation has failed. If this was the case, then acceptable violations of a syntactic rule could only be considered as a grammatical illusion, and native speakers should not be able to understand what they mean. We will see that this is not the case for extractions out of the subject. Furthermore, a theory with which the innate nature of syntactic constraints is postulated needs to explain why there is a distinction in strength between these innate rules. In my view, Uriagereka (2012: chapter 1) is taking this problem seriously and dedicates some efforts to explaining the link between processing and syntactic constraints. He sees constraints as merely preferences – strong preferences, though they can still be subverted. In Optimality Theory also, constraints are seen as criteria, and the structure that violates the less criteria "wins" in being the most acceptable (Keller 2000).

Of course, there is also an opposite view, according to which a discrete grammaticality can nevertheless lead to non-discrete acceptability judgements "as by-products of interactions of grammatical knowledge with the behavioral systems required to perceive, comprehend, and intuit" (Carroll 1979: 871–872). The gradience of data is attributed to the human capacity to find a solution – any solution – to a problem. Since the purpose of verbal communication is the exchange of information, the comprehender finds a way to interpret sentences, even if they do not belong to the language.[34]

[34]A concrete example is the common experience of hearing erroneous utterances from non-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

According to Schütze (2016), there is actually no empirical way to distinguish between the two views:

> It might be that the nature of the particular tasks used by prototype theorists (and linguists) inherently induces graded behavior, independent of the nature of the underlying knowledge. If this is so, the status of that underlying knowledge as discrete or continuous must be demonstrated by other means. But how could we ever know whether a grammar, if it exists independent of performance mechanisms, classifies sentences dichotomously? If performance mechanisms induce graded structure by themselves, and if (as I argue) they can never be circumvented because competence is not directly accessible, then it might not be possible to investigate empirically how a grammar itself classifies sentences. (Schütze 2016: 69)

In the empirical work I present later, I have done my best to take this difficult problem into account. First, I postulate that a non-grammatical structure should appear in well-edited written production only in extremely exceptional cases (or not at all). The question then is to define "extremely exceptional". I therefore establish an objective threshold below which a structure can be considered to have only a marginal number of occurrences. In the experiments, I used a methodology proposed by Sprouse (2007a) in which a factorial design is used in order to identify superadditivity effects. This design does not allow us to identify the reason of the superadditivity – whether it is caused by syntax, processing or pragmatic factors – but it enables us at least to identify clearly a contrast in acceptability. In most experiments, I added an ungrammatical baseline. I designed the baseline so that the ungrammatical sentences are nevertheless somewhat comprehensible. Thus, it is possible to see whether participants discriminate between a violation of the subject island constraint and ungrammatical-but-interpretable sentences.

2.5 The Subject Island Constraint in HPSG

Before presenting the processing-based and discourse-based accounts of the subject islands, I give here an overview of the way this phenomenon has been analyzed in HPSG. The first approaches were indeed syntax-based, and some islands (extractions of a conjunct and subextractions from relative clauses) are still treated in terms of syntactic constraints. But the analysis of subextractions from subjects has changed over the years.

native speakers and interpret them correctly nevertheless, as an anonymous reviewer rightly pointed out.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

In HPSG, filler-gap dependencies are not conceived as movement. The information that the verbal phrase is missing an element is stored in a nonlocal feature SLASH, so that the missing element can be saturated on the clausal level. The first formalization of the SLASH feature is in Gazdar (1981), where the information that an element is missing is percolated from daughter to mother in the same way as other kinds of information. This analysis is compatible with inline processing data on filler-gap dependencies: The resolution of filler-gap dependencies seems to happen at the subcategorizer, and not at the gap site (Boland et al. 1995, Traxler & Pickering 1996). In current HPSG analyses, there are two ways to treat this missing elements: either as empty categories or through a lexical rule.

Early GPSG had an equivalent to the Subject Island Condition. In Pollard (1984), the Binding Inheritance Principle makes sure that mother nodes cannot inherit an element in SLASH from a specifier. Pollard & Sag (1994) have an English specific Subject Condition (2.54) that allows parasitic gaps in the subject but no other gaps. However, the authors declare that this constraint is not universal, but possibly only belongs to the Grammar of English. Even this is not sure, given that "many [English] speakers" consider extraction out of the subject acceptable (Pollard & Sag 1994: 183).

(2.54) A lexical head's SUBCAT list may contain a slashed subject only if it also contains another slashed element. (Pollard & Sag 1994: 200)

Hence, what Pollard & Sag ultimately say is that a syntactic island constraint is possible in the HPSG formalism, but they leave open the question of whether it should be used in the case of subject islands. Subsequent work on extraction has abandoned this Subject condition (Godard & Sag 1996, Sag 1997, Bouma et al. 2001, Sag 2010, Chaves & Putnam 2020), which is probably motivated by the lack of evidence that a Subject Island constraint exists. Godard and her remarks on French *dont* relative clauses may have played an important role in this change. Still, Levine & Sag (2003) go back to the idea of a syntactic constraint for subject islands that would be English specific, but they are the exception rather than the rule.

In conclusion, as far as the subject island is concerned, we can see that there is a de facto difference between HPSG analyses and analyses proposed in a "Chomskyan" stream of generative grammar. The HPSG analysis I develop at the end of this work (Part IV) is in line with a general tendency of HPSG because I adopt a discourse-based analysis of the phenomenon. My motivation is driven by empirical evidence that I present in the rest of this work. However, this does not mean that a syntax-based analysis of the subject island is inherently impossible

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

in HPSG. Syntax-based accounts have been proposed in the past. Simpler Syntax borrows from HPSG the analysis of filler-gap dependencies ("discontinuous dependencies") through a feature SLASH, but has a syntactic constraint for extractions out of subjects (Culicover & Jackendoff 2005: 332). To my knowledge, this is also the state of the art in Lexical Functional Grammar. Conversely, Erteschik-Shir (1973) has shown that a discourse-based analysis of islands phenomena is possible in the framework of Transformation Grammar.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

3 Processing approaches

3.1 General mechanisms of processing associated with extractions

Language involves two different tasks: production (generation) and comprehension (parsing), performed respectively by a speaker (or writer) and an addressee (hearer or reader). I here use the term "processing" to account for the cognitive resources that are devoted to the linguistic knowledge at play in these two tasks: a common grammar, the construction of representation during speech, and procedures for building sentence structures (Momma & Phillips 2018: 236-237). Whether the last two mechanisms really appeal to common cognitive resources is still debated, but I will adopt here Momma & Phillips's (2018) view and assume that the same processes are at play. There is compelling evidence that it is the case: for example, agreement attraction[1] happens similarly in production and comprehension tasks.

Extractions are well-known for their processing difficulty. Structures with gaps are harder to process than structures without gaps (Wanner & Maratsos 1978, Kluender & Kutas 1993b). A variety of models exist in order to account for the distribution of costs in these structures. I present below the model adopted by the Dependency Locality Theory (DLT) in detail. But inline experiments reveal at least two main processing difficulties, one due to the filler and the second due to the gap.

3.1.1 Processing cost for the filler

The first processing cost happens at the filler site. For parsing, the phenomenon is called "active gap search": As soon as the filler is encountered, it is recognized

[1]Agreement attraction is a particular linguistic illusion involving an ungrammatical agreement that is perceived by a large number of naive speakers as grammatical under certain conditions. For example, participants in experiments are very likely to accept a sentence like (i):

(i) The bed by the lamps were undoubtedly quite comfortable. (Schlueter et al. 2019)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

as a signal for a coming gap, and processing mechanisms start to postulate potential gap sites. This induces memory costs (for remembering the morphosyntactic properties of the filler), but also costs for anticipating the potential gap sites. One consequence of the latter is so-called filled-gap effects. Self Paced Reading experiments suggest that discovering that a postulated (because highly probable) gap site is already filled produces additional processing costs (Stowe 1986). For example, in an experiment conducted by Stowe, participants had to read the sentence (3.1a) word by word. When they reached the situation in (3.1b), they certainly postulated a gap in the object position, because increasing reading times (linked to additional processing costs) are measured on the direct object *us*. Scholars generally assume that the reader has to re-anticipate the next probable gap site when the most probable one is already filled. This is linked with processing costs.

(3.1) a. My brother wanted to know who$_i$ [Ruth will bring us home to $__i$ at Christmas] (Stowe 1986: 234)

b. My brother wanted to know who Ruth will bring…

Less work has been done on the processing costs at the gap site for generation. Production errors show that it is difficult for the speaker to anticipate the gap site and choose the correct filler accordingly. It's a very typical disfluency for spontaneous speech that the speaker begins a structure involving an extraction, commits to a certain filler, and realizes later in the clause that the filler is illicit (Momma & Phillips 2018: 243).

3.1.2 Processing cost for the gap

The second processing cost happens when the integration of the information from the filler takes place. Again, the phenomenon is especially well studied for parsing. Intuitively, it is easy to understand how assigning a gap site can be hard for the comprehender. Per definition, a gap is not overtly signaled in the sentence, and there is also no overt clue whether one single filler is linked to one or several gaps. But beyond this first intuition, there is also empirical evidence that the "resolution" of the filler-gap dependency is associated with processing costs.

Kaan et al. (2000) have shown by recording online Event-Related Potentials (ERPs) in reading experiments that integration elicits P600 effects[2], such that the more complex the integration is, the more amplitude P600 has. Notice that this integration cost happens at the subcategorizing head site (P600 happens around 600 ms after the onset of the verb when extracting an argument of the verb).

[2]P600 = The waveform of the ERPs has a positive peak around 600 ms after the word onset.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Momma et al. (2019) also present preliminary results that seem to indicate that some additional costs are associated with the integration of the gap. Taking advantage of the PP/NP alternation in English for *give*-like ditransitive verbs (the benefactive can be expressed as PP or NP), they made participants produce interrogatives with extraction of the PP object (the only felicitous variant in interrogatives), with and without a prior priming for the NP variant. They notice a slowdown in producing the verb when participants were primed for the NP variant, see example (3.2). This indicates that the integration of the filler is processed when planning the subcategorization of the verb: participants notice that the structure they have been primed to is not felicitous and take more time to integrate the gap with the appropriate syntax.

(3.2) **Priming**: The girl is reading the boy the book.
Production: Who is the doctor *giving* the trumpet to?

These observations make us assume that extraction is a syntactic mechanism that implies important additional processing costs. In this chapter, I will present two main possible approaches to the subextraction from subjects from a processing point of view. These two different approaches make two opposite predictions for subextractions from the subject: the processing accounts based on memory costs expect that these extractions are easier to process than subextractions from the object (no "subject island" effect), while the processing accounts based on relevance and surprisal expect on the contrary an increase of processing costs associated with subextraction from (sentential, infinitival or NP) subjects.

3.2 Dependency-length minimization

I will present two accounts based on dependency-length minimization, the DLT and Dependency Grammar. Both originate in the Active Filler Hypothesis Frazier (1987), Clifton & Frazier (1989) which is that one postulates the closest possible gap when encountering a filler (or a cue that a gap is coming). Because filler-gap dependencies are cognitively costly, the longer the distance between the filler and the gap, the more one needs to memorize the content of the filler (Fadlon et al. 2019). As a consequence, the mental representation of the filler becomes weaker as the distance to the gap increases (Lewis & Vasishth 2005). This has an impact on sentence production also, because there is a cooperation principle between the speaker and the addressee: the speaker tries to make the sentence as easy to understand as possible, while the addressee tries to make sense out of the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

sentence to the best of their capacity. Hence the general preference in language to minimize the distance between the filler and the gap.

Some processing-based models of filler-gap dependencies, therefore, expect that shorter distances between the filler and the gap are easier to process, leading to an increased acceptability. Depending on the model, the distance may be accounted for in terms of linear distance (Gibson 1998, 2000) or in terms of structural distance (Rizzi 1990, Hawkins 1999). Both approaches have very similar predictions, and make the same predictions in the case of subextractions from the subject, which is that extractions out of the subject should actually be easier to extract than extractions out of the object, because the dependency (be it linear or structural) between the filler and the gap (or between the filler and the subcategorizor of the gap) is shorter for extractions out of subjects.

One important topic is the asymmetry between subject relative clauses and object relative clauses. A classical example in the literature is the contrast in (3.3) between an extraction of the subject (3.3a) and of the object (3.3b). Subject relative clauses are easier to process than object relative clauses and are rated higher in acceptability judgment tasks (Holmes & O'Reagan 1981; Wanner & Maratsos 1978 and many more).

(3.3) a. The reporter [who$_i$ $__i$ attacked the senator] admitted the error.
b. The reporter [who$_i$ the senator attacked $__i$] admitted the error.
(examples from Gibson 1998: 20–21)

This asymmetry holds cross-linguistically and is attributed to the shorter (linear and structural) distance between filler and gap in (3.3a) than in (3.3b). Hawkins (1999: 252–256) emphasizes the similarity between dependency-length minimization strategies (not only for filler-gap dependencies) and the Accessibility Hierarchy of Keenan & Comrie (1977).[3] The subject island constraint seems to go against all expectations of the dependency-length minimization strategies, but also against Keenan & Comrie's (1977) Accessibility Hierarchy.

[3]The Accessibility Hierarchy is a typological hierarchy of arguments. The hierarchy in Keenan & Comrie (1977) is the following: Subject > Direct Object > Indirect Object > Oblique > Genitive > Object of comparative (in subsequent works of Keenan & Comrie, Indirect Object and Oblique collapse together). One observation of Keenan & Comrie (1977) is that languages that allow only one type of extraction (e.g. Maori) allow the extraction of the subject; languages that allow only two types of extraction (e.g. Luganda) allow the extraction of the subject and of the direct object, and so forth.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

3.2.1 Dependency Locality Theory (DLT)

Gibson (1998, 2000) proposes the Dependency Locality Theory (DLT), a cognitive model of sentence processing with a particular focus on filler-gap dependencies. Following the DLT, we acknowledge that there are two costs of cognitive resources involved in filler-gap dependencies: (i) memory costs and (ii) energy costs. Memory costs are caused by the need to store the predictions made about the coming structure as the sentence goes on, e.g. predictions on the gap site (see above). Energy costs, on the other hand, are caused by the need to integrate every new word into the structure.

These integration costs are twofold. For every new referential word, a new referent must be introduced in the representation of the sentence. As a simplification, Gibson assumes a cost of one unit of energy for each new referent in the discourse. Pronouns are either anaphoric or deictic and do not introduce any new referent. Furthermore, dependencies (e.g. filler-gap dependencies) between two words also imply additional energy costs for every referent introduced between the filler and the gap. As a simplification again, Gibson assumes a cost of one unit of energy for each new referent in the discourse.

We can illustrate the DLT with (3.4), in which the energy costs for dependencies are indicated below each new referent in the discourse (memory costs and costs for introducing more referents are the same in both sentences).

(3.4) a. The reporter [who$_i$ $__i$ attacked the senator] admitted the error.
0 0 0 0 0 = 0

b. The reporter [who$_i$ the senator attacked $__i$] admitted the error.
0 1 1 0 0 = 2

The integration costs are higher in the object relative clause than in the subject relative clause, given that the filler-gap dependency adds no cost in the latter and two units of energy in the former.

If we apply the model of the DLT to extractions out of the subject compared to extractions out of the object, it is obvious that extractions out of (preverbal) subjects create lower energy costs than extractions out of objects in English and French: the head of the NP will introduce at least one new referent for both, but

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

in extraction out of the object, there is also the additional new referent introduced by the verb, and potentially one or several new referents introduced by the subject (if the subject is not pronominal).

3.2.2 Dependency Grammar

Dependency Grammar (DG) represents syntactic dependencies by means of a dependency graph like (3.5).

(3.5)

Projectivity is an important concept in DG. The sentence in (3.5) contains only projective dependencies, because the dependency arrows never cross. Many non-local dependencies lead to non-projective structures. Projectivity is considered in DG as an important factor at the origin of word order rules: The language tries to avoid non-projectivity whenever possible (see Hudson 2010: chapter 7.4.2; Osborne 2019: chapter 7.3). Non-local dependencies can override this requirement of projectivity because extraction ("displacement" in DG) is pragmatically highly motivated (Hudson 2010: chapter 7.6.7). But short distance dependencies do not necessarily lead to a non-projectivity. Interestingly, subextractions from the subject mostly lead to projective structures, as noticed by Candito & Seddah (2012a: chapter 4.3). An example can be seen in (3.6).[4]

(3.6)

Additionally, word order is constrained by Dependency Distance. For reasons similar to the ones mentioned for the DLT, Dependency Distance should be reduced whenever possible. Liu et al. (2009) propose a method to measure Mean

[4] I adopt for the dependency graphs the rules of Universal Dependency Grammar, widely adopted for annotating corpora in DG: nouns are heads of NPs and select their determiner; nouns are heads of PPs and select their preposition. Some scholars, however, prefer having the determiner as the head of DPs, and/or the preposition as the head of PP. Adopting this alternative analysis would have no impact on the projectivity in my examples.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Dependency Distance (MDD) by measuring the number of words that every dependency arrow has to cross from the beginning to the end of the dependency (see also Liu 2008). The shortest Dependency Distance is one, except for the main verb of the matrix clause that is not selected and has therefore a Dependency Distance zero. In (3.7), from Liu (2008: 167), we can see how the asymmetry of (3.3) is accounted for in DG. The Dependency Distance of each dependency is indicated under the dependency arrow-head. The subject relative (3.7a) has a MDD of 1.875, and is for this reason preferred over the object relative (3.7b) that has a MDD of 2.25.

(3.7) a. MDD = 15/8 = 1.875

b. MDD = 18/8 = 2.25

If we apply the same method to measure the MDD of subextractions from subjects and objects NPs, it gives us the results in (3.8). The extractions out of the object in (3.8b) not only has a higher MDD than the extraction out of the subject in (3.8a), but is also non-projective.[5]

(3.8) a. MDD = 14/9 = 1.556

b. MDD = 17/9 = 1.889

[5]Notice that in English interrogatives, and because of the presence of the auxiliary, an extraction similar to (3.8a) would be non-projective, while an extraction like (3.8b) would be projective. Yet, the extractions out of the object would have a higher MDD, like in relative clauses.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Hence, based on Dependency Distance, extractions out of the subject should be easier to process than extractions out of the object. This is not to say that extractions out of the subject are usually treated with this approach in DG. Bröker (1999: 58–59), Hudson (2010: 186) and Osborne (2019: chapter 9) treat islands in a relatively traditional manner as blocking some kinds of dependencies. Bröker addresses directly extractions out of infinitival subjects and sees them as a constraint of dependencies over dependencies. Osborne (2019: chapter 9.7) describes sentential and NP subject islands, and proposes that "rising catenae reluctantly include a normal dependency that bears the subject grammatical function" (Osborne 2019: 286). He notices however that acceptability judgments on such structures are "not always clear" (Osborne 2019: 285). Consequently, we can see that DG's approach to subject island does not much differ from the traditional syntactic accounts, but Projectivity and Dependency Distance make interesting predictions nonetheless.

3.3 Processing accounts based on surprisal

3.3.1 Processing difficulty of subjects

I summarize in this section the analysis proposed by Kluender (2004), who, to my knowledge, developed the most articulated argumentation around the idea that sudderadditivity effects when extracting out of subjects arise from the fact that subjects (and especially complex subjects) are hard to process.

3.3.1.1 Processing difficulty for subjects

There is strong evidence that non-finite clauses are easier to process than finite ones. Ross (1967: 27) already noticed that extractions out of an embedded question (so-called "wh-islands") are more felicitous if this embedded question is non-finite, and therefore has no overt subject.

(3.9) a. He told me about a book which I can't figure out how to read.
b. ?? He told me about a book which I can't figure when I should read. (examples from Ross 1967: 27)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Kluender (2004: 106) also points out that extractions out of relative clauses, even though they are always very degraded, are still easier to process when the relative clause is non-finite.

(3.10) a. ? That's the campaign that I finally thought of someone to spearhead.
b. * That's the campaign that I finally thought of someone could spearhead. (examples from Kluender 2004: 106)

Kluender (2004: 110) explains the contrasts in (3.9b) and (3.10b) through the hypothesis that overt subjects have a "greater discourse referential processing cost" than covert ones. But I see no reason to assume that there is a covert subject in non-finite relatives in the first place. If one renounces the idea that subjects in non-finite clauses are covert, and simply assumes that there are no subjects, the DLT predicts the contrast between extractions out of a finite and out of a non-finite clause: one referent less (the subject) reduces the integration costs. This is not related to the syntactic function of the subject, except for its ability to be absent in non-finite contexts. Furthermore, in the DLT, only finite verbs introduce a new referent in discourse (because only tensed verbs have a spatiotemporal location, Gibson 2000: 103). The DLT can therefore explain why extractions out of non-finite relative clauses are easier to process.

Further evidence comes from a study by Clark & Wasow (1998), also mentioned by Kluender (2004: 114). Clark & Wasow (1998) ran a corpus study on two corpora of spontaneous oral speech in English, the Switchboard corpus (Godfrey et al. 1992) and the London-Lund corpus (Svartvik & Quirk 1980), and looked at a certain form of disfluencies: repetitions. Among 353,820 pronouns repeated, 173,348 are nominative pronouns, like in (3.11), hence 49% (Clark & Wasow 1998: 215). They also found that there is, among 1,000 NPs, a ratio of 45 repetitions of the determiner *the* of simple subject NPs, against 30 repetitions of the same determiner for simple object NPs (Clark & Wasow 1998: 213). In both cases, they can observe a higher amount of this kind of disfluencies related to subjects than related to direct objects. Unfortunately, I have the impression that they don't take into account the relative frequency of subjects and objects (pronouns or nominal): Almost all finite verbs have a subject, whereas only transitive verbs have an object, therefore the ratio cannot be compared directly.

(3.11) yes, I {uh} I wouldn't be surprised at that (Clark & Wasow 1998: 220)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

3.3.1.2 Processing difficulty for complex subjects

Clark & Wasow (1998: 213) do not only observe a higher proportion of repetitions in subjects, but also a higher proportion of repetition for complex NPs. They define complex NPs as NPs that do not end after the head noun. They found that there is, among 1,000 NPs, a ratio of 65 repetitions of the determiner *the* of complex subject NPs, against 55 repetitions of the same determiner for simple object NPs (Clark & Wasow 1998: 213). The impact of complexity seems therefore even a bit stronger than the impact of the grammatical function mentioned above. Notice that there does not seem to be a superadditive effect of the two factors[6].

Kluender (2004) reports several pieces of evidence from various studies and authors that show that the complexity of the subject and the complexity of the rest of the VP are in competition in terms of processing. In spontaneous production, they tend to be in complementary distribution: the longer the subject, the shorter the VP and inversely. This is attested in English for children (corpus studies on early acquisition in Bloom 1990, 1993), for adults (diachronic corpus study of diaries in Kemper 1987) and for seniors (corpus study in Kynette & Kemper 1986). It is also attested in Italian for adults (Hyams & Wexler 1993: 440) and in Japanese for children and adults (Ueno & Polinsky 2009)[7]. This is what is observed generally: (a) the longest VPs tend to have clitic subjects, (b) subjects are on average shorter than objects, (c) pro-drop (in pro-drop languages) is more frequent with transitive than intransitive verbs. Some experiments on the processing of seniors in Kemper (1986) (repetition task) and Norman et al. (1992) (Self-Paced Reading task) corroborate it: complex subjects are skipped in repetition tasks 92% of the time (only 11% for complex objects), and complex subjects are read more slowly. Notice that they tested a wide variety of complex subjects (e.g. NP with a relative clause, sentential subjects). Based on this data, I expect that complex NPs with a PP-complement, that are often cited in the literature on subject island, are less difficult to process than NPs with a relative clause complement, infinitival subjects or sentential subjects.

[6]The effect of complexity on the object is such, that there are 30 repetitions for simple NPs and 55 repetitions for complex NPs. The effect of function on simple NPs is such, that there are 30 repetitions for objects and 45 repetitions for subjects. If we directly apply the effect of complexity that objects have on subjects, we predict around 82.5 (55*45/30) repetitions for complex subject NPs, and Clark & Wasow find 65 repetitions. The observed results are therefore in the range of simple additive effects.

[7]cited under a different title in Kluender (2004)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

3.3.1.3 Processing difficulty for verbal subjects

Lastly, Kluender (2004) mentions some processing difficulties inherently related to verbal subjects. Infinitival and sentential subjects are of course difficult to process for the same reason as any complex subject, but they also have the specificity of being clausal. Following Kluender (2004: 106), comprehenders forget quickly the syntactic configuration of a clause when they reach its end. He explains through this the difficulty to process center-embedded sentences. It is also his explanation for the difficulty to extract out of an infinitival or sentential subject like in (3.12). This argument is somewhat similar to the argument of some syntactic approaches like Spell out, but restricted to clauses.

(3.12) a. * Who does [that she can bake ginger cookies for _] give her great pleasure?
b. ?? Who does [to be able to bake ginger cookies for _] give her great pleasure?
c. ? Who does [being able to bake ginger cookies for _] give her great pleasure? (examples from Kluender 2004: 118)

3.3.2 Valency Completeness

Hawkins proposes the Valency Completeness preference to account for extraction out of nominal, infinitival and sentential subjects:

(3.13) **Valency Completeness**:
The human processor prefers [Filler-Gap Domains] to include the subcategorizors for all phrases within the domain that contains the gap. (Hawkins 1999: 278)

The Filler-Gap Domain of the extraction out of the subject (3.14a) is (3.14b). When the parser reaches the gap, the structure (3.14b) includes the direct subcategorizor of the gap (*disliked*), but not the subcategorizor of the sentential subject (*surprise*). Hence, the parser cannot know at this point the syntactic role of the clause in which the gap is located.

(3.14) a. * Who$_i$ did [that Mary disliked _$_i$] surprise Sue?
b. Who did that Mary disliked ...

Extracting out of nominal subjects has the same problem. This leads to an additional processing difficulty when extracting out of subjects and explain the contrast with extraction out of objects.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The Valency Completeness preference predicts that extraction out of postverbal constituent should be more acceptable. Hence, extraction out of postverbal subjects should be as felicitous as extraction out of objects.

As a matter of fact, Kluender's approach and Hawkins's approach are not mutually exclusive. Several factors and preferences may have an impact on subextractions from subjects. Since superadditivity effects are caused by an accumulation of several factors, both explanations could have an impact on the processing of subject islands. We could even go so far as saying that these approaches are not mutually exclusive with accounts based on dependency-length minimization, even though they have opposite predictions. Several processing preferences may be in competition, especially in constructions as complex as filler-gap dependencies (this is actually the view defended by Hawkins 1999).

3.4 Definiteness, referentiality and specificity

In this section, I summarize briefly the discussion around other semantic factors that are well-known to influence extraction phenomena and have been linked to processing. I present the general discussion, and how these factors have been part of the discussion about subject islands.

The contrast between subextraction from an indefinite and subextraction from a definite NP is well known since it has been pointed out by Chomsky (1973) and Erteschik-Shir (1973). This phenomenon, illustrated by (3.15), is sometimes called the definite NP island.

(3.15) a. Who$_i$ were you reading a book about?

b. * Who$_i$ were you reading the/this/that/his book about? (examples from Radford 2009)

For Ariel (1988), definite descriptions are cognitively less accessible than indefinite ones. The reason is that definite descriptions contain more information, and the quantity of information to retrieve being more important, the process is more costly. Definite descriptions are stored in long-term memory, while indefinite ones are in short-term memory, ready to be retrieved as soon as necessary. Kluender (1998: 269) proposes to use this theory to account for the contrast in (3.15).

The subextraction from subject NPs is by definition impacted by this contrast. Extractions out of definite NP subjects are not necessarily ungrammatical, but extractions out of demonstrative NP subjects are less acceptable (Jiménez-Fernández 2009).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(3.16) a. ¿[De qué cantante]$_i$ has dicho que son muy provocativas
of which singer have.2SG said that are very provocative
[varias/las fotos $_{-i}$]? (Jiménez-Fernández 2009: 117)
several/the photos
'Of which singer have you said that several/the photos are very provocative?'

b. * ¿[De qué cantante]$_i$ has dicho que son muy provocativas
of which singer have.2SG said that are very provocative
[estas fotos $_{-i}$]? (Jiménez-Fernández 2009: 117)
these photos
'Of which singer have you said that these photos are very provocative?'

Simonenko (2015) explains this by the semantic contradiction between the presupposition implied by the demonstratives (they are deictic, hence their referent is known in the discourse situation) and the presupposition of questions (the *wh*-phrase refers to an unknown individual), (see also Erteschik-Shir 1973).

The research on islands tends also to emphasize the role played by fillers that imply a high referentiality. The discussion mostly revolves around interrogatives in English. In English, the determiner *which* + N or *what* + N is used to build filler phrases that are more referential than, for example, *what*. The corresponding filler in French is *quel(le)(s)* + N (lit. 'of which(.FEM.PL'). The contrast between these fillers and other less referential fillers, that (3.17) illustrates, has been discussed for a long time, especially for extractions out of embedded questions (e.g. Pesetsky 1982, Kluender & Kutas 1993a,b, Erteschik-Shir 2006, Jiménez-Fernández 2009, Chaves 2013). This phenomenon is often referred to as "d(iscourse)-linking" in the literature, a denomination that goes back to Pesetsky (1982).

(3.17) a. ? [Which book]$_i$ did you wonder [whether John bought $_{-i}$]?

b. ?? What$_i$ did you wonder [whether John bought $_{-i}$]? (examples from Erteschik-Shir 2006: 318)

Many introspective and experimental data suggest that these referential fillers improve extraction, whether there are used in filler-gap-dependencies considered as islands or not (Kluender & Kutas 1993a,b).

Referential fillers have also been discussed in the discussion on subject islands. Scholars make the same observation: the acceptability of the subextraction from subject improves with referential fillers.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(3.18) a. [Of which cars]$_i$ were [the hoods $__i$] damaged by the explosion? (Ross 1967: 242)

Jiménez-Fernández (2009) proposes a syntactic explanation of the phenomenon, and accommodates Chomsky's (2008) analysis of subject islands based on phases. Jiménez-Fernández (2009) assumes that DPs are by default weak, but may become strong DPs if they are definite and "non-d-linked". Strong DPs are then phases, and are therefore islands to extractions. Chaves (2013: 313) points out the weaknesses of this analysis, that is not independently motivated and circular. The general impression is that definite NPs with a non-specific extraction are phases in Jiménez-Fernández's account because extraction is prohibited, and as Chaves complains "the causal nexus between movement and D-linking remains obscure".

Erteschik-Shir (2006) proposes an explanation at the interface between syntax and information structure. She redefines d-linking as a property of being referential that is inherent for *which* + N fillers, and can be attributed to other wh-words by the discourse context (if for example *what*, as in (3.19), has identified referents in the Common Ground).

(3.19) I know that we need to install transistor A, transistor B, and transistor C, and I know that these three holes are for transistors, but I'll be damned if I can figure out from the instructions where what goes! (Pesetsky 1987, from Bolinger 1979).

In Erteschik-Shir's (2006) analysis, these d-linking NPs are the topic of the interrogative. Consequently, strictly speaking, there would be no extraction, because the gap is not a trace but a silent anaphoric pronoun. Example (3.20) illustrates Erteschik-Shir's proposal.

(3.20) [Which book$_i$]$_T$ [did you choose $\emptyset_i$]$_F$? (Erteschik-Shir 2006: 327)

However, observe example (3.21), in which extraction of the adverb out of the non-finite subject seems completely acceptable:

(3.21) The 'Hunan' Restaurant is a place [where$_i$ [having dinner $__i$] promises to be most enjoyable]. (Grosu 1981: 72)

The filler in (3.21) is neither d-linked nor referential, but we can know that the filler refers to a location as soon as we encounter it. The filler *where* is more specific than an imprecise filler like *what*. First, it is easier to build a mental representation of the referent of *where* than of the referent of *what*, which could

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

be anything. Second, *where* is compatible with fewer potential semantic roles, and this helps the active gap search to postulate the adequate gap, which reduces filled-gap effects. This all contributes to making the processing of (3.21) easier.

The same is true for questions in *which*+N. In (3.17), *which book* is semantically more informative than *what* (Hofmeister et al. 2013, Chaves 2013).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

4 Discourse-based approaches

It is time to address the last type of approach, the one that takes into account pragmatics and discourse. I introduce in this chapter the working hypothesis formulated with colleagues during the years of research that led to the writing of this book: the Focus-Background Conflict constraint. Therefore, this chapter focuses on aspects of information structure.

It is important to note, however, that there are other pragmatic considerations at play. Constructions involving extractions are costly from a processing point of view, but they are used in order to fulfill specific communicative goals. These goals differ from one construction to another, of course. If this were not the case, and according to Grice's (1975) cooperation principle, the speaker would resort to a simpler construction. It is therefore essential that the use of extraction is relevant: this is the central idea of Chaves & Putnam (2020) who attribute the first formulation of it to Kuno (1987).

Kuno notices that the contrast in (4.22) cannot be attributed to a semantic distinction between the two verbs involved.

(4.1) a. What did you see pictures of?
b. * What did you see a book about? (examples from Kuno 1987: 23)

The explanation, Kuno claims, relies on the fact that seeing a picture as a matter of fact is synonymous with seeing what this picture portrays. For that reason, what the picture portrays is a relevant aspect of the event of seeing a picture. On the contrary, seeing a book does not necessarily imply seeing what the book is about. Reading a text and seeing the physical object book are two distinct events. Consequently, it is not obvious that the theme of the book is relevant to the event of seeing a book. Because the theme of the book is not relevant, there is no compelling reason to ask questions about it. Hence, it is difficult for the addressee to imagine a context in which the question would be needed in the first place, and the sentence (4.1b) is perceived as unacceptable.

Chaves (2013) shows with numerous examples that extraction of non-relevant elements leads to an important degradation of the sentences. Example (4.2) is an extreme case. It is indeed very difficult to imagine a situation in which the ownership is at-issue in a sneezing event.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(4.2) * What$_i$ did [the owner of $__i$] sneeze? (Chaves 2013: 12)

Expanding on the idea of Kuno (1976), Chaves & Putnam (2020: 327) posit that the extracted element must be relevant to "the main action that the sentence describes".

It seems indisputable to me that this factor is highly pertinent. I refer the reader to Chaves & Putnam (2020) for a more exhaustive discussion. My own work, however, has addressed a discourse factor that is different from relevance, but which is not in contradiction with it. Before going into more detail about my working hypothesis, I need to define the concepts of information structure that I use in this book (Section 4.1), and then present previous works that have explored these notions in the context of islands.

4.1 Information structure

The discourse-based approach takes into account an undoubtedly crucial parameter in communication, a parameter so complex that it is very difficult to formalize it entirely: the fact that communication is an interchange of information between several participants in a discourse event. Phatic discourse – i.e. discourse in which no exchange of information is involved – is possible, however the exception rather than the rule. An interchange of information between several participants requires from each of them a capacity for empathy: They need to recall which pieces of information the other participant(s) have and which ones they do not have. The sentence "*Mary is a good scholar.*" only succeeds in its informative role if all participants in the discourse know who Mary is (Kuno 1972: 309). In order for the communication to be efficient, it is also necessary that each participant keeps in mind the information that they have already been given in the previous part of the discourse.

In this work, we assume a formalization of how individual participants manage discourse information based on "information packaging" (Chafe 1976) and on the notion of Common Ground (Krifka 2007).[1] Common Ground covers information exchanged in a particular discourse. The Cooperative Principle defined by Grice (1975) also implies that every utterance in a discourse entails a proposition which augments the Common Ground. For this reason, example (4.3b) is inappropriate in the specific discourse situation. The first utterance, *I had to bring my cat to the vet*, entails at least two pieces of information: the first information is presupposed

[1]The notion of "Common Ground" was probably first discussed by Stalnaker under the notion of "common knowledge" and especially "common background knowledge" (Stalnaker 1978: 86).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

and is that a cat exists and that the speaker is the owner of this cat; the second piece of information, *I have a cat*, brings no new information to the Common Ground, because the information that it entails is redundant to the information presupposed in the previous utterance. This is not the case with (4.3a), where each part of the sentence brings new information to the Common Ground.

(4.3) a. I have a cat, and I had to bring my cat to the vet.
b. # I had to bring my cat to the vet and I have a cat. (Krifka 2007: 16)

4.1.1 Topic and comment

Reinhart (1982) proposes a helpful metaphor to describe the input of new information in the Common Ground: we can imagine the storage of information by the participants as a recollection of index cards. Each card has a title, its index: this is the topic. On each card, under the title, participants keep record of the relevant information: this is the comment, what the utterance states about the topic.

We use the subscript $_T$ and squared brackets to identify the topic in our examples if needed. Similarly, we use the subscript $_C$ and squared brackets to identify the comment.

For example, in (4.4), the first utterance introduces the individual Geneva to the Common Ground; this individual is then the topic of the second utterance. The comment is the information about her love for parrots.

(4.4) This is Geneva Howell. [Geneva]$_T$ loves parrots.

Example (4.4) illustrates the case of an **aboutness topic**. There is a second kind of topic, called **frame-setting topic** (Krifka 2007: 45–46). A frame-setting topic "acts as a restrictor as to when, where or with respect to who or what, the truth value of the predication is to be evaluated" (Erteschik-Shir et al. 1997: 130). In example (4.5), the adverb is the topic and restricts the domain for which it is true that Peter is well (implicitly implying that Peter is not well regarding other domains of his life).

(4.5) [Körperlich]$_T$ geht es Peter gut. (Jacobs 2001: 655)
physically goes it Peter well
'Physically, Peter is well.'

As we will see, the aboutness topic will be the most relevant one in the study of subject islands. Very often, the aboutness topic of an utterance is anaphoric,

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

hence uses "given" information. "Given" means here that it already entered the Common Ground at some point of the discourse. However, givenness is not required for topicalization: Corpus studies show that new information is able to become the topic of an utterance (Krifka 2007: 41–42).

(4.6) a. [A good friend of mine]$_T$ [married Britney Spears last year]$_C$. (Krifka 2007: 42)

b. Because they wanted to know more about the ocean's current, [students in the science club at Mark Twain Junior High School of Coney Island]$_T$ gave ten bottles with return address cards inside to crewmen of one of New York City's sludge barges. (Reinhart 1982: 66)

Reinhart (1982: chapter 3.2) proposes a way to test whether X is the aboutness topic of a given utterance by using a paraphrase such as "*as for* X ...'", "*speaking about* X ...", or "*about* X ...". If the paraphrase is pragmatically identical with the original utterance, this means that X is the aboutness topic. Following the same idea, Götze et al. (2007: 19) propose the following test for aboutness topics:

(4.7) An NP X is the aboutness topic of a sentence S containing X if: S would be the natural continuation of the announcement *Let me tell you something about X.*

Lastly, I should add that a sentence does not necessarily contain a topic. Topicless sentences are called thetic sentences (Kuroda 1976, Ladusaw 1994).

4.1.2 Focus

The notion of "focus" is very common in linguistics and at the same time usually poorly defined. Different authors understand this same notion in different ways, without explicitly specifying which definition they are using. We assume in this work the definition given by Alternative Semantics (Rooth 1992), which has the advantage of being a formal definition. In Alternative Semantics, focus signals the importance of alternatives to the focused element for the interpretation of the utterance. For this reason, the most straightforward example of focus is an answer to a *wh*-question. The interrogative word like *which* in (4.8a) signals a set of alternatives to the *wh*-phrase *which one of your siblings* (here the set of speaker B's siblings, let us assume the set {Jennifer, Karen, Brandon}). The focus of speaker B's answer in (4.8b) is the most informative element of the set (namely here the individual Karen).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(4.8) a. Speaker A: Which one of your siblings is the oldest?
b. Speaker B: [Karen]$_F$ is the oldest.

We use the subscript $_F$ and squared brackets to identify the focus in our examples if needed, as can be seen in (4.8b). All other elements of the utterance – i.e. *be the oldest* for (4.8b) – are backgrounded (see Section 4.1.3).

Any kind of constituent can be focused: a single word like in (4.8b), whole sentences like in (4.9b), as well as everything in between.[2]

(4.9) a. Speaker A: What happened?
b. Speaker B: [Karen bought a parrot]$_F$.

This leads to a distinction between narrow and broad focus. The difference relies on the type of constituent bearing the focus: the whole sentence for a broad focus and some constituent(s) for the narrow focus.

Though other definitions have been proposed in previous literature, I will assume Götze et al.'s (2007) definition of focus:

(4.10) Typically, focus on a subexpression indicates that it is selected from possible alternatives that are either implicit or given explicitly, whereas the background can be derived from the context of the utterance.

The focused element is also mostly the one bearing the main stress of the sentence (at least in languages like English or French). Krifka (2007) notes, however, that stress is only one possible way to create focus, and not the very definition of focus. Prosody can at the most be a useful tool to identify certain kinds of focus. In the written language, however, we can only stipulate the place of the main stress. As the empirical part of this work is based almost exclusively on written French (researches in written corpus and experiments based on reading tasks), I do not discuss much the intonational aspect of focus.

Focus is also sometimes described as the most "important" part of the utterance. Krifka (2007) criticizes this formulation for being vague and subjective. In his opinion, importance, as well as pertinence or main stress, only correlates with focus, but none of these aspects are criteria to define focus.

It is also useful to say a word on the relation between focus and new information, or between focus and the topic/comment distinction. The focus, contrary to

[2]Contrastive focus on one syllable is even possible in order to stress metalinguistic information.

(i) I did not say that he had been a pathetic help, but that he had been a SYMpathetic help!

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the background as stated in definition (4.10), cannot be derived from the context of the utterance, it is new information. This does not mean, however, that the semantic referent has not been mentioned in the discourse, only that this part of the proposition is new. In (4.11), the answer selects one of the alternatives previously mentioned in the discourse. What is new is that the destination was the beach.

(4.11) a. Speaker A: Did you go to the beach or to the museum yesterday?
b. Speaker B: We went to the [beach]$_F$.

In (4.12), the focus contains an anaphoric pronoun, i.e. the referent has already been mentioned, but it is still a felicitous answer to the question of speaker A, because it is selected from other possible alternative answers.

(4.12) a. Speaker A: Who did Felix praise?
b. Speaker B: Felix praised [himself]$_F$. (Marandin et al. 2007)

Because of this, focus often belongs to the comment, but contrastive, corrective or confirmative focus (see below) is also possible on the topic, which is then usually called a "contrastive topic".

Many kinds of focus have been identified in the literature (Krifka 2007: 6–34). We will give below a series of definitions for kinds of focus which are useful in this work. This list is by no means exhaustive.

4.1.2.1 Information focus

Information focus is the prototypical kind of focus, and is also called **semantic focus**. There is an informational focus when new information is added to the Common Ground; it is the element that answers the implicit or explicit question.

4.1.2.2 Contrastive focus

An utterance containing a contrastive focus reacts to a proposition which just entered the Common Ground. The focus signals an element that the speaker wants to correct or wants to give additional information on. One example of the latter is given in (4.13).

(4.13) a. Speaker A: Karen has a child.
b. Speaker B: [Brandon]$_F$ has a child too.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

4.1.2.3 Corrective (or confirmative) focus

An utterance with a corrective or confirmative focus also reacts to a proposition which just entered the Common Ground. Focus signals the element that the speaker wishes to confirm or correct while expressing the alternative, which is the only one for which the proposition is true. For a corrective focus like (4.14a), the set of alternatives contains the alternative previously mentioned in the discourse (here: Karen) and excludes it: this alternative leads the proposition to be false. In confirmative focus like (4.14b), this same alternative is pertinent, and other potential alternatives are excluded: the proposition with this alternative is true.

(4.14) Speaker A: Karen is the oldest.

a. Speaker B: No, $[\text{Brandon}]_F$ is the oldest.

b. Speaker B: Yes, $[\text{Karen}]_F$ is the oldest.

4.1.2.4 A topic with focus properties: Contrastive topic

The answer in (4.15b) contains two topics: *Karen* and *Brandon*. Both are continuation topics that add more information to the topic introduced in the question (4.15a), *your siblings*. Since *siblings* refers to several individuals, there is potentially a need to distinguish between them.

(4.15) a. Speaker A: What do your siblings do?

b. Speaker B: $[\text{Karen}]_{CT}$ is a writer and $[\text{Brandon}]_{CT}$ is a life guard.

In this case, we talk about contrastive topics (Krifka 2007: 44-45). Contrastive topics have some properties of focus, because they signal a set of sets of propositions (whereas focus signals a set of propositions).

4.1.3 Background (and presuppositional content)

The Background – already defined in (4.10) – is the part of the utterance that is presupposed, following the definition of presupposition given by Lambrecht.

(4.16) A proposition P is a pragmatic presupposition of a speaker in a given context just in case the speaker assumes or believes that P, assumes or believes that his addressee assumes or believes that P, and assumes or believes that this addressee recognizes that he is making these assumptions, or has these beliefs (Lambrecht 1994: 51)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Any information can be backgrounded because it is old information in the Common Ground, but can also be new information that is not at issue and that must be taken for granted in order for the propositional content of the utterance to be true (Lambrecht 1994: 54). Focus and Background are in a complementary distribution, such that an element in the utterance must be either focused or backgrounded.

In Alternative Semantics, the backgrounded information is regarded as introducing a set of only one element.

Presuppositions differ from implicatures, because implicatures can be negated while the negation of presupposition is infelicitous. Consider (4.17a), whose implicature is that the speaker has only one child. Yet, the conversation in (4.17b) is felicitous, event though this implicature is contradicted in the next sentence.

(4.17) a. I have a child.

b. Speaker A: I wish I would be a father. What about you, do you have a child?
Speaker B: Yes, I have a child. Actually, I have three children.

This contrasts with the presupposition of (4.18a), which is that Jennifer has two siblings (the verb *to know* takes as a complement an S whose propositional content is presupposed). Contradicting this presupposition as in (4.18b) is infelicitous.

(4.18) a. The landlord does not know that Jennifer has two siblings.

b. # The landlord does not know that Jennifer has two siblings. Actually, she's an only child.

This property of presuppositions lead Erteschik-Shir (1973) to propose a test of backgroundedness, called the "liar test". The test consists on reporting that someone has said the utterance, and then adding that this person was lying about a particular part of the utterance. Example (4.19) is a liar test for the utterance in (4.18a). The continuation in (4.19a) shows that the elements [*does not know*] are not backgrounded (they bear the informational focus), while the continuation in (4.19b) shows that the sentential complement [*Jennifer has two siblings*] is backgrounded.

(4.19) Ashley said: The landlord does not know that Jennifer has two siblings...

a. ... which is a lie: he knows.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. # ... which is a lie: she's an only child.

Lambrecht (1994: 51) and Ambridge & Goldberg (2008) propose similar tests that take advantage of the same property of presupposition in order to identify the backgrounded elements. It must be noted that the liar test targets only the backgroundedness with respect to the main clause. The internal information structure of an embedded clause cannot be targeted directly. The embedded sentence has to be tested in isolation.

4.2 General principles: from Erteschik-Shir's dominance constraint on extraction to Goldberg's "Backgrounded Constituents are Islands"

In this section, I will present some accounts based on the discourse function of extractions that offer an analysis of many different islands. The next section will be devoted to the subject island in particular.

4.2.1 The Focus approach

Erteschik-Shir proposed another alternative to syntactic accounts of islands (Erteschik-Shir 1973, Erteschik-Shir et al. 1997, Erteschik-Shir 2006). Her proposal is based on information structure[3] and maintains as a general principle that extraction can only occur out of the "potential focus domain". The focus and the elemnts it c-commands (including traces) build the focus domain. In her first works, this same concept was defined as the semantically dominant phrase or clause.[4] Her original constraint is reproduced in (4.20):

(4.20) **The dominance condition on extraction**:
Extraction can occur only out of clauses or phrases which can be considered dominant in some context. (Erteschik-Shir 1973: 27)

She uses the liar test in order to identify the potential focus domain in a specific context. Example (4.21) makes clear that the context is very important to determine the focus domain: in both examples, the liar test targets the complement of the noun in the NP [*a book about Nixon*]. In the first case, however, the

[3]Which she calls the f(ocus)-structure since Erteschik-Shir et al. (1997).

[4]She defines "semantic dominance" as such: "A clause or phrase is semantically dominant if it is not presupposed and does not have contextual reference." (Erteschik-Shir 1973: 22). In later works (e.g. Erteschik-Shir 2006), she says that the two formulations are equivalent.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

liar test shows that *about Nixon* is in the focus domain[5] in one context, not in the other.

(4.21) a. Sam said: John wrote a book about Nixon. Which is a lie – it was about a rhinoceros.

b. Sam said: John destroyed a book about Nixon. #Which is a lie – it was about a rhinoceros.

This distinction explains the contrast in (4.22): in (4.22a), the extracted element belongs to the potential focus domain, and therefore can be extracted following (4.20), whereas in (4.22b), it does not.

(4.22) a. What did they write a book about?

b. * What did they destroy a book about? (examples from Bach & Horn 1976: 272)

Context also plays a role in the fact that some islands are "stronger" than other, and that acceptability judgement varies for islands: "the positive response of informants is conditional on their ability to contextualize in such a way that the clause from which extraction has occurred is interpreted as a focus domain" (Erteschik-Shir 2006: 320).

4.2.2 The Topic approach

Kuno (1987), on the contrary, proposes an account of islands based on Topic. He notices that Erteschik-Shir's proposal that extraction can only take place out of the pal focus domain is not able to account for the contrast between (4.23a) and (4.23b). The context remains the same (hence with the same potential focus domain), and the liar test gives similar results but extracting *the actress* out of the NP [*Mary's portrait of this actress*] is not felicitous. The reason cannot be the presence of the genitive *Mary's* alone, because the extraction in (4.23c) is felicitous.

(4.23) a. Yesterday, I met the actress who I had bought a portrait of.

b. * Yesterday, I met the actress who I had bought Mary's portrait of.

c. This is the story that I haven't been able to get Mary's version of. (examples from Kuno 1987: 13)

[5]In this work, I describe it as non-presupposed, and therefore non-backgrounded.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

His proposal is that topics, and not dominant (or focused) elements, are extracted. His definition of topichood is somewhat broader than the one I gave previously, because in his proposal NPs can have a topic as well, and not only utterances. The utterance (4.23c) implies that the speaker has heard the version of this story from at least one other person. It thus opens an alternative set: *Mary's* is interpreted as contrastive, and therefore as a focus. On the other hand, *the actress* can be interpreted as the topic of the NP. In (4.23b), *Mary* is more naturally the topic, and *the actress* the focus in the NP. Kuno formulates this constraint as follows:

(4.24) **Topichood Condition for Extraction**:
Only those constituents in a sentence that qualify as the topic of the sentence can undergo extraction processes (i.e. Wh-Q Movement, Wh-Relative Movement, Topicalization, and It-Clefting). (Kuno 1987: 23)

4.2.3 The salience approach (reconciling Focus and Topic approaches)

The Focus approach and the Topic approach are not mutually exclusive, and Kuno (1987) sees the Topic Condition as an extension of Erteschik-Shir's rule. What is however missing in both accounts is an explanation of how a syntactic factor like extraction and discursive factors like Topic and Focus interact.

Deane (1991) answers this concern and provides an unifying account based on the management of cognitive resources. His idea is that extraction requires that we pay attention to two separated parts, the filler and its head, which we need to link together in order to obtain the appropriate syntactic structure. The longer the distance, the stronger this division of attention has an impact on our cognitive resources: we have limited space in our short-term memory. If the two parts are cognitively salient, however, it is easier to keep them active. Focus and Topic are the two most salient elements in the sentence: the focus is salient because it is the important part of the discourse, and the topic is salient because it is the center of interest in the sentence. They are therefore the best candidates for extraction.

Building on this idea, and adopting the constraint-based counterpoint of Erteschik-Shir's (1973) dominance condition on extraction, (Goldberg 2006: 135) proposes the BCI constraint (see also Ambridge & Goldberg 2008, Goldberg 2013):

(4.25) **Backgrounded Constituent are Islands (BCI)**:
Backgrounded constituents may not serve as gaps in filler-gap constructions. (Ambridge & Goldberg 2008: 366)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The BIC and the dominance condition on extraction make the same predictions: extraction out of non-focus (hence backgrounded) constituents is felicitous. The difference is that Erteschik-Shir assumes that extraction is ruled out by default and needs rules that licences it, while Goldberg assumes that extractions are possible by default, and that only certain constructions can constrain them. Both constraints are discourse-based, but this is not reflected explicitly by their respective formulation.

4.3 The subject island constraint from a functional perspective

Erteschik-Shir (1973) shows that sentential subjects are presupposed in the utterance. Consider first the sentential complement in (4.3):

(4.26) Bill said 'It's likely that Sheila knew all along.' (Erteschik-Shir 1973: 157)
  a. , which is a lie – it isn't.
  b. , which is a lie – she didn't

Targeting the sentential complement with the liar test seems to be felicitous. We can conclude that the sentential complement is not backgrounded, hence part of the potential focus domain. There is a clear contrast in this respect with the sentential subject in (4.3).

(4.27) Bill said 'That Sheila knew all along is likely.' (Erteschik-Shir 1973: 157)
  a. , which is a lie – it isn't.
  b. * , which is a lie – she didn't

Most scholars in the functional approach agree on the fact that the "subject island contraint" for an NP subject is caused by the subject being the default topic of the utterance. One evidence for that is that topics have a preference for being expressed as subjects. Indeed, when *John* is the topic, the answer in (4.28a) is more natural than the answer in (4.28b).

(4.28) Tell me about John. (Erteschik-Shir 2006: 323)
  a. – He is in love with Mary.
  b. – Mary is in love with him.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

This is not to say that it is always the case. We can see a counterexample with (4.29a). Here, the subject is more likely to be the new or unpredicted information in the sentence, and thus the focus. That's why (4.29b) is a good paraphrase for (4.29a).

(4.29) a. [This person alone]$_F$ [passed the test]$_B$.
b. The only person who passed the test was this person. (examples from Kuno 1987)

Erteschik-Shir (2006: 324) assumes that extractions are allowed only in what she calls "canonical f-structures", in which the subject is the topic (see also Erteschik-Shir et al. 1997: 186). The reason is that it is harder for the addressee to identify the dependents in an utterance with a non-canonical f-structure like (4.29a), and it is therefore harder to identify the gap. Because extraction has to take place from the potential focus domain, as stated in (4.20), extraction out of subjects is ruled out.

As could be expected, Goldberg (2006) has a similar proposal. With subjects being default topics – what she calls "primary topics" –, and topics being backgrounded, extraction out of the subject is violating the BCI (4.25). It is possible to extract a primary topic as a whole, but not to extract out of it. She explains: "It is pragmatically anomalous to treat an element as at once backgrounded and discourse-prominent." The subject island is hence caused by a discourse-clash, so Goldberg.

4.4 The BCI revisited: the Focus-Background Conflict constraint

The previous functional approaches to islands have not taken much into consideration the fact that all filler-gap dependencies do not have the same discourse function. Indeed, *wh*-questions and *it*-clefts focus the extracted element (Lambrecht 1994), while relativizations and topicalization topicalize it (Kuno 1987: 15).[6] Even though Erteschik-Shir, Kuno and Goldberg explain constraints on extractions in terms of discourse status, they all take for granted that "topicalization processes (Topicalization and Relativization) and focusing processes (Wh-Q Movement and It-Clefting) are subject to the same constraint" (Kuno 1987: 27). Probably for the same reason, the constraints they proposed (Subject Condition,

[6] "On the basis of the pervasive parallelism between topicalization and relativization, I proposed that in Japanese what is relativized is the theme of the relative clause." (Kuno 1987: 15)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

BCI, Topichood Condition for Extraction) rely on discursive factors, but are not explained in terms of discursive mechanisms.

Notably, these proposals all assume that extraction is a key factor in the constraint. But extraction, and word order more generally, is only one of many tools used in human languages to encode specific discourse status. There is no reason to assume that discourse clash cannot lead to infelicitous sentences independently of extractions. In Chicheŵa (a language from the Bantu family), in which object marking (OM) on the verb is otherwise optional, the presence of an object marking is ruled out for object interrogatives. This is illustrated by the contrast in (4.30).

(4.30) a. Mu-ku-fún-á chiyâni?
you-PRES-want-INDIC what
'What do you want?'

b. * Mu-ku-chí-fún-á chiyâni? (examples from Bresnan & Mchombo 1987: 759–760)
you-PRES-OM-want-INDIC what
'What do you want?'

In (4.30b), the verbal object marker *-chí-* seems not compatible with the object interrogative word *chiyâni*. According to Bresnan & Mchombo (1987: 758–760), the reason is that the verbal object marker *-chí-* is an anaphoric pronoun that signals that the object is the topic. Since the object cannot be at the same time topic and focus of the utterance, the sentence is ruled out.

> Because the topic designates what is under discussion (whether previously mentioned or assumed in discourse), it is presupposed. The interrogative focus designates what is NOT presupposed as known, and is contrasted with presupposed material. Hence, allowing the same constituent to be both topic and focus of the same clause leads to inconsistent presupposition. (Bresnan & Mchombo 1987: 758)

Extraction here plays no role, because the interrogative word is in situ.

Furthermore, and as explained already in Section 3.1, the difference between the preference for subject relatives over object relatives on one hand and the subject island on the other hand is very surprising and remains unexplained under the previous discourse-based accounts. The subject island seems to contradict directly Keenan & Comrie's (1977) Accessibility hierarchy.

Based on experimental data from English and French, we proposed in Abeillé et al. (2020: rule (8)) that the penalty observed in extraction out of the subject and

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

known as "subject island" is caused by a discourse clash: the degradation results from the attempt to focalize some part of a backgrounded element. Indeed, it seems reasonable to assume that we cannot simultaneously identify an individual x as part of the Common Ground and open a set of alternatives about property inherent to this same individual. We therefore reformulated the BCI and call this the Focus-Background Conflict constraint, which we define as:

(4.31) **Focus-background conflict (FBC) constraint:**
A focused element should not be part of a backgrounded constituent.

We agree, however, with previous discourse-based approaches in assuming that subjects are default topics (and thus backgrounded). Subextractions out of the subject that lead to a focalization of the extracted phrase are therefore violating the FBC constraint, and this is, we claim, the reason why it is degraded compared to a similar subextraction out of the object. Complements have a tendency to belong to the focus, and for this reason subextractions out of the object are more often felicitous.

Notice that this constraint explicitly presents focusing processes as the cause of the degradation. The straightforward consequence is that only focusing extractions like *wh*-questions and *it*-clefts can violate the FBC constraint. In a relative clause, the extraction is a topicalization, such that the referent denoted by the antecedent of the relative clause (the noun modified by the relative clause) is the topic of the relative clause. In other words, the relative clause "is about" the noun it modifies. The subject in relative clauses is preferably backgrounded, but since the extracted element is not focussed, the FBC constraint is not violated.

A consequence of the FBC constraint (4.31) is that it does not necessarily involve an extraction. A focalization of part of a backgrounded constituent that does not involve an extraction would violate the FBC constraint as well.

Another consequence of the FBC constraint (4.31) is that it is not expected to apply to all subjects. Even though subjects are topics by default, they also have the possibility to be focus. This means that extracting by means of an interrogative or *it*-cleft out of a focused subject should be possible, because this does not lead to a discourse clash.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

5 Concluding remarks on the state of the art

In this first part of the book, I presented three main approaches to the subject island phenomenon, and to the contrast between (some?) extractions out of the subject and extractions out of the object. The traditional and still most well-known approach is a syntactic approach. I have shown that there are many different accounts that provide slightly different predictions – especially about whether extractions out of subjects of passives fall under the subject island constraint or not – and why some languages do not display a subject island effect. I also showed that all syntactic accounts should expect that French is not an exception to the subject island constraint and that extractions out of the subject are ruled out. Relative clauses with *dont* may be an exception, according to Tellier. In the following parts, I will have to simplify and talk about "the syntactic accounts" as an umbrella term to refer to accounts that predict an important degradation when extracting out of subjects: extractions out of the subject do not belong to the grammar of French.

There are a lot of other proposals with non-syntactic approaches to the subject island phenomenon. I presented accounts based on processing and accounts based on information structure. I can identify two main trends in processing-based accounts. If we look at the phenomenon of extractions from the point of view of memory load, then shorter dependencies should be easier to process and extractions out of the subject are actually expected to be better than extractions out of the object. This is was is predicted by the DLT, and – in some respect – what could be predicted by Dependency Grammar. Another possible way to look at the phenomenon is to say that extractions out of the subject are unexpected (because subjects are complex or because there is not enough information yet when the parser reaches the gap inside the subject) and therefore are surprising for the parser. For these accounts based on surprisal, a degradation when extracting out of subjects is expected. The degradation does not have to be important, because other factors may counterbalance the effect of surprisal and ameliorate the parsing of these subextractions.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Finally, I make a distinction between two main trends in discourse-based accounts. Previous discourse-based accounts all predict a degradation when extracting out of subjects, regardless of the construction of the extraction. Like for processing-based accounts, the impact is not necessarily big. The unacceptability of subextractions from subjects is caused by the difficulty to imagine a context in which the extraction would be felicitous, and this means that an appropriate context can ameliorate the acceptability of the utterance. But I proposed a new discourse-based account, the FBC constraint (4.31): The FBC constraint states that the degradation when extracting out of subjects is caused by a discourse clash, but expects that the extraction out of the subject is acceptable in topicalizing constructions (e.g. relative clauses).

Many of these accounts are mutually exclusive, but not all. Processing-based accounts and discourse-based accounts can to a certain degree be compatible with each other. I will argue in this book that the FBC can best account for the data that I present, and the cross-construction contrast that I found. But the FBC constraint is compatible with accounts based on relevance. Being at-issue is certainly necessary in order to create a context that supports the focalization or the topicalization of some phrase. The FBC constraint is also compatible with accounts based on memory load, and where there is no violation of the constraint, a preference for shorter dependencies is expected. I also posit that the complexity of subjects plays a role, but that this factor has a lesser impact than has been claimed.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Part II

Empirical studies on French subject subextractions

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

6 Preliminary remarks on the empirical data

It is impossible to build any meaningful theory (about the subject island, any other kind of island or any linguistic phenomenon in general) without agreeing on the data in the first place. But as far as extractions out of the subject are concerned, scholars do not agree on the felicitous or infelicitous status of many examples. For example: Are extractions out of the subject of passives ruled out, or are they felicitous? Are extractions out of the subject with *dont* in French better than extractions out of the subject with *de qui*? In the former case, different authors have given different judgements on the same language. In the latter case, Godard's (1992) intuition, as well as my own, differs from Tellier's (1990). This disagreement between linguists, even between native speakers, is far from exceptional. Experimental data have shown for a long time that native speakers disagree on such matters, as soon as a sentence structure is complex, or the situation it describes infrequent (Chaves & Dery 2019). Obviously, filler-gap dependencies are a complex phenomenon in themselves and, unsurprisingly, not all speakers feel equally comfortable with all of them. Often enough, the constructed examples are also at least slightly (and sometimes very) unnatural, and the appropriate context missing (see discussion in Section 4). Furthermore, linguists are not naive speakers on metalinguistic questions, and a linguist's intuition (including mine), even though highly valuable, may be biased.

Quantitative data are by nature more resistant to individual preferences. Provided that we have a sufficient amount of data and that we treat outliers as needed, individual preferences disappear in the statistical result driven by the data. What remains are general tendencies. For this reason, quantitative data play an important role nowadays in the linguistic debate. There are several ways to collect quantitative data, and in this work, I will use two methods that I judge equally important: corpus studies and experiments.

Islands in the languages of the world have been the core of many experimental studies, probably starting with Kluender (1991). His work itself was in the logical extension of the first online experiments on filler-gap dependencies that took place in the 80s (Tanenhaus et al. 1985, Stowe 1986: a.o.). Since then, many

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

experiments on islands have been conducted. I will present in Section 7 some experiments on subject islands in particular, a list that is not and cannot by any means be exhaustive. On the contrary, there was hardly any corpus study done on the subject before our own work (Abeillé et al. 2016, Abeillé & Winckel 2020), except for Candito & Seddah (2012a) which I will mention below but which only incidentally deals with subextractions from the subject. It is puzzling to note that extractions out of the subject were hence considered impossible without even considering whether the speakers produced them.

Corpus data are productions with non-metalinguistic aims, and are therefore useful to look at before building experimental items. As already mentioned, it is important that the situations described by the experimental items are familiar and that an appropriate context is easy to imagine. It is thus important to look at spontaneous productions of native speakers in order to know how filler-gap dependencies are actually used by speakers, what kind of situations are described and what kind of vocabulary is used.

Here, we should also pay attention to the relative frequencies of different structures based on different factors, especially the relative frequencies of extractions out of subjects and out of objects. My expectations are as follows:

1. If extractions out of subjects are indeed grammatically ruled out, then extractions out of the subject should be absent from the corpora (or be accidental – I come back to this issue later on). Notice that the opposite is not necessarily true: the fact that a certain structure does not appear in a corpus does not imply nor prove that this structure is absent from the specific language, let alone that it is ruled out by syntax. No corpus, however large it might be, can account for all possible structures of a certain language.

2. If extractions out of the subject are not ruled out, but only more difficult to process than extractions out of the object, then we expect the former to be less frequent in the corpora than the latter. Several previous corpus studies have shown that complex subjects are less frequent than complex objects. Kluender (2004), among various other scholars, argues that it is because they are harder to process (see Section 3.3.1). Extractions out of subjects, per definition, require complex subjects to begin with, and should consequently be less frequent than extractions out of objects.

3. The Focus-Background Conflict constraint (4.31) predicts different results for different constructions. Because subjects are usually topics, focalizations of a subpart of the subject should be dispreferred. For this reason, we

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

expect extractions out of subjects to be less frequent than extractions out of objects in interrogatives and *c'est*-clefts. In these constructions, we also expect that the subjects which allow for subextraction can be interpreted as focus (e.g. with a contrastive meaning). In relative clauses, there is no constraint on the subextraction from subject: we expect to see different distributions between the different constructions.

Since the corpus data are not able to provide us with negative evidence, it is essential to conduct controlled experiments as well. If subextractions from subjects do not appear in the corpora, we would need to verify that the speakers do not accept them. Without this proof, their absence in the corpora may be coincidental. Moreover, as we shall see, some constructions (c'est clefts and infinitival subjects) appear too infrequently in the corpora for us to be able to perform a relevant statistical analysis in our corpus studies. Experimental data can provide us with more information on these constructions.

Since the method has been applied to islands by Kluender & Kutas (1993a,b) and then by Sprouse and his colleagues (e.g. Sprouse et al. 2011, 2012, 2016, Sprouse & Almeida 2017), it has become common practice to use factorial designs in order to test island hypotheses, and to expect superadditive effects as a result of island constraints. The factorial design is usually a 2*2 design, with a double comparison. The first comparison is between gap sites, comparing the "island" gap site with another gap site, similar but not expected to lead to an island. For example, the comparison often used in the literature on subject island is between extraction out of an NP subject and extraction out of an NP object. The second comparison is between constructions, one characteristic for the island, the other as similar as possible but not an identified island. For example, we can compare extraction of the whole NP with subextraction out of the NP, or – as we often did in the experiments that I will present – non-extraction with subextraction.[1] This double comparison ensures that we isolate the factor of the island configuration, such that the resulting unacceptability of the structure does not come from the gap site independently of the structure, or from the structure independently of the gap site. Island phenomena are expected to cause a superadditive effect, i.e. a statistically significant interaction effect between gap site and construction. If subjects are islands, the difference between extraction out of the object and extraction out of the subject is expected to be greater than between the two other

[1]We favor non-extractions, because there is a well-known preference in processing (and acceptability judgments) for subject relative clauses over object relative clauses (a.o. Wanner & Maratsos 1978, Traxler et al. 2002, Pozniak & Hemforth 2015). This preference can create interaction effects in the factorial design, that would not be related to the island phenomenon.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

control conditions (e.g. extraction of the object and extraction of the subject). Figure 6.1 illustrates the expected difference between a linear additivity and a superadditivity.

Figure 6.1: Prediction for linear additivity vs. superadditivity (inspired by Sprouse et al. 2012: 86). Extraction out of the subject (subject + subextraction) is the island condition.

I will present a series of 16 experiments, most of which follow a 2*3 factorial design. In addition to the usual 2*2 design, there is indeed a comparison between the subextraction condition and two ungrammatical controls.

In this work, I aim to test the expectations of the various accounts on subject islands proposed by linguists. As it is not possible to take them all into account, I identify five general categories of accounts: (i) "traditional" syntactic accounts (syntactic island hypothesis), (ii) processing accounts based on the hypothesis that complex subjects are unexpected, (iii) functional accounts based on the hypothesis that backgrounded constituents are islands to extraction, (iv) processing accounts based on the hypothesis that distance between dependents should be as minimal as possible, and (v) functional accounts based on the hypothesis that focalizing part of a backgrounded constituent result in a discourse clash. There are of course many variations inside these categories, especially among the proponents of a syntactic account of subject island, as explained in Section 2. However, they have similar general expectations with respect to the experiments that I will present. In a nutshell, we can say that accounts in the categories (i), (ii) and (iii) expect superadditive effects such that extractions out of the subjects are less acceptable (for offline experiments) or read more slowly (for inline experiments) than the other grammatical conditions. Accounts from the category (iv) expect on the contrary an advantage for extractions out of the subject. The Focus-Background Conflict constraint, in category (v), expects superadditive effects in disfavor of extractions out of the subject only in focalizing constructions.

The quantitative analysis reported in this work are conducted in R (R Core Team 2018: version 3.6.3), and graphs are all created using the `ggplot2` package

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(Wickham 2016). According to the broad consensus in statistics, I consider a result significant if and only if the confidence level is at least 95%, i.e. if and only if the probability value (*p* value) is at most 5% (p<.05). I indicate the *p* value relative to six levels of significance: p<.05, p<.01, p<.005, p<.001, p<.0005 or p<.0001.

The data and R code of all the corpus studies and experiments presented below are available online at https://osf.io/5qhxa/.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

7 Previous experimental work on subextraction from subjects

I attempt in this section to give an overview of the previous works on subjects island, reporting results that I judged most interesting. I only mention below experiments published in peer-reviewd publications, or in Ph.D. theses, leaving aside talks and posters presented as various conferences and workshops but unpublished. Nevertheless, given the growing interest of experimental linguistics in islands, such an undertaking is likely to be incomplete.

The experiments on French presented in this book, some of which have been published, are not included in the tables, nor are a few experiments on English that we carried out in parallel with the experiments on French (Abeillé & Winckel 2019, Abeillé et al. 2020). I'll mention them later in the book.

I deliberately leave aside the work done by several scholars on a phenomenon called "satiation" by some, and "habituation" by others. Sprouse (2007a,b, 2009), Francom (2011), Goodall (2011), Chaves & Dery (2014, 2019) and Chaves & Putnam (2020) ran different experiments in order to test if the acceptability of subject islands increase after repeated exposure. All these experiments are done on extraction out of subjects in *wh*-questions. The subjects tested are NP subjects or non-finite and finite sentential subjects. The results are mixed, but the latest evidence suggests that the acceptability of the extractions out of subjects improves after at least eight exposures.

I also omit studies on non-native speakers because the questions they are trying to answer are very different from my own. Kush & Dahl (2022) provide a current overview of the state of the art.

I start with studies on extractions out of NP subjects, which are the most common ones, before presenting studies on extractions out of sentential subjects.

7.1 Interrogatives

Unsurprisingly, the most studied language in these studies is English. Maybe more surprisingly, a large majority of the studies concentrate on testing extrac-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

tion by means of wh-questions (mostly direct wh-interrogatives, sometimes also indirect ones). Table 7.1.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Publication	Subject type	Filler (island condition)	Task	Design	Results
Phillips (2006), Experiment 1	NP	Direct of object (of the complement / of the relative clause)	Acceptability ratings, likert scale	Testing embedded wh-question, crossing extractee type (direct object / complement of the subject NP / both) with finiteness (non-finite complement of NP / finite relative clause of NP).	- interaction extractee type : finiteness (p <.0001) - no effect of finiteness for direct objects - extraction out of the subject rated higher in the non-finite condition (p <.05) - double gap rated higher in the non-finite condition (p <.0001)
Phillips (2006), Experiment 2	NP		Self-paced reading	Testing embedded wh-question, crossing plausibility (filler is plausible as subject complement / implausible as subject complement) and finiteness (non-finite complement of subject / finite relative clause of subject).	Accuracy on comprehension questions: - no interaction Reading times: - (marginal) interaction plausibility : finiteness (p <.05 in the participant analysis ; p = .086 in the item analysis), such that reading times increase only in the implausible + non finite condition.
Sprouse (2007a), Experiment in section 3.2	NP	PP-complement (with preposition stranding)	Acceptability ratings, magnitude estimation	Crossing function (subject / object), extraction type (extraction of NP / extraction out of NP) and context (with / without supporting context).	- interaction function : extraction type (p <.001; Cohen's d = .521) - no main effect of context - no 3-way interaction
Jurka (2010), Experiment 8	NP	Of-complement (with and without preposition stranding)	Acceptability ratings, likert scale	Crossing function (subject / object), extraction type (no extraction / extraction out of the NP) and preposition stranding (with / without preposition stranding).	- for preposition stranding, interaction function : extraction type, so that extraction out of the subject is rated lowest - without preposition stranding, interaction function : extraction type, so that extraction out of the subject is rated lowest - interaction for preposition stranding larger than without preposition stranding
Jurka (2010), Experiment 9	NP	Of-complement (with preposition stranding)	Acceptability ratings, likert scale	Crossing extraction type (no extraction / extraction out of the subject) and Exceptional Case Marking (simple verb / embedding with ECM).	- interaction extraction type : ECM, mostly due to the condition ECM with no extraction being much lower than ECM with subextraction - for extraction out of the subject, the simple verb is rated higher than the ECM (p = .031)
Jurka (2010), Experiment 10	NP	Of-complement (with preposition stranding)	Acceptability ratings, likert scale	Testing embedded wh-questions, crossing extraction type (no extraction / extraction out of the subject) and verb type (unergative / passive).	- interaction extraction type : verb type, so that the extraction out of the subject of the unergative verb is rated lowest, but the effect size is very small
Sprouse et al. (2012), Experiment 1	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale + Serial recall task	Crossing function (subject / object) and extraction type (extraction of NP / extraction out of NP). A Measure of working memory is also included.	- interaction function : extraction type (p <.0001) - main effect of serial recall (p <.02)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Sprouse et al. (2012), Experiment 2	NP	PP-complement (with preposition stranding)	Acceptability ratings, magnitude estimation + Serial recall task and n-back task	Crossing function (subject / object) and extraction type (extraction of NP / extraction out of NP). Two measures of working memory are also included.	- interaction function : extraction type (p <.0001) - no effect of serial recall (p = .7) - no effect of n-back (p = .66)
Fukuda et al. (2012), Experiment 1	NP	Of-complement (with preposition stranding)	Acceptability ratings, yes/no	Crossing extraction type (no extraction / extraction out of NP) and extraction site (nominal subject / nominal object / wh-subject).	- interaction extraction type : extraction site (p = .0218) - extraction out of nominal object rated higher than extraction out of nominal subject (p = .0052) - extraction out of nominal object rated higher than extraction out of wh-subject (p <.001) - no difference in rating between extraction out of nominal subject and extraction out of wh-subject (p = .997)
Fukuda et al. (2012), Experiment 2	NP	Of-complement (with preposition stranding)	Acceptability ratings, likert scale	Same as previous	- interaction extraction type : extraction site (p = .0027) - extraction out of nominal object rated higher than extraction out of nominal subject (p = .0001) - extraction out of nominal object rated higher than extraction out of wh-subject (p = .0001) - no difference in rating between extraction out of nominal subject and extraction out of wh-subject (p = .7504)
Fukuda et al. (2012), Experiment 3	NP	Of-complement (with preposition stranding)	Acceptability ratings, magnitude estimation	Same as previous	- marginal interaction extraction type : extraction site (p = .0582) - extraction out of nominal object rated higher than extraction out of nominal subject (p .0036) - extraction out of nominal object rated higher than extraction out of wh-subject (p = .0001) - no difference in rating between extraction out of nominal subject and extraction out of wh-subject (p = .2554)
Polinsky et al. (2013), Experiment 1a	NP	Of-complement (with preposition stranding)	Acceptability ratings, likert scale	Testing embedded wh-questions, crossing extraction type (extraction of the subject / extraction out of the subject) and verb type (unaccusative / unergative / transitive).	- marginal effect of verb type, only between unaccusative and uneragtives (p <.1) - no interaction effect
Polinsky et al. (2013), Experiment 1b	NP	Of-complement (with preposition stranding)	Self-paced reading	Same as previous	- the verb and the NP following the verb are read slower for transitives than the other verb types (p <.05) - the PP following the verb is read slower for unergatives than unaccusatives (p <.005) - the NP/PP following the verb is read slower in the subextraction than in the extraction (p <.0001)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Bianchi & Chesi (2015)	NP	Of-complement (with and without preposition stranding)	Acceptability ratings, continuous scale	Crossing predicate (stage-level / individual-level) and extraction type (with / without preposition stranding)	- interaction predicate : extraction type (p = .036) - for s-level predicates, preposition stranding is rated lower (p = 6.127e-13) - for i-level predicates, preposition stranding is rated lower (p = 2.719e-05)
Sprouse et al. (2016), English Experiment 2	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Crossing function (subject / object) and extraction type (extraction of NP / subextraction from NP)	- marginal interaction (p <.062)
Chaves & Dery (2019), Experiment 4	NP		Self-paced reading	Comparing plausibility (filler is plausible / implausible as direct object of the relative clause inside the subject)	- reading times increase for implausible fillers on the verb of the relative clause
Chaves & Putnam (2020), Experiment 6	NP	Of-complement (with preposition stranding)	Acceptability ratings, likert scale	Comparing relevance (the extracted element is relevant / less relevant for the situation described by the sentence. The relevance scores are based on a previous norming experiment.	- more relevant fillers rated higher than less relevant fillers (p = .02)

Table 7.1: Studies on English wh-questions

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Most studies on English wh-questions are acceptability rating tasks with slightly different methodologies, whose results usually are roughly similar (Fukuda et al. 2012). The "subject island effects" are attested and seem robust (Sprouse 2007a, Jurka 2010, Sprouse et al. 2012, Fukuda et al. 2012, Sprouse et al. 2016). All the studies which extracted a pp-complement out of the subject used preposition stranding, except Jurka (2010: Experiment 8) and Bianchi & Chesi (2015) which test both with and without preposition stranding: preposition stranding seem to lower the acceptability of the extraction out of the subject. Some studies tried different verb types (Jurka 2010, Polinsky et al. 2013, Bianchi & Chesi 2015), and their results show that there are indeed some differences between verbs. But they do not systematically measure whether island effects disappear based on those factors. The presence of a quantifier might ameliorate extraction out of the subject, but the effect size are very small, so that the results are difficult to interpret (Jurka 2010: Experiment 11). Supporting context does not seem to improve extraction out of subjects (Sprouse 2007a) but relevance does Chaves & Putnam (2020). The results on working memory are mixed: working memory may have an impact on the acceptability ratings of extractions out of subjects, but do not explain them (Sprouse et al. 2012). Two studies with inline measures tried to see whether or not readers postulate a gap in the subject (Phillips 2006, Chaves & Dery 2019). Their results go in the same direction, though the authors draw opposite conclusions from them.

Table 7.2 presents studies on wh-question made on other languages (only on direct interrogatives).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Publication	Language	Subject type	Filler (island condition)	Task	Design	Results
Jurka (2010), Experiment 1	German	NP	Specifier (was-für split)	Acceptability ratings, likert scale	Crossing function (subject / object), position (NP moved before Adverb / NP in situ after adverb) and extraction type (extraction of NP / extraction out of NP).	- for the subextraction, interaction function : position (p <.001), so that extraction out of the "moved" subject is rated worse
Jurka (2010), Experiment 2	German	NP	Specifier (was-für split)	Acceptability ratings, likert scale	Testing passive verbs, crossing function (subject / dative object), markedness (unmarked with dative object before subject / marked with dative object after subject) and extraction (no extraction / extraction out of NP).	- extraction out of the subject rated higher than extraction out of the dative object - for extracted conditions, no interaction function : markedness
Jurka (2010), Experiment 3A	German	NP	Specifier (was-für split)	Acceptability ratings, likert scale	Testing "in situ" subjects (after the adverb), crossing argument type (subject of unaccusative / passive / transitive /unergative / object of transitive) and extraction type (no extraction / extraction out of the NP).	- for transitives, extraction out of object rated higher than extraction out subjects (p <.001) - for transitives (two-by-two comparison with all other verb types), significant interactions argument : extraction type, so that extraction out of the subject is worse than the other conditions - for other extractions out of the subject, no other interaction argument : extraction type
Jurka (2010), Experiment 3B	German	NP	Specifier (was-für split)	Acceptability ratings, likert scale	Testing "in situ" subjects (after the adverb), crossing verb type (unaccusative / unergative) and extraction type (extraction of the subject / extraction out of the subject).	- interaction verb type : extraction type (p <.001)
Jurka (2010), Experiment 4	German	NP	Specifier (was-für split)	Acceptability ratings, likert scale	Testing embedded wh-question, crossing function (subject / object), extraction type (extraction of the NP / out of the NP) and scrambling (object scrambled and before the adverb / not scrambled and after the adverb).	- extraction of subject rated higher than extraction of object (p = .0014) - extraction out of subject with object scrambled rated lower than extraction out of object (p <.004) - extraction out of subject without object scrambled rated lower than extraction out of object (p = .041) - for subextractions, no interaction function : scrambling
Jurka (2010), Experiment 13a	Serbian	NP	Specifier	Acceptability ratings, likert scale	Crossing function (subject / object) and extraction type (no extraction / extraction out of the NP).	- no interaction function : extraction type
Jurka (2010), Experiment 13b	Serbian	NP	PP-complement	Acceptability ratings, likert scale	Crossing function (subject / object) and extraction type (extraction of the NP / extraction out of the NP).	- interaction function : extraction type, so that extraction out of the subject is rated lowest
Jurka et al. (2011), Experiment in 2.1	German	NP	Specifier (was-für split)	Acceptability ratings, likert scale	Crossing function (subject / object), extraction type (extraction of NP / extraction out of NP) and freezing (scrambled NP / NP in situ).	- interaction function : freezing (p <.001), the condition with extraction out of the scrambled NP being rated lowest

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Polinsky et al. (2013), Experiment 2	Russian	NP	Specifier	Acceptability ratings, likert scale	Crossing extraction type (extraction of NP / extraction out of the NP), extraction site (subject of unaccusative / unergative / transitive / object of transitive) and subject position (preverbal / postverbal).	- sentences with a transitive verbs rated lower than other verb types (p <.005 for postverbal; p <.005 for preverbal) - sentences with an unergative verb rated lower than other verb types (p <.05 for postverbal; p <.01 for preverbal) - for transitive verbs, extraction out of the subject rated lower than extraction out of the object (p <.001 for postverbal; p <.05 for preverbal)
Bianchi & Chesi (2014), Experiment 1	Italian	NP	Di-complement	Acceptability ratings, continuous scale	Testing state verbs and indefinite NPs, crossing predicate (identity-denoting / stage-denoting) and subject position (preverbal / postverbal).	- interaction predicate : subject position (p <.003) - for i-level, no effect of subject position (p = .6) - for s-level, postverbal is rated higher than preverbal (p = .003)
Bianchi & Chesi (2014), Experiment 2	Italian	NP	Di-complement	Acceptability ratings, continuous scale	Testing extraction out of definite postverbal subject, comparing verb types (unergative / unecacusative).	- no difference between verb types (p = .932)
Sprouse et al. (2016), Italian Experiment 2	Italian	NP	Di-complement	Acceptability ratings, likert scale	Crossing function (subject / object) and extraction type (extraction of NP / extraction out of NP).	- interaction function : extraction type (p <.001)
Greco et al. (2017), Experiment 1	Italian	NP	Di-complement	Acceptability ratings, likert scale	Comparing extractions (extraction out of the subject / object / extraction of adjunct).	- extractions out of objects rated higher than extractions out of subjects (p <.0001) - extractions of adverbs rated higher than extractions out of objects (p <.05)
Greco et al. (2017), Experiment 2	Italian	NP	Di-complement	Acceptability ratings, likert scale	Crossing verb type (passive / unaccusative / unergative / transitive), extraction types (extraction out of the subject / extraction of adjunct) and subject position (preverbal / postverbal).	- for transitive verbs, preverbal subjects rated higher than postverbal (p = .0539), but no effect of extraction type - for passives verbs, preverbal subject rated lower than postverbal (p = .0176), but no effect of extraction type - for extractions out of the subject, unergatives rated lower than other verb types
Kush et al. (2018), Experiment 1	Norwegian	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Testing bare filler (similar to who/what), crossing extraction site (extraction in the main clause / out of embedded clause) and complexity (subject of the embedded clause simple / complex).	- interaction extraction site : complexity (p <.001), so that extraction out of the complex subject is rated lowest.
Kush et al. (2018), Experiment 2	Norwegian	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Same as previous.	- interaction extraction site : complexity (p <.001), so that extraction out of the complex subject is rated lowest.
Kush et al. (2018), Experiment 3	Norwegian	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Testing complex filler (similar to which NP), otherwise same as previous.	- interaction extraction site : complexity (p <.001), so that extraction out of the complex subject is rated lowest
Pañeda et al. (2020)	Spanish	NP	De-complement	Speeded acceptability ratings, yes/no	Crossing extraction site (extraction in the main clause / out of embedded clause) and complexity (suject of the embedded clause simple / complex).	- interaction extraction site : complexity, so that extraction out of the complex subject is rated lowest

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Kobzeva et al. (2022), wh-question	Norwegian	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Same as previous. Another construction is also tested (see below).	- interaction extraction site * complexity ($p < .0001$), so that extraction out of the complex subject is rated lowest

Table 7.2: Studies on wh-questions in other languages

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

For those studies that have a design allowing to identify the presence of island effects (Jurka 2010: Experiment 13b, Jurka et al. 2011, Sprouse et al. 2016 Greco et al. 2017: Experiment 2, Kush et al. 2018, Pañeda et al. 2020, Kobzeva et al. 2022), there is almost systematically a significant interaction effect pointing to a potential "subject island" (unfortunately, Jurka (2010: Experiment 1 & 2) and Polinsky et al. (2013) have such a design but do not report the results for the interaction). However, all except one (Greco et al. 2017) use as a baseline to test subextraction an extraction of the whole subject, which is not ideal, given that extractions of the subject display processing advantages. The study that stands out is Jurka (2010: Experiment 13a) on Serbian, which does not show a superadditive effect. Some studies explore different verb types (Jurka 2010, Polinsky et al. 2013, Bianchi & Chesi 2014), leading to different results than for English: in German, Russian and Italian, different verb types seem to behave similarly as far as the extraction out of the subject is concerned. The position of the subject seems to play a role (Jurka 2010, Jurka et al. 2011, Polinsky et al. 2013, Bianchi & Chesi 2014), but there is no evidence that this is not a general preference that has nothing to do with the subextraction (since there is either no comparison with a baseline, or it is not reported). Several experiments test the extraction of the specifier, which is possible in the respective language of these studies (Jurka 2010, Jurka et al. 2011, Polinsky et al. 2013). The fact that specifiers might have specific behaviors in subextractions compared to complements is only explored in Jurka (2010: Experiment 13a&b). Here, extraction of the specifier does not show superadditive effects, while the extraction of the complement does (but notice that their baselines differ, being respectively "no extraction" and "extraction of the NP"). There is unfortunately no test for a three-way interaction.

Sprouse and colleagues also ran a series of experiment on in situ questions. An overview is provided in Table 7.3.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Publication	Language	Subject type	Task	Design	Results
Sprouse (2007a), Experiment in Section 6.1.1	English	NP	Acceptability ratings, magnitude estimation	Testing double questions, comparing extraction type (wh-question with extraction out of the subject / in-situ).	- no difference between wh-questions and in situ questions.
Sprouse (2007a), Experiment in Section 6.1.2	English	NP	Acceptability ratings, magnitude estimation	Testing double questions, crossing function (subject / object) and wh-phrase (whole NP / complement of NP).	- interaction function : wh-phrase ($p < .05$)
Sprouse (2007a), Experiment in Section 6.1.3	English	NP	Acceptability ratings, yes/no	Testing double questions, comparing extraction type (wh-question with extraction out of the subject / in-situ).	- both in-situ and ex-situ questions rejected as unacceptable
Sprouse et al. (2011), Experiment 1	English	NP	Acceptability ratings, magnitude estimation	Testing double questions, crossing wh-phrase (whole NP / complement of NP) and extraction type (no extraction / wh-question / in situ question).	- for wh-questions, interaction wh-phrase : extraction type ($p <.0001$) - for in situ questions, no interaction ($p = .271$)
Sprouse et al. (2011), Experiment 3	Japanese	NP	Acceptability ratings, magnitude estimation	Crossing function (subject / object) and wh-phrase (whole NP / complement of NP).	- no interaction function : wh-phrase ($p = .1368$)

Table 7.3: Studies on in situ questions

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Since in-situ questions in English are uncommon and restricted to specific contexts, Sprouse (2007a) and Sprouse et al. (2011) tested English in situ questions by using double interrogatives: the first wh-phrase being extracted, the second wh-phrase can be in situ. The results are mixed: depending on the baseline, a superadditive effect may be observed. In Japanese, interrogatives are in situ by default, such that Sprouse et al. (2011) can test directly the wh-phrase inside the subject. They found no interaction effects, which goes against an analysis of in situ questions as covert movement. I will develop more the issue of in situ questions in Section 11.4.

7.2 Other constructions

Few studies have tested non-interrogative constructions. Table 7.4 presents five such studies.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Publication	Language	Construction	Subject type	Filler (island condition)	Task	Design	Results
Sprouse et al. (2016), English Experiment 1	English	Relative clause	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Crossing function (subject / object) and extraction type (extraction of NP / extraction out of NP).	- interaction function : extraction type (p <.001)
Sprouse et al. (2016), Italian Experiment 1	Italian	Relative clause	NP	Di-complement	Acceptability ratings, likert scale	Crossing function (subject / object) and extraction type (extraction of NP / extraction out of NP).	- no interaction function : extraction type (p <.84)
Kush et al. (2019), Experiment 1	Norwegian	Topicalization	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Testing sentences without context, crossing extraction site (extraction in the main clause / out of embedded clause) and complexity (suject of the embedded clause simple / complex).	- interaction extraction site : complexity (p <.001)
Kush et al. (2019), Experiment 2	Norwegian	Topicalization	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Testing sentences with supporting context, crossing extraction site (extraction in the main clause / out of embedded clause) and complexity (suject of the embedded clause simple / complex).	- interaction extraction site : complexity (p <.001)
Kobzeva et al. (2022), relative clause	Norwegian	Demonstrative relative clause (or cleft)	NP	PP-complement (with preposition stranding)	Acceptability ratings, likert scale	Crossing extraction site (extraction in the main clause / out of embedded clause) and complexity (suject of the embedded clause simple / complex). Wh-questions are also tested.	- interaction extraction site : complexity (p = 0.0090) - three-way interaction (p <0.0003), so that the interaction effect is larger for wh-questions than for relative clauses.

Table 7.4: Studies on other constructions

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The other constructions tested are topicalizations (Kush et al. 2019) and relative clauses (Sprouse et al. 2016, Kobzeva et al. 2022), even though Kobzeva et al. notice that the Norwegian demonstrative relative clause could be read as a cleft. It is therefore difficult to know whether or not the construction tested by Kobzeva et al. is a focalizing construction or not, but the others are not. As previously discussed, the baseline in these studies might cause a problem, but they all show superadditive effects, except the Italian experiment (Sprouse et al. 2016). It is also the only experiment without preposition stranding. Only Kobzeva et al. (2022) looked for a three-way interaction: compared with wh-questions, the superadditive effect in relative clauses (or clefts) is smaller.

7.3 Sentential subjects

Even though the subject island contraint was first formulated as the sentential subject island constraint (Ross 1967), there are relatively few studies on extractions out of sentential subjects. These studies are presented in Table 7.5.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Publication	Language	Construction	Subject type	Filler (island condition)	Task	Design	Results
Sprouse (2007a), Experiment in Section 2.2	English	Wh-question	Non-finite sentential subject	Direct object	Acceptability ratings, magnitude estimation	Testing extraction out of the subject, compared with other island violations.	- rated worse than any other island violation
Sprouse (2007a), Experiment in Section 2.2	English	Wh-question	Finite sentential subject	Direct object	Acceptability ratings, magnitude estimation	Testing extraction out of the subject, compared with other island violations.	- rated higher than the extraction out of non-finite sentential subjects, sometimes rated higher than extraction out of adjuncts ("adjunct island")
Jurka (2010), Experiment 5	German	Wh-question	Non-finite sentential subject	Direct object	Acceptability ratings, likert scale	Crossing function (subject / object), extraction (no extraction / extraction out of sentential VP) and extraposition (sentential VP extraposed with expletive "es"/ not extraposed).	- interaction function : extraction, so that the extraction out of the sentential subject is rated worse - no interaction extraposition : extraction - for non-extraposed sentential VP, interaction function : extraction (p <.001) - for non-extraposed sentential VP, subject rated higher than object (p <.001) - for extraposed sentential VP, subject rated higher than object (p <.001) - for sentential subject, interaction extraposition : extraction
Jurka (2010), Experiment 6	German	Wh-question	Non-finite sentential subject	Direct object	Acceptability ratings, likert scale	Crossing function (sentential subject / sentential object) and V2 (auxiliary with past participle / main verb with present tense).	- no interaction function : V2
Jurka (2010), Experiment 7	German	Wh-question	Non-finite sentential subject	Direct object	Acceptability ratings, likert scale	Crossing extraction (extraction out of the sentential subject / no extraction) and verb type (particle verb / verb without article).	- no interaction extraction : verb type
Jurka et al. (2011), Experiment in Section 2.2	German	Wh-question	Non-finite sentential subject	Direct object	Acceptability ratings, likert scale	Crossing extraction type (no extraction / extraction) and function (subject / object).	- interaction extraction type : function (p <.001)
Jurka (2010), Experiment 12 & Jurka et al. (2011), Japanese Experiment	Japanese	Scrambling & clefts	Finite sentential subject	Direct object	Acceptability ratings, likert scale	Crossing function (subject / object) and construction (no extraction / scrambling / cleft).	- interaction function : construction (p <.001) - for scrambling, no difference between subject and object - for clefting, no difference between object and subject - for no extraction, object rated lower than subject (p = .002)
Fukuda et al. (2014), Japanese Experiment	Japanese	Scrambling	Finite sentential subject	Direct object	Acceptability ratings, likert scale	Crossing function (subject / object) and scrambling (no scrambling / scrambling).	- no interaction function : scrambling

Table 7.5: Studies on sentential subjects

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Studies tested finite and non-finite sentential subjects, sometimes in the same experiment. In English, extractions out of sentential subject are one of the worse island violation (in raw ratings), and worse for non-finite subjects than finite ones (Sprouse 2007a). In German, Jurka (2010) found superadditive ffects, but again the baseline condition showed an advantage for the subject condition, so that the baseline increases the interation. Extraposition does not seem to play a role. Finally, it seems like Japanese do not have a "subject island effect" (Jurka 2010, Jurka et al. 2011, Fukuda et al. 2014). This is in line with what the literature says about subject island in Japanese.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8 Empirical data on *dont* relative clauses

I will now present the experimental and corpus results that I have been carrying out and that will form the empirical basis of this book. I begin in this chapter by presenting the results of three corpus studies and four experiments on *dont* relative clauses. Here I focus on inanimate antecedents, other experiments on *dont* with an animate antecedent will be presented in the next chapter. The organization of the chapter is the following:

Corpus studies on *dont*: In these corpus studies, I annotated occurrences of *dont* in two different written corpus and for different time periods (20th century and 21st century). The results show not only that extractions out of the subject are very frequent in written French, but even the most frequent use of *dont* in relative clauses. This is not restricted to subjects of passive or unaccusative verbs and is attested in the two time periods.

Experiment 1: In this Acceptability Judgment task, we crossed extraction type (extraction / non-extraction) with three different distances between *dont* and the gap (one new referent / two new referents / three new referents). The shorter distance is an extraction out of the subject, the other ones are extractions out of the object. The results show that the longer the distance, the lower the acceptability. Contrary to what is expected from a subject island, we find a significant difference between extraction out of the subject and out of the object such that the latter is degraded compared to the former.

Experiment 2: In this Speeded Acceptability Judgment task, we reproduced the design of Experiment 1 (with slightly different material). Sentences were presented on the screen one word at a time relatively quickly, and participants had to choose whether they accept or reject the sentence within 2 seconds. This technique allowed us to reduce the ceiling effects seen in Experiment 1, but unfortunately we only obtained null-effects: all conditions were acceptable to the same

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

degree. Even though I think that this is an indication that extractions out of the subject are not ruled out by grammar, Experiment 2 does not give any statistical evidence of it and does not falsify any prediction.

Experiment 3: In this Eye Tracking study, we tested the same experimental material as in Experiment 1. There are relatively few variations in the reading pattern of participants, except that relative clauses seem easier to read than the coordinations (non-extractions). If we compare extractions out of the subject with extractions out of the object with a nominal subject (the low and high distance conditions), the data seem to indicate at most an increase in processing difficulties for extractions out of the object.

Experiment 4: In this Acceptability Judgment task, we crossed extraction type (extraction / non-extraction / ungrammatical controls) with syntactic function (subject / object). The data show that extraction out of the subject gets significantly higher ratings than extraction out of the object. There is no interaction effect between extraction type and grammatical function.

8.1 Corpus studies on *dont*

This chapter summarizes the results of three corpus studies previously published in Abeillé et al. (2016) and Abeillé & Winckel (2020) looking at relative clauses introduced by the relative word (and complementizer) *dont*. I call them *dont* relative clauses in this work. Godard (1988) has claimed that these relative clauses allow for extraction out of the NP subject, but these corpus studies show that this is a common and frequently attested phenomenon in French.

8.1.1 Motivation

Dont is very frequent in written (and spoken) French. That is probably the reason why the discussion on extraction out of the subject in French started with examples of *dont*-relative clauses. As mentioned in chapter 2.3.1, Godard (1988) has shown that *dont* may be the complement of a subject noun, despite the general subject island constraint assumed in the syntactic tradition. However, to the best of my knowledge, Candito & Seddah (2012a) is the only corpus study that already gave some quantitative results on *dont* in production data, even though the usage of *dont* was not their primary concern. I will present the relevant points of this study briefly in chapter 8.1.2.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

There are seven main goals we wanted to pursue in conducting a corpus study on *dont*. First, we wanted to have a detailed description of the usage of *dont*. Blanche-Benveniste (1990) noticed that *dont* has what she calls a "fixed usage" in contemporary spoken French because it is used almost exclusively as the complement of a verb. If this were to be the case in written French as well, and if extractions out of a NP was a rare usage of *dont*, any comparison between the frequency of extraction out of the subject NP or the object NP would be irrelevant. We thus wanted to see whether extraction out of NPs are frequent with *dont*, and then see if extractions out of the subject are present at all, and in which proportion.

Second, we wanted to describe more precisely extractions out of subjects in order to see if their usage may reveal something about the way they are processed. Especially, we wanted to annotate the position of subjects containing a gap with respect to the verb. Even tough French is a SVO language, subject-verb inversion are common in relative clauses. Lahousse (2011: 263) says that postverbals subjects are less topical than preverbal ones. Following an approach of filler-gap dependencies based on memory load like the DLT or Dependency Grammar (see chapter 3.2), one would expect that postverbal subjects are dispreferred while extracting out of the subject, because this would imply an additional intervening referent between relative word and gap compared to a preverbal subject, as illustrated in (8.1). On the other hand one would expect that postverbal subjects are preferred while extracting the complement of the verb, because this would imply one intervening referent less between the relative word and its gap compared to a preverbal subject, as illustrated in (8.2).

(8.1) a. Extraction out of a subject with preverbal subject (one intervening referent):
the cat **of which** [the owner _] disappeared
1

b. Extraction out of a subject with postverbal subject (two intervening referents):
the cat **of which** disappeared [the owner _]
1 1

(8.2) a. Extraction out of a verb with preverbal subject (two intervening referents):
the cat **of which** Ernest thinks _
1 1

b. Extraction out of a verb with postverbal subject (one intervening referent):

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the cat **of which** thinks _ Ernest
1

Furthermore, looking for the presence of postverbal subject containing a gap also allows us to test Heck's (2009) analysis of *dont*. In an attempt to reconciliate Godard's (1988) counterexample with the minimalist account of subject island, Heck proposes that *dont* is not an extracted element when it is the complement of the subject, but a specifier of the subject phrase such that the whole DP is pied-piped to the edge of the relative clause, as shown in example (8.3a). This implies that there are two different usage of *dont* for Heck (2009), because there is a filler-gap dependency when *dont* is the complement of a verb or of an object noun (8.3b).

(8.3) a. la fille [dont le frère]$_{DP}$ t' a rencontré (Heck 2009: 101)
the girl of.which the brother you.ACC has met
'the girl whose brother met you'

b. la fille dont tu as rencontré [le frère _]$_{DP}$
the girl of.which you have met the brother
'the girl whose brother you met'

According to Heck's analysis, no material should intervene between *dont* and the subject when *dont* is a specifier as in (8.3a): no subject inversion like (8.4a) and no long distance dependency like (8.4b) is supposed to be possible when relativizing a complement of the subject. However, such constraints have not been tested empirically.

(8.4) a. * Colin, dont choque la coiffure blonde peroxydée (Heck 2009)
Colin of.which surprises the hair blond bleached
'Colin, whose bleached blond hair is shocking'

b. ?? un homme dont je refuse que le fils vous fréquente (Tellier 1991)
a man of.which I refuse that the son you.ACC dates
'a man of whom I refuse that the son dates you'

That is why our third goal will be to look if there are extractions out of the subjct that are long distance dependencies. This will be a way to test Heck's (2009) prediction.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Fourth, we want to annotate the kind of verbs used in the corpus, in order to see whether extractions out of the subject NP are predominantly subjects of passives or unaccusative verbs, hence "internal objects" as they are sometimes called in the literature. The prediction of accounts in the line of Chomsky (2008) is that speakers produce extractions out of subject, but exclusively out of "internal objects", and not out of subjects which are base-generated in a Specifier position.[1]

Fifth, we want to look if extractions out of the subject differ from other uses of *dont* with respect to restrictiveness. As far as we know, no account predicts that extractions out of the subject are sensitive to this factor, but there are different predictions for the two kinds of relative clauses as far as information structure is concerned. According to Song (2017: 181–186), the antecedent of a non-restrictive relative clause is the "aboutness topic" of its main verb. However, there are "no additional clue" for identifying the relation that holds between the antecedent and the main verb of the relative in a restrictive relative clause. Indeed, non-restrictive relative clauses like (8.5b) can be paraphrased as (8.5c) using the test for aboutness topic, whereas restrictive relative clauses like (8.5a) cannot.

(8.5) a. Kim chases the dog that likes Lee.
b. Kim chases the dog, which likes Lee.
c. Kim chases the dog, and speaking of the dog, it likes Lee. (all examples from Song 2017: 181)

Hence, it is not excluded that the extracted element in restrictive relative clauses is something else than a topic. If extractions out of the subject require that the extracted element is non-focal, then we may find a higher proportion of non-restrictive relative clauses among extractions out of the subject than in other types of extractions.

Sixth, we want to look at the distribution of extraction out of the subject in terms of semantic meaning of the relation expressed by the extracted *de*-complement in extractions out of the subject (spatial or temporal relations, property, possessives, etc.). This is again a more exploratory aspect of the corpus study, given that no prediction is made by any approach that we are aware of.

And finally, we want to distinguish relative clauses with an antecedent from *c'est*-cleft sentences. The latter are indeed a focalization, and are in terms of discourse status more close to wh-questions than to relative clauses. We will develop this more extensively in chapter 12.1.

[1]see fn. 12

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.1.2 A previous exploration of *dont* in the FTB (Candito & Seddah)

Candito & Seddah (2012a) explored two corpora, the French Treebank (Abeillé et al. 2019, see our corpus study below) and the Sequoia treebank (Candito & Seddah 2012b: it contains sentences from the French Wikipedia, from medical texts, from Europarl and from the regional newspaper *L'Est Républicain*) and looked for words involved in unbounded dependencies: the clitic *en* ('of it') and wh-words (relative and interrogative pronouns and determiners). The relative word *dont* is the second most frequent word in their results after the relative word *que*. They found 501 extractions with *dont*, the three most frequent types being extractions out of subject NPs (251 cases), extractions out of object NPs (29 cases) and extractions out of the predicative complement (27 cases). This means that one half of the extractions with *dont* are extractions out of subject NPs, a number surprisingly high if one expect these extractions to be banned by syntax. In general, Candito & Seddah notice with their terminology from Dependency Grammar (see chapter 3.2) that around 1/3 of their extractions (259 out of 618 dependencies) are projective. "This is because most [long distance dependencies] are extractions from a subject NP [...]." As explained earlier, some extractions out of a subject NP are non-projective nevertheless.

Even though Candito & Seddah do not give much more detail on their results (the usage of *dont* was not what they were interested in), we can already see clearly that extractions out of the subject, especially with *dont*, are very frequent in the two corpora used in this study, given that they represent the majority of the unbounded dependencies.

8.1.3 Procedure

One of the corpus study, published in Abeillé et al. (2016), is done on the French Treebank (FTB version 1.0, Abeillé et al. 2019). The corpus is a tagged newspaper corpus of 21 550 sentences (about 664 500 words) from the French newspaper *Le Monde* (articles from 1990 to 1993). We explored it with TIGERsearch (König & Lezius 2003). For the two other studies, published in Abeillé & Winckel (2020), we used a larger corpus, Frantext (ATILF et al. Version décembre 2016). It is an online recollection of texts from various authors in the French literature. We explored it with the online search tool of the corpus. Both the FTB and Frantext collect well-edited written productions.[2] Their typology differ, since the FTB contains

[2]My colleagues and I also presented a corpus study on spontaneous spoken French in Abeillé et al. (2016).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

many texts focusing on economical questions, while Frantext often describe protagonists and their interactions.

The final aim of the two studies in Frantext was to compare *dont* and *de qui* in order to confirm Tellier's (1990) 1990, 1991 intuitions (2.3.1). To do this, and because the *de qui* relatives have only animate antecedents, we also selected only animate antecedents for the *dont* relatives. In order to compare the evolution over time, we have selected two similar periods in Frantext: texts published between 1900 and 1913 (179 texts, about 7.8 million words), and texts published between 2000 and 2013 (222 texts, about 13.2 million words).

We looked for occurrences of *dont* in the corpus. Since Frantext contains too many occurrences of *dont* (see Figure 8.1), we only annotated a random subset of the output.

Table 8.1: Occurrences of *dont* in the French Treebank and Frantext

	French Treebank	Frantext 2000–2013	Frantext 1900–1913
total occurrences of *dont*	632	more than 13 000	close to 10 000
total annotated among which: - relative clauses with a verb a one gap - *c'est* clefts	632 382 2	500 123[3] 1	1300 176[3] 3

These corpora are annotated for part of speech and lemmas. All other annotations had to be done manually. First, it was necessary to remove occurrences that are "noises" (i.e. false positives of a given query that are not what we were looking for). Second, in order to test the impact of certain factors on the results we had (such as: Are there occurrences of extractions out of a subject?), it was necessary to annotate these factors for each occurrence.

We found only 6 *c'est*-clefts among the occurrences we annotated. The two clefts in (8.6) are extractions of the complement of a verb.

(8.6) a. C' est de semi- retraite dont parle M. Tapie
it is of semi retirement of.which talks Mr Tapie
'It's about semi-retirement that Mr Tapie is talking.

b. C' est de l' indépendance tout court dont il a été
it is of the independence all short of.which it has been

[3]only with an animate antecedent for Frantext, as explained above

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

finalement question.
finally question.
'At the end, it is simply the independence that was at issue.'

Example (8.7) is an extraction out of the object. However, it is a presentational, and thus is more similar to English *there*-clefts than English *it*-clefts.

(8.7) C' est la momie d' un embryon humain, dont on avait dans
it is the mommy of an embryo human of.which one had in
les temps orné [le visage _] d' une belle couche d' or [...]. (La
the times decorated the face of a nice layer of gold
Mort de Philæ, Pierre Loti, 1909)
'This is the mommy of a human embryo, of who someone had in due time decorated the face with a nice layer of gold.'

The three remaining *c'est*-clefts, reproduced in (8.8), are interesting because they display an extraction out of the subject. However, (8.8b) is presentational and (8.8c) is probably presentational too. Only (8.8a) is a real focalization by means of extraction.

(8.8) a. C' était lui maintenant, dont [les yeux _] évitaient les yeux
it was him now of.which the eyes avoided the eyes
de l' autre. (Jean-Christophe : Le Buisson ardent, Romain
of the other
Rolland, 1911)
'Now it was him whose eyes avoided the other's eyes.'

b. C' était donc le jeune homme dont [le livre de chevet _]
it was then the young man of.which the book of bedside
était resté longtemps *Des aveugles*. (Le protocole
was stayed long of.the blinds
compassionnel, Hervé Guibert, 2007)
'So this is the young man whose bedtime reading had been for a long time *About the blinds*.'

c. [...] c' est un mourant dont [les traits _ creusés par la
it is a dying of.which the face drilled by the
souffrance] s' éclairent d' une céleste joie [...] (Sermons,
suffering REFL shine of an unearthly joy
fragments et lettres, Horace Monod, 1911)
'It's a dying man, whose face, deformed by the suffering light up with an unearthly joy.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Unfortunately, we cannot draw any meaningful conclusion yet with so few data, even though the presence of extractions out of the subject is noticeable. The analysis below does not take the *c'est*-clefts into account.

Furthermore, I only present the analysis for relative clauses with a verb and one gap. The partitive verbless *dont* relative clauses like (8.9) of the French Treebank have already been described by Bîlbîie & Laurens (2010). We ignore gapless *dont* relative clauses like (8.10) and relatives with different gap sites for our purpose.[4]

(8.9) En Amérique latine, 23 journalistes ont trouvé la mort, dont 9
in America Latin 23 journalists have found the death of.which 9
en Colombie et 7 au Pérou. (FTB - flmf7aa1ep-328)
in Colombia and 7 in Peru.
'In Latin America, 23 journalists have died, among which 9 in Colombia and 7 in Peru.'

(8.10) Un bel effort, dont l' avenir dira s' il persuade les
a nice effort of.which the future will.say if it persuades the
consommateurs, s' il suscite des imitateurs [...] (FTB - flmf7ak1ep-272)
consumers if it generates DET imitators
'A fine effort, and the future will tell us whether consumers are persuaded and whether it will be imitated.

In order to present harmonized and consistent results for all corpus studies presented in this work, some minor corrections have been made to the annotation (see guidelines in Appendix, section IV). The values may therefore vary slightly from those reported in the respective publications.

8.1.4 Results and analysis

Table 8.2 gives an overview of the functions of *dont* for the three corpora. They are also represented in Figure 8.1 and 8.2 on page 132.

[4]We distinguish between several gaps and different gap sites. If there are several gaps, but all have the same syntactic function, like in (8.1.a), they are included in the results below. If the different gaps have different syntactic functions and are therefore at different gap sites, like in (8.1.b), they are excluded from the results. This is true for all corpus studies in this work.

(i) a. the car of which [the wheels _] and [the brakes _] are defective
b. the car of which [the driver _] broke [the wheels _]

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8.1: Distribution of *dont* relative clauses in the French Treebank

Figure 8.2: Distribution of *dont* relative clauses in Frantext

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 8.2: Distribution of *dont* relative clauses in the French Treebank and Frantext

Frequency	French Treebank	Frantext 2000–2013	Frantext 1900–1913
Verb	74 (19.42%)	25 (20.33%)	20 (12.20%)
Noun			
Subject	216 (56.69%)	60 (48.78%)	99 (60.37%)
Object	48 (12.60%)	31 (25.20%)	35 (21.34%)
Predicate	26 (6.82%)	4 (3.25%)	4 (2.44%)
Adjective	6 (1.57%)	3 (2.44%)	6 (3.66%)
Adjunct	11 (2.89%)	0	0

8.1.4.0.1 Confidence intervals for frequency: As mentioned before, the advantage of quantitative data is to give an overview of the broader tendencies in the usage of a language while concealing the individual preferences. In order to achieve this, it is necessary to identify and treat accordingly the outliers. Outliers are exceptional outcomes, that are present in quantitative data but do not reflect the general tendency. Let us assume that extractions out of subjects are indeed completely out of the French language. Let us assume in addition that, over a million occurrences of a given filler in a given corpus, one case of extraction out of a subject is attested: This fact should not satisfactorily falsify the hypothesis that such structures are ruled out. Indeed, even in a well edited text, an error may have been overlooked by proofreaders, or made intentionally to create a feeling of strangeness. Hence, we need statistical validations that few occurrences are more than marginal. In this respect, the size of the corpus matters also (one out of ten occurrences for 1000 occurrences is a more trustworthy proportion than one out of ten occurrences for 20 occurrences). In order to account for this, I perform an exact test of a simple null hypothesis about the probability of success in a Bernoulli experiment with the function `binom.test()` from the R Stats Package (R Core Team 2018): this test gives us confidence intervals[5] with a probability of 95% where the amount of occurrences of each structure is compared to the total size of our subcorpus. This confidence level of 95% is corrected for multiple comparisons when needed. For example, in Figure 8.1, it is corrected for 6 comparisons, and in Figure 8.2 for 5 comparisons.

If the lower bound of the confidence interval for one structure is smaller than 0.5 occurrence, we consider that the frequency of this structure is not significantly above 0. The fact however that a given structure does not occur – or

[5]The package documentation indicates that the "confidence intervals are obtained by a procedure first given in Clopper & Pearson (1934)".

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

occurs with a frequency that is not significantly above 0 – does not necessarily mean that the structure is out of the language. We can only say that the corpus data do not contradict the hypothesis that this structure is out of the language.

8.1.4.0.2 Functions of *dont* attested in the corpus As expected, *dont* can have any function of a *de*-PP except be the complement of a preposition (or of a noun complement of a preposition). *Dont* can therefore either be complement of a verb (8.11), of a noun (8.12) or of an adjective (8.13a) or be an adjunct (8.14).

8.1.4.0.3 Some examples of *dont* as verb complement:

(8.11) a. Le gouvernement n' avait ni écrit ni choisi cet
the government NEG had neither written nor chosen this
accord [dont nous avons hérité _]. (FTB - flmf7af2ep-602)
agreement of.which we have inherited
'The government had neither written nor chosen this agreement that we inherited.'

b. De nouvelles figures s' imposaient bientôt, dont [il
of new faces REFL imposed soon of.which he
attendait plus de charmes _]. (L'enfant d'Austerlitz, Paul Adam,
expected more of charms
1902)
'New faces soon establish themselves, from who he expected more charms.'

8.1.4.0.4 Some examples of *dont* as noun complement:

(8.12) a. **Subject noun:**
C' est ce qu' a annoncé récemment M. Georges Fillioud,
it is this that has annonced recently Mr Georges Fillioud
PDG, dont [le mandat _] devrait être reconduit . (FTB -
CEO of.which the mandate should be renewed
flmf7al1ep-66)
'This is the recent announcement of Mr Georges Fillioud, CEO, whose mandate should be renewed.'

b. Je suis partie avec Georges Lesèvre, étudiant en Lettres
I am left with Georges Lesèvre student in Literature
dont [le père _], [la mère _] et [le frère _] avaient été
of.which the father the mother and the brother had been

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

arrétés puis déportés. (Demain il fera beau : journal d'une
arrested then deported
adolescente (novembre 1939-1944), Denise Domenach-Lallich, 2001)

'I left with Georges Lesèvre, a student in Literature whose mother, father and brother had been arrested, and then deported.'

c. **Object noun:**
Et chaque pore de ma peau, alors, est un chien qui se
and every pore of my skin then is a dog who REFL
redresse, dont on a touché [la laisse _]…' (Un peu de
get.up of.which one has touched the leash
désir sinon je meurs, Marie Billetdoux, 2006)

'And every pore on my skin is then like a dog who stands up, of who someone touched the leash…'

d. Elle ne bougea pas, afin de ne pas réveiller son mari,
she NEG moved not so.that of NEG not wake.up her husband
dont elle redoutait [la violence _]. (Dingley, l'illustre
of.which she feared the violence.
écrivain, Jérôme Tharaud, 1906)

'She did not move, in order not to wake up her husband, of who she feared the violence.'

e. **Predicate noun:**
Le premier n' avait pas les faveurs de France Télécom,
the first NEG had not the support of France Télécom
dont Matra Communication est [l' un des tout premiers
of.which Matra Communication is the one of.the very first
fournisseurs _]. (FTB - flmf7ag1exp-449)
suppliers

'The first one did not have the support of France Télécom, of which Matra Communication is one of the very first suppliers.'

f. Fignon se rebelle contre Hinault, dont il a été
Fignon REFL rebel against Hinault of.which he has been
[lieutenant _] : provocation […]. (La légende des cycles,
lieutenant provocation
Jean-Noël Blanc, 2003)

'Fignon rebels against Hinault, who he has been the lieutenant of: (that's a) provocation.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.1.4.0.5 Some examples of *dont* as adjective complement:

(8.13) a. Ils ôtent à la politique monétaire ses références
they remove from the policy monetary its references
chiffrées dont les membres du directoire sont
quantitative, of.which the members of.the directorate are
[friands _]. (FTB - flmf7aa2ep-513)
fond
'They deprive the monetary policy of its quantitative benchmarks, which the members of the management board are fond of.'

b. Sans doute n' imaginait - il plus sa vie sans ma
without doubt NEG imagined he anymore his life without my
grand-mère dont il était [fort épris _] ? (La vie après,
grandmother of.which he was very in.love
Virginie Linhart, 2012)
'Arguably, he could not imagine anymore to live without my grandmother who he was in love with?'

8.1.4.0.6 An example of *dont* as adjunct:

(8.14) La GSA conteste la manière dont [l' armée de l' air
the GSA contests the manner of.which the army of the air
américaine a mené l' évaluation des différentes
American has led the evaluation of.the different
propositions _] [...]. (FTB - flmf7an2co-919)
proposals
'The GSA contests the manner in which the American air force led the different proposals' evaluation.'

There is a very high amount of extractions out of a NP. For the 21st century (FTB and Frantext), they represent around 3/4 of usages of *dont*, but the proportion is even higher in Frantext 1900–1913. In all cases, most of them are extractions out of the subject. Except for Frantext 2000-2013, extractions out of the subject are significantly more frequent than extractions out of the object. This corroborates that extractions out of the subject are possible with *dont* (Godard 1988), and are even the most frequent case (Candito & Seddah 2012a).

Because we only consider relative clauses with animated antecedents in Frantext, and since usages of *dont* as an adjunct are almost exclusively *la manière*

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

dont or *la façon dont* ('the way how'), there is no occurrences of *dont* being an adjunct in our Frantext results.

8.1.4.0.7 Subject position Subject-verb inversions, even though they are possible, are very rare in our results, as can be seen in Table 8.3. They are strikingly more frequent in the FTB, probably for stylistic reasons that have to do with journalistic writing.[6] Extractions out of the subject are very rare as well, but attested.

Table 8.3: Subject-verb inversions in the French Treebank and Frantext

Nb of occurrences	French Treebank	Frantext 2000–2013	Frantext 1900–1913
postverbal subjects in total	36	6	5
extractions out of a postverbal subject	0	4	1

For extractions out of a subject, using a postverbal subject instead of a preverbal subject increases the linear distance between the relative word and its gap. Processing accounts (the DLT or UD) predict therefore that this configuration will be avoided.

All five occurences of an extraction out of a postverbal subject are reported in (8.15).

(8.15) a. les morts, dont se dissout dans l' air [la présence _]
the deads of.which REFL dissolves in the air the presence
(Dans la main du diable, Anne-Marie Garat, 2006)
'the dead ones, whose presence vanished in the air'

b. Millie, dont grandissait [l' angoisse _] (Dans la main du diable, Anne-Marie Garat, 2006)
Millie of.which grew the anxiety
'Millie, whose anxiety was growing'

c. Pierre Getzler, dont est reproduite [une gravure _]
Pierre Getzler of.which is reproduced an engraving
(Entretiens et conférences II [1979–1981], Georges Perec, 2003)
'Pierre Getzler, of who an engraving is reproduced'

[6] In Abeillé et al. (2016), we show that these postverbal subject appear most of the time when there is an extraction out of the verb. We argue that the cost for subject-verb inversion is in this case counterbalanced by a reduction of filler-gap dependency length.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

d. Éric Elmosnino lui-même, dont nous charment [la voix _],
Éric Elmosnino himself of.which us.ACC charm the voice
[la présence _], [le mouvement _], [la malice _]. (Voix off,
the presence the movement the craftiness
Denis Podalydès, 2008)
'Éric Elmosnino himself, whose voice, presence, movement and craftiness charm us.'

e. [l]es monstres cabrés, dont se reconnaissent déjà [les
the monsters rearing of.which REFL recognise already the
silhouettes _]. (L'Inde (sans les Anglais), Pierre Loti, 1903)
shapes
'the rearing monsters, whose shapes are already recognizable'

Postverbal subjects are counterexamples to Heck (2009)'s analysis of *dont* as being inside the subject NP. Furthermore, these sentences are unproblematic and well-formed from my point of view as a native speaker.

I can report a few more cases challenging Heck (2009)'s account. The first one is questionable: in (8.16), a negative conjunction (*ni …ni …*) stands between *dont* and the subject. One could possibly argue that the negative particle as well as *dont* are occupying the specifier position of D, even though I think that this would be an unusual analysis.

(8.16) ces êtres privés […] de l' usage de leurs membres et de
these beings deprived of the use of their limbs and of
celui de la parole, mais dont **ni** [l' intelligence _] **ni**
the.one of the speech but of.which neither the intelligence nor
[le besoin _ de communiquer] ne sont altérés (La vie sexuelle
the need of communicate.INF NEG are modified
de Catherine M. précédé de Pourquoi et Comment, Catherine Millet, 2001)
'these beings, deprived of the use of their limbs and of the ability to speech, but of who neither the intelligence nor the need to communicate have been modified'

Another questionable case is reported in (8.17). Here, the extracted *de*-PP the complement of the *de*-PP complement of the subject noun. If *dont* in (8.17) is situated in the specifier position of DP, then it cannot be in the specifier position of the DP of its head noun, but in the specifier position of the DP of the head of its head noun. Such a configuration is not explicitly expected by Heck (2009),

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

but one can imagine that it is not entirely incompatible with his hypothesis (e.g. in assuming cyclic movement inside the subject NP).

(8.17) [les] chômeurs [...] dont [les durées [d' affiliation _]] sont les
the unemployed of.which the period of affiliation are the
plus courtes (FTB - flmf7ag2ep-663)
most short
'the unemployed whose period of affiliation are the shortest'

Finally, there is the indisputable case of a long distance dependency in (8.18), possibility which was explicitly ruled out by Heck's (2009) analysis.

(8.18) madame Segond-Weber, la grande tragédienne, dont **il aime**
Madame Segond-Weber the great tragedian of.which he likes
rappeler que [les répliques _] tombaient de sa bouche « comme
recall.INF that the lines felt of her mouth like
des fûts de colonne ». (Voix off, Podalydes, 2008)
some shafts of column
'Madame Segond-Weber, the great tragedian, of who he enjoys
recalling that the lines fall out of her lips « like pillars »'

The attested examples in (8.15) and (8.18) show that Heck's (2009) explanation cannot hold. His analysis of *dont* is contradicted by the empirical data. Even cases such as (8.16) and (8.17) would be hard to conciliate with his approach.

8.1.4.0.8 Verb types Following some generativist approaches on syntax (Chomsky 2008 a.o.), extracting out of the subject of a passive or unaccusative verb is an extraction out of the (underlying) direct object. Table 8.4 shows the types of verbs involved in the extractions out of the subject. We can see that all kind of verbs are attested. Transitives (8.19a), unergatives (8.19b) and state verbs (8.19c) are frequent. Passives (8.19d) are more frequent in the FTB than in Frantext, and more frequent in the 21st century than the 20th century. Unaccusatives (8.19e) and mediopassives (8.19f) are attested, but not frequent. Mediopassives are in general rare in our relative clauses.

(8.19) a. Les soldats, dont [quelques-uns _] portent des drapeaux,
the soldiers of.which some carry DET flags
envahissent la salle. (Tête d'or [2e version], Paul Claudel, 1901)
overrun the room
'The soldiers, of which some are carrying flags, run into the room.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 8.4: Type of verbs in the extractions out of the subject among *dont* relative clauses

Type of verb	French Treebank	Frantext 2000–2013	Frantext 1900–1913
Passive	53 (24.54%)	8 (13.33%)	9 (9.09%)
Unaccusative	17 (7.87%)	7 (11.67%)	9 (9.09%)
Mediopassive	4 (1.85%)	4 (6.67%)	5 (5.05%)
Transitive	49 (22.69%)	15 (25.00%)	33 (33.33)
Unergative	29 (13.43%)	12 (20.00%)	22 (22.22%)
State	64 (29.63%)	14 (23.33%)	21 (21.21%)

b. [l]es tatanes de Greg LeMond dont [les pieds _] ne
the big.shooes of Greg LeMond of.which the feet NEG
ressemblaient à rien de connu dans le peloton (Besoin de
resembled at nothing of known in the peloton
vélo, Paul Fournel, 2001)
'the big shoes of Greg LeMond, whose feet were like nothing else that was known in the peloton'

c. La fumée contenait en effet du oxyde cyanhydrique
the smoke contained in effect some oxide hydrocyanic
dont [les effets _] sont immédiats. (FTB -
of.which the effects are immediate
flmf3_08500_08999ep-8561)
'The smoke contained indeed some hydrogen cyanide, whose effects are immediate.'

d. les morts de Lampedusa dont [les noms _] sont illustrés
the dead.PL of Lampedusa of.which the names are illustrated
de photos (L'arrivée de mon père en France, Martine Storti,
of photographs
2008)
'The dead of Lampedusa whose names are illustrated with photographs'

e. une actrice dont [le fils _] voulait devenir metteur en
an actress of.which the son wanted become.INF director of
scène (Rendez-vous, Christine Angot, 2006)
stage
'an actress whose son wanted to become a stage director'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

f. Pierre, dont [la haute taille _] s' encadrait dans la
Pierre of.which the high size REFL frame in the
fenêtre (Terres lorraines, Emile Moselly, 1907)
window
'Pierre, whose high figure framed itself in the window' (intended: the window formed a frame around his high figure)

We can compare the types of verbs involved in extractions out of the subject with the types of verbs involved in other kinds of extractions. Figure 8.3 on page

Figure 8.3: FTB: Distribution of the type of verb involved among extractions out of the subject, compared to other type of extractions in *dont* relative clauses[7]

141 illustrates this for the French Treebank. You can see that if we take into account the confidence intervals, the only difference seems to be that extractions out of the subject have more passives and less unergatives than the other kinds of extractions. Similar observations can be made for the two corpus studies on Frantext. However, this can easily by explained: extractions out of objects nouns or predicate nouns cannot involve a passive, and we have seen that extractions out of nouns are very frequent in the corpus. The second most frequent case are extractions of the complement of the verb, and since most *de*-PP complement of

[7]See page 133 for the confidence intervals (here six comparisons). The percentage is given for each group (extraction out of the subject on one hand, other extraction on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

verbs are complements of an unergative verb, there is also an explanation why the category "other kinds of extractions" has such a high proportion of unergatives. We do not need to assume that extractions out of the subject are especially felicitous with passives or especially infelicitous with unergatives.

The crucial point is that extractions out of the subject have a non-marginal amount of transitive verbs: Figure 8.4 on page 142 shows this time a binary

Figure 8.4: Distribution of the transitive verbs in *dont* relative clauses[8]

distinction between transitive verbs and the other types of verbs. Transitives are around 1/4 of the verbs involved in extractions out of the subject: 22.69% in the French Treebank, 25% in Frantext 2000–2013 and 33.33% in Frantext 1900-1913. We notice that this amount correlates with the amount of transitives in the other types of extractions, so that it seems to be a general tendency for the French Treebank to have few transitive verbs, maybe as a consequence of the text genre. We can find more transitive verbs in the group "other kinds of extractions", but this does not mean that the amount of transitive is especially low in the group "extractions out of the subject": the group "other kinds of extractions" contains the extractions out of a direct object, which necessarily imply the presence of a transitive verb.

To sum up, we can indeed confirm that there are more non-transitive verbs than transitive verbs among the extractions out of the subject. And indeed, we

[8]See page 133 for the confidence intervals (here two comparisons). The percentage is given for each group (a group = one kind of extraction in one corpus).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

find an important amount of passives and state verbs among them. This can explain why many of the examples we find in the literature imply extractions out of the subject of a passive or state verb. This could even explain why scholars had the impression that extractions out of the subject sound particularly good with these kinds of verbs. However, this does not mean that extractions out of the subject are degraded – let alone ungrammatical – with transitive verbs, because extractions out of subjects of transitive verbs are still common.

8.1.4.0.9 Other factors We annotated the relative clauses for several other factors: the numerus and definitness of the antecedent, the restrictiveness of the relative clauses and the semantic relation holding between *dont* and its head noun. I will briefly summarize here the relevant findings, and Section 7 in the Appendix provides the interested reader with more details.

Numerus and definiteness of the antecedent do not seem to follow any specific pattern.

We find a clear tendency for extractions out of the subject to be in majority non-restrictive relatives. This result is expected by the FBC constraint (4.31): If extractions out of the subject require that the extracted element is non-focal, and because restrictive relative clauses allow for their extracted element to be non-topic (thus potentially focus), then extractions out of the subject should display a preference for non-restrictiveness. For this reason, there are more non-restrictive relative clauses among extractions out of the subject than in other types of extractions: we can imagine that speakers opt for an alternative construction when they wish to express a restrictive relative clause with a focused extracted element.

As for the semantic relation holding between *dont* and its head noun, the text genre of the corpora (newspaper article vs. literary text and animate and inanimate antecedent vs. only animate antecedent) have a bigger impact than the type of extraction. However, by comparing extractions out of subjects and extractions out of objects in Frantext 2000–2013 and 1900–1913, the kind of relation was close to being a good predictor for the gap site. In general, there are many part-of-whole relations (especially for body parts) when extracting out of the subject, and many patient-of-event relations when extracting out of the object.

8.1.5 General conclusion on the corpus studies on *dont*

All these corpus results agree on one major point: extracting out of the subject is not only possible with *dont*, but is even the most common usage of *dont*. In Frantext 2000–2013, the difference with extracting out of the object is not significant, but it is significantly different to all other kinds of extractions in FTB and

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Frantext 1900–1913. This corroborates Godard (1988), but also any account based on minimizing the distance between the relative word and the gap. In general, extractions out of NPs are very frequent (over 3/4 in all three corpora).

Extractions out of subjects of transitive verbs are attested in all corpora, and are even a very frequent case. This means that the extractions out of subject cannot be claimed to be restricted to extractions out of underlying objects, but are also attested for what all theories on syntax consider as "real" subjects. Even if one assumes a movement of the subject as in Minimalism, the data show clear evidence that there is no freezing effect blocking the extraction.

We can however also observe in all three corpora that there is a higher proportion of passives among extractions out of subject than among all other kinds of extractions. We can also observe in all three corpora that there is a lesser proportion of transitives among extractions out of subject than among all other kinds of extractions. This does not mean that there are more passives than transitives among the extractions out of the subject: in fact, Frantext 1900–1913 has significantly more transitives, and in the two other corpora, the proportions are very similar between passives and transitives. This may however explain why French scholars have a feeling that passives are especially good by extractions out of the subject, and have the feeling that transitives are especially good when not extracting out of the subject.[9]

All examples in Godard (1988) of felicitous extractions out of the subject are build with the state verb *être* ('be'). Indeed, we can observe a frequent use of extractions out of the subject of state verbs, but my guess is that the main reason why Godard used them was in order to build simple sentences with a very straightforward semantic content. This can also explain why scholars often illustrate extractions out of subjects with passives: they aim to build easy sentences.

[9]It is also important to take into account some parameters that may affect our results:

- There are not many other possible gap sites for a *de*-PP when a clause has a passive verb than inside the subject itself. This fact alone can explain why there are more passives in this group than in the other group (other kinds of extractions).
- Extractions out of an object NP can only involve transitive verbs, and no other type of verbs. This fact alone can explain why there are more transitives in the "other kinds of extractions" group.
- Extractions of the *de*-complement of a verb can only involve unergative verbs, and no other type of verbs. This fact alone can explain why there are so much unergatives in the "other kinds of extractions" group.

In this respect the factors are not completely independent from each other. This weakens the conclusion that we can draw from the comparison.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

No other conclusion should be drawn from this choice, at least as far as production data are concerned.

In Frantext 2000–2013, we find some pieces of evidence that material can stand between *dont* and the subject NP it is extracted from. This contradict Heck (2009). The fact that intervening material rarely appears after *dont* is easy to understand with accounts assuming that speakers tend to minimize the linear distance between *dont* and the gap. It also can explain why constructed counterexamples have been judged degraded by scholars (Tellier 1990). But the corpus data give us the evidence that extractions out of subjects with *dont* are "real" extractions.

8.2 Experiment 1: Acceptability Judgment study on *dont* relative clauses with different linear distances

The goal of this first experiment was to test the opposite predictions of two approaches. We wanted to test the traditional syntactic approach with a processing approach based on memory costs. We compared extractions out of the subject with extractions out of the object: the traditional syntactic approach expects a subject island, and approaches based on memory loads expect on the contrary a subject advantage.

8.2.1 Material and design

The experiment is an Acceptability Judgment task with a 3*2 design that I explain here in detail.

We compare extractions out of the subject (8.20a) and extractions out of the object (8.20b). In this experiment, we not only compare different gap sites, but also the distance between the relative word and the gap (that has an impact on the memory load). For this reason, I call the subject condition the "low-memory" condition and the object condition the "high-memory" condition.

(8.20) a. **Condition low-memory + PP-extracted:**
Ils présentent une innovation dont$_i$ [l' originalité $_{}_i$]
they present an innovation of.which the uniqueness
émerveille mes collègues.
delights my colleagues
'They present an innovation of which the uniqueness delights my colleagues.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. **Condition high-memory + PP-extracted:**
Ils présentent une innovation dont$_i$ mes collègues
they present an innovation of.which my colleagues
apprécient [l' originalité $_{-i}$].
value the uniqueness
'They present an innovation of which my colleagues value the uniqueness.'

The relation between *dont* and the gap always expresses a quality (e.g. *originalité* 'uniqueness', *beauté* 'beauty'). The noun out of which we extract is always an inanimate. We use psych verbs that come in reversible pairs (e.g. *apprécier* 'value' and *émerveiller* 'delight') in order to have transitive verbs but also in order to compare sentences whose content is as similar as possible. In all extractions conditions, the extraction is out of the stimulus. It is important that the two conditions have transitive verbs, because some syntactic accounts only expect a subject island for subjects of transitive verbs. It is also important that the content is as similar as possible between subject and object conditions. We have seen in Section 4 that the relevance of the extracted element for the main proposition is an important factor for the acceptability of filler-gap dependencies. By keeping the content the same, we ensure that the relevance for the main proposition remains as constant as possible.

In the low-memory condition (extraction out of the subject) in (8.20a), one new referent is introduced into the discourse (*originalité*). In the high-memory condition (extraction out of the object) in (8.20b), three new referents are introduced into the discourse (*collègues*, *apprécier* and *originalité*). We add a third intermediate category, with two referents between *dont* and the gap, by using a clitic subject instead of a nominal subject in the extraction out of the object, as in (8.21).

(8.21) **Condition medium-memory + PP-extracted:**
Ils présentent une innovation dont$_i$ nous apprécions [l'
they present an innovation of.which we value the
originalité $_{-i}$].
uniqueness
'They present an innovation of which we value the uniqueness.'

In order to have a grammatical baseline, we cross the three distance conditions with an extraction type condition: the control condition is a coordination, such that the sentence has no extraction. The material in (8.22a), (8.22b) and (8.22c) are therefore the respective controls of (8.20a), (8.21) and (8.20b).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(8.22) a. **Condition low-memory + noextr:**
Ils présentent une innovation et son originalité émerveille
they present an innovation and its uniqueness delights
mes collègues.
my colleagues
'They present an innovation and its uniqueness delights my colleagues.'

b. **Condition medium-memory + noextr:**
Ils présentent une innovation et nous apprécions son
they present an innovation and we value its
originalité.
uniqueness
'They present an innovation and we value its uniqueness.'

c. **Condition high-memory + noextr:**
Ils présentent une innovation et mes collègues apprécient
they present an innovation and my colleagues value
son originalité.
its uniqueness
'They present an innovation and my colleagues value its uniqueness.'

We tested 30 items, each declined in the six conditions already described. In addition, the experiment had 36 distractors.

8.2.2 Predictions

The aim of this experiment is to look at the predictions of the traditional syntactic account and of a processing account based on memory costs.

The traditional syntactic account expects to see a subject superadditivity effect when extracting out of the subject. For this reason the first expectation is that the acceptability of (8.20a) is degraded compared to (8.20b). Following Sprouse et al.'s (2016) definition of superadditivity (see Section 6), we assume that the syntactic account predicts that there is an interaction effect such that (8.20a) is worse than all three conditions (8.20b), (8.22a) and (8.22c). On the other hand, the syntactic account predicts no differences between the two conditions of extraction out of an object. Therefore it expects also that (8.20a) is degraded compared to (8.21), and that there is an interaction such that (8.20b) is worse than all three conditions (8.21), (8.22a) and (8.22b).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

A processing account based on memory load expects on the contrary that the extraction out of the subject is better than the extraction out of the object. Indeed, there is only one intervening new referent in discourse between *dont* and the gap in (8.20a), but two referents for (8.21) and three referents for (8.20b). Therefore, this processing approach expects that (8.20a) has better acceptability judgments than (8.21) and (8.20b), and that (8.21) has better acceptability judgments than (8.20b). The extraction baseline is also expected to be less costly than the extraction conditions, and thus a main effect of extraction type is expected such that non-extraction has better acceptability judgments than extraction.

8.2.3 Procedure

Thirteen of the experiments presented in this work are acceptability judgment tasks with non-binary responses on a Likert scale. Acceptability judgment tasks are a widespread[10] formal method for linguistic experiments: those experiments are technically easy to set up, are conducted on online platforms by untrained participants, often even on a volunteer basis which makes them very cheap to run. They seem also highly robust, results are reproducible, and in line with other experimental paradigms: Pechmann et al. (1994) have compared the results of offline acceptability judgment tasks with several online methods and conclude that acceptability judgment tasks provide reliable results (see also Keller 2001, Sorace & Keller 2005, Gibson & Fedorenko 2013). Provided a careful design of the experiment, it is a reliable method to compare conditions (Schütze 2016, Tonhauser & Matthewson 2015).

The acceptability judgment tasks have been set up on the online platform Ibex (Drummond 2010). For every experiment, the homepage consisted of a small welcome text with an explanation of the task and of the duration of the experiment. Participants were instructed that they were free to close their browser and thus delete their answers at any time, and that the data collected do not enable researchers to identify them. They had to give their consent before proceeding to the experiment. The experimental items (test items and distractors in at least a 1:1 ratio) are presented one sentence at a time on the screen. Each session began with 3 practice items, that were explicitly identified as such and gave the participants the opportunity to get used to the judgment task. Participants had to judge one sentence at a time on a Likert-scale from 1 to 10, 1 being labeled as "bad" and 10 being labeled as "good".[11] It is common practice in psychology

[10]Tonhauser & Matthewson (2015) ran a survey of 40 papers on meaning and report that 3/4 of them use acceptability judgment tasks.

[11]The description explicitly mentioned that there was no right or wrong answer to the task.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

and psycholinguistics to use a 7 points Likert-scale (or sometimes 5 points Likert scale) for this kind of experiments. However, the Laboratoire de Linguistique Formelle of the Université de Paris traditionally uses the 10 points Likert scale for experiments with French native speakers. The French school system (including preschool and university) makes extensive use of a 10 point scale notation (alternatively 20 points scale notation), such that French participants are very familiar with this notation, which is therefore more "natural" to them than a 7 point scale notation. After the rating, some experiments included a comprehension question to stimulate the participants' attention. The order of presentation of the items can have an impact on the participants judgments (e.g. because of fatigue, see Schütze 2016: 180–181), and for this reason the sentences in Acceptability Judgment tasks were pseudo-randomized for each participant in order to balance the order of presentation among participants. Pseudorandomization ensures that the participants did not see sentences in the same condition two times in a row. I used a Latin square design, such that participants saw each test item only once and in only one condition, but that they saw each condition in equal proportions.

This experiment took approximately 20 minutes to complete. The participants received no financial reward for taking part in the experiment. We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

8.2.4 Participants

The study was run in January and February 2016. 55 participants took part in the experiment. We present here the analysis made on the answers of the 44 participants who satisfied all criteria. Exclusion critera are the same for all experiments I present in this book and are explained in the Appendix (section 7). The 44 participants are 19 to 73 years old. 28 participants self-identified as women, 16 self-identified as men. Seven participants (15.91%) indicated having an educational background related to language.

The main difference between a 0 to 10 Likert scale and a 1 to 10 Likert scale is that the latter provides a value in the middle of the scale, while the later do not. A 0 to 10 Likert scale on the contrary forces the participants to choose between more than average and less than average. I used both scales, depending on the experiment, and never noticed any difference in the results for the phenomenon at hand.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.2.5 Results and analysis

Figure 8.5 on page 150 gives an overview of the results of the Acceptability Judgment task. In the subextraction conditions, the low-memory condition (8.20a) has an average acceptability of 8.41, higher than the medium-memory condition (8.21) that has an average of 8.30, followed by the high-memory condition (8.20b) that has an average of 7.88. The control conditions without extraction receive overall lower ratings: the low-memory condition (8.22a) has an average acceptability of 7.23, higher than the medium-memory condition (8.22b) that has an average of 7.08, followed by the high-memory condition (8.22c) that has an average of 7.00.

Figure 8.5: Acceptability judgments for each condition of Experiment 1. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 8.5 suggests a ceiling effect on the extraction conditions. Indeed, Figure 8.6 on page 150 shows the shape of a normal distribution of the ratings with a strong ceiling effect for the extraction conditions (on the right). There seems also to be a ceiling effect, even though smaller, for the non-extraction conditions (on the left).

Figure 8.6: Density of the ratings across conditions for Experiment 1

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Another representation of the results is given by the ROC (Receiver Operating Characteristic) and zROC curves of the results in Figure 8.7 on page 151.[12] The ROC curve shows that the participants discriminated between the *dont*-relative clauses (extraction) and the coordinations (non-extraction). We can also see that the low-memory and medium-memory conditions are rather similar, while the high-memory condition receives slightly lower judgments. However, the difference is not big. The zROC curves for the high-memory and low-memory conditions are straight lines, which is, following Dillon & Wagers (2019: 21–22), a visual cue that the underlying distribution acceptability is normally distributed. The line of the medium-memory condition is slightly convex, which can be a visual cue of bimodality. I think that this is correlated with the strong change of acceptability during the experiment (decreasing "habituation" effect) that I present below.

Figure 8.7: ROC curves (top) and zROC curves (bottom) of the extraction conditions compared to their respective non-extraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 1.[13]

[12] See the methodology for Receiver Operating Characteristic curves below on page 153.

[13] For the zROC curve, I have to exclude the level 2 of the scale from the graph. The proportion of hits for this level in the PP-extracted + low-memory condition was indeed 100%, that leads to a z-score of $+\infty$

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.2.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is depicted in Figure 8.8 on page 152. In general, the conditions remain equals during the experiment, except for the two extractions out of the object whose acceptability declines. Especially the extractions out of the object with a clitic subject (medium-memory) show a strong decreasing.

Figure 8.8: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 1 in the course of the experiment

8.2.5.0.2 Cumulative Link Mixed Models: For acceptability judgment tasks, participants are asked to rate sentences on a Likert scale. Until recently, scholars working with acceptability judgments (including myself[14]) used ANalysis Of VAriance (ANOVA) or linear models in order to identify statistically the expected interaction effects. But these models assume continuous numeric variables, and it is problematic to use this methods for ordinals like acceptability judgments, as Dillon & Wagers (2019) illustrate with some simulations. Standardized rating (z-scores rating) are in this respect a bit more appropriate, but they are not ideal, because there is no certainty that participants attribute similarly strong acceptability differences between all pairs of points on the Likert scale.

The best solution is therefore to perform Cumulative Link Mixed Models, that are most appropriate for ordinal variables. They are now easily available on R. I am using the function `clmm()` from the `ordinal` package (Christensen 2019) to run Cumulative Link Mixed Models.

Expanding from the "best practices" recommendations from Barr et al. (2013: 275–277) for Linear mixed models, I include random slopes for all fixed effects grouped by participants and items in my Cumulative Link Mixed Models (because including only random intercepts can be anti-conservative, at least in linear models) and fitted a maximal model whenever convergence was achievable. If

[14] Abeillé et al. (2016, 2020), Abeillé & Winckel (2020)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the model did not converge, I would step back to non-maximal models. Stepping back to non-maximal models has flaws and using a Bayesian inference method would be more adequate to avoid false positive results, but I leave this for future research.

There is, to my knowledge, no method of residual diagnostic for Cumulative Link Mixed Models.

8.2.5.0.3 Signal Detection Theory & Receiver Operating Characteristic curve: Dillon & Wagers (2019) proposed an alternative way to analyse the results of acceptability judgments by using tools of the Signal Detection Theory. That's why, in addition to the Cumulative Link Mixed Models, I build Receiver Operating Characteristic (ROC) curves for the different conditions, following the methodology explained in Dillon & Wagers (2019). The ROC curve is built by comparing the cumulative probability of hits of every point on the scale (the probability for participants to click on 0 for the point 0, the probability for participants to click on 0 or 1 for the point 1, the probability for participants to click on 0, 1 or 2 for point 2, and so on) for one condition with the respective cumulative hits for another condition. The "better" condition is then plotted with respect to the "worse" one, that serves as a baseline. The Area Under the Curve (AUC) gives visual cue to how much the participants were able to discriminate between both conditions: the more important the AUC, and especially the further away it is from the baseline (AUC = 0.5), the more the participants discriminated between both conditions.

I am using the function `roc()` from the `pROC` package (Robin et al. 2011) to calculate the AUCs. However, for the graphic representation, I am making my own calculations and plotting the curves with `ggplot2` (Wickham 2016), because the `pROC` package does not provide a way to plot multiple ROC curves.

I also build the respective zROC curves, following the same methodology, except that the probabilities of hits are transformed into z-scores. Dillon & Wagers (2019) explain how the zROC curve gives visual cues about the normal distribution of the underlying ratings and helps identify bimodality in the data.

The AUC is therefore a measure of the difference between two conditions. In a 2x2 design, comparing two AUCs is a way to see whether there is a difference between two differences, which is basically the definition for an interaction effect. Hence, I use the function `roc.test()` from the `pROC` package (Robin et al. 2011) to compare the AUCs of two ROC curves. Even though I am testing sided hypotheses (i.e. hypothesis that expect one specific AUC to be significantly bigger than the other AUC), I am using a two-sided test for the difference in AUCs,

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

because I am most of the time testing many different hypothesis with opposite expectations. This allows me to avoid running too much multiple tests. Notice that I do not correct the confidence level for multiple comparisons.

A significant difference between two AUC is an indicator of an interaction effect, and can corroborate the results of the Cumulative Link Mixed Models. On the basis of my experience, I consider the methodology from the Signal Detection Theory proposed by Dillon & Wagers (2019) as more conservative, and the Cumulative Link Mixed Models as more liberal. Indeed, the former is less likely to refute the null hypothesis with a significant probability than the latter.

8.2.5.0.4 Comparing the low-memory condition with the high-memory condition We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as a covariate, and random slopes for fixed effect and covariate grouped by participants and items. The results of the model are reported in Table 8.5. There is a significant effect of the distance (or grammatical function), but not of trial (habituation). This is expected by the processing account, and displays the opposite pattern than the one expected by the syntactic account (the value of the estimate is negative, and is expected to be positive).

Table 8.5: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
distance	-0.341	0.064	-5	p<.001	1.41
Trial	-0.001	0.004	-0	0.7113	1.00

We fit a second model crossing distance and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 8.6. There is a significant main effect of the distance (or grammatical function) and of extraction type, but no main effect of trial (habituation). There is also an interaction effect: the difference between the extraction and non-extraction conditions in low-memory is bigger than the distance between the extraction and non-extraction conditions in high-memory. The interaction is illustrated by Figure 8.9 on page 155.

However, if we compare the Area Under the Curve (AUC) for the ROC curves of the two distance conditions (see Figure 8.7 on page 151), the difference is not significant.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 8.6: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
distance	-0.284	0.087	-3	p<.005	1.33
extraction type	0.628	0.126	5	p<.001	1.87
trial	0.001	0.005	0	0.9145	1.00
distance:extraction type	-0.175	0.081	-2	p<.05	1.19

Figure 8.9: Interaction between distance and extraction type in the Experiment 1. The graph only represents the low-memory and high-memory conditions.

8.2.5.0.5 Comparing the low-memory condition with the medium-memory condition We fit a third model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for fixed effect and covariate grouped by participants and items. The results of the model are reported in Table **??**. The difference is not significant.

Table 8.7: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	2.664	0.184	14	p<.001	14.36
trial	0.005	0.007	1	0.5357	1.00

We fit a fourth model crossing distance and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 8.8. There is a main effect of extraction type, but no main effect of distance or of trial and no interaction effect. The interaction is illustrated by Figure 8.10 on page 156.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 8.8: Results of the Cumulative Link Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	0.834	0.159	5	p<.001	2.30
distance	-0.097	0.104	-1	0.3491	1.10
trial	0.000	0.006	0	0.9967	1.00
extraction type:distance	-0.014	0.083	-0	0.8684	1.01

Figure 8.10: Interaction between distance and extraction type in the Experiment 1. The graph only represents the low-memory and medium-memory conditions.

If we compare the Area Under the Curve (AUC) for the ROC curves of the two distance conditions (see Figure 8.7 on page 151), the difference is not significant.

8.2.5.0.6 Comparing the medium-memory condition with the high-memory condition We fit a fifth model to compare the extractions out of the object with a clitic subject and with a nominal subject on their own (mean centered with clitic coded negative and nominal coded positive). We included trial number as covariate, and random slopes for fixed effect and covariate grouped by participants and items. The results of the model are reported in Table 8.9. The difference is not significant.

Table 8.9: Results of the Cumulative Link Mixed Model (model n°5)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
distance	-0.003	0.063	-0	0.9604	1.00
trial	-0.001	0.004	-0	0.8379	1.00

We fit a last model crossing distance and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

by participants and items. The results of the model are reported in Table 8.10. There is a main effect of extraction type and a main effect of distance (medium-memory has higher ratings than high-memory). There is however no effect of trial (habituation) and no significant interaction. The interaction is illustrated by Figure 8.11 on page 157.

Table 8.10: Results of the Cumulative Link Mixed Model (model n°6)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	0.629	0.124	5	p<.001	1.88
distance	0.213	0.076	3	p<.01	1.24
trial	0.001	0.005	0	0.8325	1.00
extraction type:distance	0.173	0.090	2	0.0553	1.19

Figure 8.11: Interaction between distance and extraction type in the Experiment 1. The graph only represents the medium-memory and high-memory conditions.

If we compare the Area Under the Curve (AUC) for the ROC curves of the two distance conditions (see Figure 8.7 on page 151), the difference is not significant either.

8.2.6 Discussion

We can first compare the results of the analysis with the predictions of the traditional syntactic approach: The expected degradation between the subextraction from subject condition (8.20a) and the subextraction from object conditions (8.20b,8.21) is falsified by the data. At least the difference between the subextraction from a subject and the subextraction from an object with a nominal subject is significant, but in disfavor of the subextraction from the object (model n°1). We find an interaction effect (model n°2) with a rather small effect size (odd ratio of

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

1.19), but it has again the opposite pattern than expected. What we see in our case is actually a significant interaction in disfavor of extracting out of the object (and not of extracting out of the subject).

Notice that our results are also problematic for other kinds of accounts that expect a penalty when extracting out of the subject. With 30 items for six conditions, the participants only saw the extraction out of subject condition five times during the experiment: according to Chaves & Dery (2019), this is not sufficient to obtain an ameliorative effect due to habituation.

We can now compare the results to the predictions of processing approaches based on memory costs. Here, the acceptability means are at least pointing in the right direction: in the extraction conditions, the means for the low-memory extraction are better than for the medium-memory extraction, that are in turn better than for the high-memory extraction. However, this difference is only significant for the two extremes, i.e. between low-memory and high-memory (model n°1). There is no significant difference between low-memory and medium-memory (model n°3) nor between medium-memory and high-memory (model n°5). Even between the two extremes, the effect size is rather small (odd ratio 1.39), but this is expected from processing factors. The interaction that we find between low and high (model n°2) is also compatible with a superadditive effect. But notice that this interaction is significant in the Cumulative Link Mixed Models, but not if we compare the AUCs. To conclude, even though the data do not reproduce exactly the predictions of the DLT (or any other model based on memory load), these predictions are at least not falsified by the experiment.

The habituation graph (Figure 8.8 on page 152) shows a strange pattern for the medium-memory condition (extraction and non-extraction alike) that is decreasing strongly in acceptability in the course of the experiment. I cannot find any explanation for this phenomenon. Notice however that there is no main effect of trial in model n°5, therefore this decrease of acceptability is not significant.

Finally, some remarks on the low acceptability of the non-extraction condition have to be made: I do not know of any study on long-distance dependency in any other language in which the non-extraction control happens to be less acceptable than the extraction condition (island or non-island). This is in contradiction with the idea that acceptability reflects processing costs, because extractions involve higher processing costs. I think that this is due to the high frequency of *dont* relative clauses in French and to the special relationship of French speakers to stylistic properties of sentences. We have seen in the corpus studies that *dont* relative clauses were very frequent (and especially for extractions out of a NP). The control conditions involve a certain anaphoric repetition (*an innovation... its originality*), that could be considered non-necessary because the *dont* relative

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

clause alternative is permitted. Armstrong (2001: 133) points out the " still highly normative and formal teaching methods employed in French schools to teach the language". Non-necessary repetitions are strongly stigmatized by the French education system (almost systematically corrected in written productions, and described as "unelegant" or "heavy"), and, because this experiment is a reading task, this may explain why the participants give lower acceptability ratings to the coordination conditions. This phenomenon is known as social desirability (Edwards 1957), i.e. a distortion of the participants' results toward metal-linguistic judgments that reflect the (socially favored) norm instead of the actual grammatical competence.

On the other hand, it must be acknowledged that the fact that the relative clauses are rated higher than the coordinations is coherent with the analysis of *dont* as a "hanging topic": The *dont* relative clauses would then be coordinate-like structures, but without an anaphoric determiner as in the baseline condition, hence their higher acceptability (reflecting lower processing costs). The interaction found between extraction out of the subject and out of the object remains however unexplained with this hypothesis.

The fact that the extraction conditions are higher than the non-extraction conditions has an unfortunate and non-intended consequence for our results: Figure 8.6 on page 150 gives visual cues of a ceiling effect in the extraction conditions, that can flatten the results of the models.

We replicated this experiment with a different 3*2 design in Abeillé et al. (2020).

8.3 Experiment 2: Speeded Acceptability Judgment study on *dont* relative clauses with different linear distances

One problem of the previous experiment is that the *dont* relative clauses in general are rated very high, which leads to potential ceiling effects. In standard Acceptability Judgment tasks, participants have time to read the sentence as long as they want, and their eyes can operate leftward movements that help processing extractions. It is not the case with Speeded Acceptability Judgment tasks, where words are presented once at a time. We expected therefore that this technique may disadvantage the extraction conditions in such a manner that the difference between the low-, medium- and high-memory conditions would be made more visible. That's why we use a material very similar to the material of Experiment 1 in a new experiment.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.3.1 Material and design

In this Speeded Acceptability Judgment task, we use the same 3*2 design than in Experiment 1 but slightly changed the material. For the subextraction conditions, the item begins with an open question, whose answer is a NP with a relative clause. Like in Experiment 1, the low-memory condition (8.23a) is an extraction out of the subject, the medium-memory condition (8.23b) is an extraction out of the object with a clitic subject, and the high-memory condition (8.23c) is an extraction out of the object with a nominal subject.

(8.23) a. **Condition low-memory + PP-extracted:**
Quel genre d' innovation ont - ils présentée hier ? Une
which kind of innovation have they presented yesterday an
innovation dont$_i$ [l' originalité $__i$] émerveille mes collègues.
innovation of.which the uniqueness delights my colleagues
'What kind of innovation did they present yesterday? An innovation of which the uniqueness delights my colleagues.'

b. **Condition medium-memory + PP-extracted:**
Quel genre d' innovation ont - ils présentée hier ? Une
which kind of innovation have they presented yesterday an
innovation dont$_i$ nous apprécions [l' originalité $__i$].
innovation of.which we value the uniqueness
'What kind of innovation did they present yesterday? An innovation of which we value the uniqueness.'

c. **Condition high-memory + PP-extracted:**
Quel genre d' innovation ont - ils présentée hier ? Une
which kind of innovation have they presented yesterday an
innovation dont$_i$ mes collègues apprécient [l'
innovation of.which my colleagues value the
originalité $__i$].
uniqueness
'What kind of innovation did they present yesterday? An innovation of which my colleagues value the uniqueness.'

[14]The reason for this change is that the material was mixed with the material from another experiment, that served as distractor items. The other experiment presented question/answer pairs, and we wanted to mimic these structures so that the participants cannot distinguish the two sets of items from each other.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Like in Experiment 1, the non-extraction controls are coordinations. It follows a yes/no question, whose answer is always "yes". The distractors are all polar questions, followed by "yes" or "no" answers in a 1:1 ratio.

(8.24) a. **Condition low-memory + noextr:**
Ils ont présenté une innovation hier ? Oui, et son
they have presented an innovation yesterday yes and its
originalité émerveille mes collègues.
uniqueness delights my colleagues
'Did they present an innovation yesterday? Yes, and its uniqueness delights my colleagues.'

b. **Condition medium-memory + noextr:**
Ils ont présenté une innovation hier ? Oui, et nous
they have presented an innovation yesterday yes and we
apprécions son originalité.
value its uniqueness
'Did they present an innovation yesterday? Yes, and we value its uniqueness.'

c. **Condition high-memory + noextr:**
Ils ont présenté une innovation hier ? Oui, et mes
they have presented an innovation yesterday yes and my
collègues apprécient son originalité.
colleagues value its uniqueness
'Did they present an innovation yesterday? Yes, and my colleagues value its uniqueness.'

We tested the same 30 items than in Experiment 1, each declined in the six conditions already described. In addition, the experiment had 28 distractors.

8.3.2 Experimental method

Speeded Acceptability Judgment tasks differ from usual Acceptability Judgment tasks for two reasons: the experimental items are displayed on the screen word by word (for a duration between 300 and 400ms each word), and the judgments must be made as fast as possible. The judgment is binary: participants have to either accept or reject the sentence.

This kind of task forces participants to rely on their intuition in performing the judgment. Indeed, the time at their disposal to perform both the reading and the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

judgment, is too short, so that metalinguistic thinking cannot take place (Riou & Hemforth 2018: 5). Bader & Häussler (2010) compare Speeded Acceptability Judgment tasks with other methodologies (Acceptability Judgment task and Magnitude Estimation) and conclude that this methodology gives compelling results.

8.3.3 Predictions

Because this experiment had the same design as the previous experiment, it also makes the same predictions. Again, our aim is to compare the predictions of the traditional syntactic account with the predictions of a processing account that only relates on memory costs.

Contrary to the standard Acceptability Judgment task, participants were asked in this experiment to make a binary distinction and to either accept the sentence or reject it. The underlying presupposition is that, the more acceptable a condition is, the less likely participants will reject the items in this condition.

The traditional syntactic account predicts a difference between the extraction out of the subject (8.23a) and the extractions out of objects (8.23b) and (8.23c), such that the former has significantly more rejections.

On the contrary, a processing account based on memory load would expect the ratings to increase as the filler-gap distance decreases. This means that (8.23a) is expected to get significantly fewer rejections than (8.23b) on one hand, and (8.23b) is expected to get significantly fewer rejections than (8.23c) on the other hand.

8.3.4 Procedure

We built six lists with a Latin square design, such that each participant saw each item and distractor in only one condition. The items on each list were in a pseudo-randomized order, in order to avoid having two items in the same condition following each other, and two non-distractors following each other.

We run the experiment on the E-Prime software (Schneider et al. 2012).[15] We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/). On the day of the experiment, participants came to the experimental room of the Laboratoire de Linguistique Formelle (LLF) in the Université de Paris[16]. Etienne Riou (Ph.D. student) was the investigator on site.

[15] I wish to thank Etienne Riou, who set up the experiment and conducted it at the Université de Paris, and Doriane Gras, who also helped with the use of E-Prime.

[16] When the experiment was run, the university was named Université Paris-Diderot – Paris VII.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

First, the investigator would welcome each participant, would explain shortly the task, including the financial retribution for their participation, and would give them a consent form to fill. Participants were instructed that they could stop the experiment at any time and still get their retribution. The experiment took place on a laptop in a soundproof experimental room.

Experimental items were presented on the screen on a word-by-word fashion. Words were presented for 250ms + 25ms for each character in the word (such that longer words were displayed longer). After the last word of the sentence, participants had to either accept (by pressing the S key) or reject (by pressing the L key) the sentence within 2s. If a participant failed to answer in time, the trial would be aborted and the program would pass on to the next sentence. Participants could pause between two experimental items.

The participants received a financial retribution of 5 € for their participation.

8.3.5 Participants

The study was run in June 2016. 33 participants took part in the experiment, all native speakers and monolinguals. Participants are 18 to 75 years old.

8.3.6 Results and analysis

Figure 8.12 on page 164 gives an overview of the results of the Speeded Acceptability Judgment task. We can see that all conditions have been considered as "acceptable" in more than 3/4 of the cases. In the subextraction conditions, the low-memory condition (8.23a) is judged acceptable in 77% of the cases, the medium-memory condition (8.23b) is judged acceptable in 79% of the cases, and the high-memory condition (8.23c) is judged acceptable in 79% of the cases. The control conditions have a slightly higher acceptability: the low-memory condition (8.24a) is judged acceptable in 78% of the cases, the medium-memory condition (8.24b) is judged acceptable in 85% of the cases, and the high-memory condition (8.24c) is judged acceptable in 79% of the cases.

The fail rate is relatively similar across conditions: participants failed to answer in time in less than 5% of the cases. Figure 8.13 on page 164 illustrates this. The lowest fail rate are extractions out of the subject (8.23a): participants failed to answer in time in 1% of the cases.

8.3.6.0.1 Logistic regression models: Contrary to acceptability judgments on a Likert scale, the data from this experiment are binary. In order to predict a binary variable, we run logistic regression models, using the `glm()` function under R (R

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8.12: Average acceptability judgments (in percentage) for each condition of Experiment 2.

Figure 8.13: Average answer rate for each condition of Experiment 2. Non-answers are NA, i.e. participants failed to answer in time.

Core Team 2018). One prerequisite is that the Gaussian model is valid for these data: it is generally assumed that the regression model is valid if and only if the number of data points is at least equal to 5 times the amount of explanatory variables, and if and only if the residuals follow a normal distribution. For all models, we validated the model by performing a residual diagnostics using the R package DHARMa (Hartig 2019). We only consider the model valid and report it in this work if the residual diagnostics is compelling.

As in the Cumulative Link Mixed Models (see page 152), I include random slopes for all fixed effects grouped by participants and items whenever convergence was achievable, and fit a non-maximal model otherwise.

8.3.6.0.2 Habituation An overview of the habituation effects in the course of the experiment is depicted in Figure 8.14 on page 165. Remember that in Experiment 1, the two extractions out of the object show a "reversed" habituation, with a decline of acceptability in the course of the experiment (especially the medium condition), which was however not significant. For Experiment 2, the results are

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

very different, because the medium-memory conditions (with and without extraction) display a strong habituation. Striking is the habituation pattern of the low-memory conditions: whereas the habituation is small in the non-extraction condition, it seems much stronger in the subextraction condition.

Figure 8.14: Evolution of the average acceptability for each condition of Experiment 2 in the course of the experiment.

We fitted a first model to compare the subject conditions (low-memory) on their own (mean centered with subextraction coded positive, no extraction coded negative) crossing extraction type with trial number. We included participants and items as random variables. The results of the model are reported in Table 8.11. There is no significant main effect or interaction effect: the distinction of habituation seen in Figure 8.14 is not significant.[17]

Table 8.11: Results of the Logistic regression model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	1.124	0.384	3	p<.005	3.08
extraction type	-0.334	0.311	-1	0.2825	1.40
trial	0.016	0.009	2	0.0844	1.02
extraction type:trial	0.010	0.009	1	0.3003	1.01

[17] Additional models, that I do not report here, show that there is a significant interaction between syntactic function (distance) and trial number when we compare the low-memory subextraction condition with the high-memory subextraction condition ($p < 0.05$), but not when we compare the medium-memory subextraction condition with the high-memory subextraction condition . This corroborates that extractions out of the subject show habituation effects (Chaves & Dery 2019).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.3.6.0.3 Comparing the low-memory condition with the high-memory condition We fitted a second model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and participants and items as random variables. The results of the model are reported in Table 8.12. There is a significant main effect of trial (habituation), but no main effect of syntactic function.

Table 8.12: Results of the Logistic regression model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	1.127	0.239	5	p<.001	3.09
syntactic function	0.044	0.091	0	0.6283	1.04
trial	0.012	0.005	2	p<.05	1.01

We fitted a third model crossing distance and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and participants and items as random variables. The results of the model are reported in Table 8.13. There is no significant main effect, and no interaction effect. The interaction is illustrated by Figure 8.15 on page 167 and all conditions seem indeed to have a similar ratio of acceptability.

Table 8.13: Results of the Logistic regression model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	1.293	0.270	5	p<.001	3.65
syntactic function	0.046	0.102	0	0.6531	1.05
extraction type	-0.020	0.101	-0	0.8433	1.02
Trial	0.008	0.006	1	0.2006	1.01
syntactic function:extraction type	0.020	0.102	0	0.8432	1.02

8.3.6.0.4 Comparing the low-memory condition with the medium-memory condition We fitted a fourth model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and participants and items as random variables. The results of the model are reported in Table 8.14. There is a main effect of habituation (trial), but no significant difference between subject and object.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8.15: Interaction between distance and extraction type in the Experiment 2. The graph only represents the low-memory and high-memory conditions.

Table 8.14: Results of the Logistic regression model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	0.990	0.215	5	p<.001	2.69
syntactic function	0.113	0.092	1	0.2193	1.12
Trial	0.017	0.005	3	p<.005	1.02

We fitted a fifth model crossing distance and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and participants and items as random variables. The results of the model are reported in Table 8.15. There is a main effect habituation (trial) again, but no other main effect, and no interaction effect. The interaction is illustrated by Figure 8.16 on page 168: there is a slight tendency toward a penalty for extracting out of the object (medium-memory), but it is not significant.

Table 8.15: Results of the Logistic regression model (model n°5)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	0.866	0.233	4	p<.001	2.38
extraction type	-0.142	0.103	-1	0.1683	1.15
syntactic function	0.142	0.103	1	0.1676	1.15
trial	0.022	0.006	4	p<.001	1.02
extraction type:syntactic function	-0.086	0.103	-1	0.4049	1.09

8.3.6.0.5 Comparing the medium-memory condition with the high-memory condition We fitted a sixth model to compare the extractions out of the object with a clitic subject and with a nominal subject on their own (mean centered with

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8.16: Interaction between distance and extraction type in the Experiment 2. The graph only represents the low-memory and medium-memory conditions.

clitic subject coded negative and nominal subject coded positive). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 8.16. There is a main effect of habituation (trial) but the difference between subject and object is not significant.

Table 8.16: Results of the Logistic regression model (model n°6)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	1.053	0.233	5	p<.001	2.87
syntactic function	0.112	0.093	1	0.2277	1.12
trial	0.017	0.005	3	p<.005	1.02

We fitted a last model crossing distance and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 8.17. Exactly like in model n°5, there is a significant main effect of habituation (trial), but no other significant main effect or interaction effect. The interaction is illustrated by Figure 8.17 on page 169: there is again a slight tendency toward a penalty for extracting out of the medium-distance object, but it is not significant.

8.3.7 Discussion

Thanks to the Speeded Acceptability Judgment task, we managed to reduce the ceiling effects that we observed in Experiment 1. Unfortunately, all we see in the results are null-effects, that do not allow us to falsify any predictions. The results

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 8.17: Results of the Logistic regression model (model n°7)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	1.231	0.261	5	p<.001	3.43
extraction type	-0.119	0.105	-1	0.2556	1.13
syntactic function	0.106	0.105	1	0.312	1.11
trial	0.014	0.006	2	p<.05	1.01
extraction type:syntactic function	-0.124	0.105	-1	0.238	1.13

Figure 8.17: Interaction between distance and extraction type in the Experiment 2. The graph only represents the medium-memory and high-memory conditions.

of Experiment 2 are overall compatible with any account on extractions out of NPs. It is even possible, in the light of Experiment 2, to consider that the subject advantage for extractions out of the subject in Experiment 1 might be an artefact of the ceiling effects.

Nevertheless, the absence of any strong degradation when extracting out of subjects raises suspicion against a syntactic approach of the phenomenon, in which clear and categorical judgments are expected: if extractions out of the subject are ruled out by grammar, we expect participants to reject them strongly, and not to accept these subextraction in 77% of the cases.

The habituation patterns in Figure 8.14 are compatible with Chaves & Dery's (2014) conclusions. According to them, extractions out of the subject ameliorate over time, but the effects can only be seen after enough exposure to the structure, and our Experiment does not have enough items for habituation to be a significant factor according to them. This is however not compatible with the FBC constraint, because no special behavior of extractions out of subjects in relative clauses is expected.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.4 Experiment 3: Eye-Tracking study on *dont* relative clauses with different linear distances

In this Experiment, we test the material from experiments 1 and 2 with another experimental method: Eye-Tracking. Eye-Tracking is a useful method to identify processing difficulties (see Section 8.4.2 below).

8.4.1 Material and design

In this Eye-Tracking experiment, the whole sentence appears on the screen and the participant have to read it before going on to the next sentence. Therefore, we defined regions of interest on the sentence and measured the time the participant's eyes stayed on each region (i.e. fixations). The first region is not very informative because the reading process is starting and the time spent on the region reflects not only the reading time but also the reaction time to the beginning of the reading task, as well as potential correction of fixations for the beginning of the line. Therefore, it is not possible to compare the reading times in this region to reading times of other regions. The last region also is not very informative, because the participant will have long reading times in this area regardless of the material presented in this region. This latter phenomenon is known as the wrap-up effect (Rayner et al. 1995). We therefore want to build regions of interest such that the first and last regions are not relevant for the outcome of the experiment.

In our case, we wish to compare the reading times for subjects with a gap to the reading times for objects with a gap. For this reason, we used in Experiment 3 the same material than in Experiment 1, but introduced some material after the direct object. We therefore got the following material (square brackets indicate regions for explanatory purposes, but there was no indication of regions on the screen):

(8.25) a. **Condition low-memory + PP-extracted:**
[Ils présentent une innovation]$_1$ [dont]$_2$ [l' originalité]$_3$
they present an innovation of.which the uniqueness
[émerveille]$_4$ [mes collègues]$_5$ [sans aucune raison]$_6$.
delights my colleagues without any reason
'They present an innovation of which the uniqueness delights my colleagues for no reason.'

b. **Condition medium-memory + PP-extracted:**

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

[Ils présentent une innovation]$_1$ [dont]$_2$ [nous]$_3$
they present an innovation of.which we
[apprécions]$_4$ [l' originalité]$_5$ [sans raison]$_6$.
value the uniqueness without any reason
'They present an innovation of which we value the uniqueness for no reason.'

c. **Condition high-memory + PP-extracted:**
[Ils présentent une innovation]$_1$ [dont]$_2$ [mes collègues]$_3$
they present an innovation of.which my colleagues
[apprécient]$_4$ [l' originalité]$_5$ [sans aucune raison]$_6$.
value the uniqueness without any reason
'They present an innovation of which my colleagues value the uniqueness for no reason.'

(8.26) a. **Condition low-memory + noextr:**
[Ils présentent une innovation]$_1$ [et]$_2$ [son originalité]$_3$
they present an innovation and its uniqueness
[émerveille]$_4$ [mes collègues]$_5$ [sans aucune raison]$_6$.
delights my colleagues without any reason
'They present an innovation and its uniqueness delights my colleagues for no reason.'

b. **Condition medium-memory + noextr:**
[Ils présentent une innovation]$_1$ [et]$_2$ [nous]$_3$ [apprécions]$_4$
they present an innovation and we value
[son originalité]$_5$ [sans aucune raison]$_6$.
its uniqueness without any reason
'They present an innovation and we value its uniqueness for no reason.'

c. **Condition high-memory + noextr:**
[Ils présentent une innovation]$_1$ [et]$_2$ [mes collègues]$_3$
they present an innovation and my colleagues
[apprécient]$_4$ [son originalité]$_5$ [sans aucune raison]$_6$.
value its uniqueness without any reason
'They present an innovation and my colleagues value its uniqueness for no reason.'

We tested 30 items, each declined in the six conditions already described. There was a typo in one condition of one item, and for this reason I present here the results for only 29 items. In addition, the experiment had 32 distractors.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.4.2 Experimental method

Contrary to standard Acceptability Judgment tasks, that record offline measures, Eye-Tracking (as well as Self Paced Reading, a method used in Experiment 9) provides inline measures that are assumed to reflect the ongoing processing of sentences. This assumption is based on the eye-mind hypothesis (Just & Carpenter 1980), i.e. that readers look at the part being currently processed. Following this hypothesis, longer reading times reflect higher processing difficulties (Staub & Rayner 2007; Conklin et al. 2018: 65). Speeded Acceptability Judgments also give an indication on the reading times, but in a more indirect fashion.

In an Eye-Tracking study, participants are typically facing a screen with visual stimuli, while their eye-movements are recorded by the Eye-Tracking device (Conklin et al. 2018: 33–35). In our case, the stimuli are static, and the task of the participant is to read one sentence at a time.

The eye-tracker records fixations and saccades of the participant's eye. While early measures such as first fixation duration usually reflect the reader's lexical access to the words in the critical region, intermediate and late measures such as regression path or second path reading time are more likely to reflect processing difficulties linked to discourse or contextual factors (Conklin et al. 2018: Section 3.2.1). However, syntactic processing difficulties can be reflected by virtually any of these measures (Clifton et al. 2007; Conklin et al. 2018: 90). Here is a list of the different measures that will be used in the current experiment:

- **First fixation duration**: The first fixation is the first time a fixation is recorded inside the critical region. The first fixation duration does not include the duration of another fixation inside the same region, not even a fixation inside the region without any saccade outside the region in-between. The first fixation is usually associated with lexical retrieval, but it is also an interesting measurement in the so-called spill-over region, i.e. the region after the critical region. Spill-over effects occur when the increase in reading time due to processing difficulties in one region induce an increase in reading time in the following region. The reader may for example look forward in the sentence to find some piece of information that may help the processing of the critical region.

- **Regression path duration**: The "regression" refers to the whole time spent between the first fixation inside the critical region and the first fixation into further regions on the right side is recorded. Therefore, it may include several saccades and fixations backward to the left of the critical region. It is a good indicator for syntactic or pragmatic difficulties. For example, the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

reader may need to go back to a previous region in order to confirm that they correctly interpreted previous words, or to correct a false interpretation. I will also look at regression path duration in the spill-over region in order to identify potential spill-over effects.

- **Regression out**: how many times a regression from the critical region was made backward to former regions in the sentence.
- **Regression in**: how many times a regression from a further region in the sentence was made backward to the critical region.
- **Total reading time**: the addition of all fixation durations in the critical region.

The experiment was designed in order to isolate the two factors we are interested in: linear distance of the dependency and extraction type. In addition, the length (= number of characters) of the regions 3 and 5 have been counterbalanced as much as possible in the conditions where they are nominal, and are taken into account in the models as explanatory factors. But another factor can impact a word's reading time: the participant's familiarity with the word. Participants tend to read familiar words faster than unfamiliar words. For this reason, we also take into account as explanatory variable the frequency of the word. We attributed a frequency value to the region 3, 4 and 5 based on the frequency of the head noun for region 4 and 6 and on the frequency of the verb for region 5. The value of frequency is taken from lexique.org[18]. Frequencies in a corpus are of course only an approximation of the participant's familiarity with a certain word, but is a good predictor for the influence of lexical access on reading times (Rayner & Duffy 1986). Finally, the predictability of a word also has an influence on its reading time (Ehrlich & Rayner 1981). We relied on our intuition that relational nouns were all equality predictable and plausible in the test items, but did not perform a pretest to control for this factor.

8.4.3 Predictions

Like Experiment 1 and Experiment 2, the aim of this experiment was primarily to compare the predictions of the traditional syntactic account with the predictions of a processing account based on memory load.

[18]The Lexique database was implemented by Boris New and Christophe Pallier. We used the frequency of the lemma, called `freqlemfilm2` and based on the frequency in French subtitles.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.4.3.0.1 Subject (region 3) If we consider as the critical region the subject, then the pre-critical region is region 2 (the coordination word or the relative word), and the spillover region is region 3. We can only compare condition (8.25a) with condition (8.25c), (8.25b) being too short in comparison to draw meaningful conclusions.

Accounts that predict subject to be an island predict by consequence processing difficulties with integrating the gap to the subject. The subject itself may reflect this difficulty, but more probably the difficulty creates a spillover effect on the next region (the verb). We therefore look at regression path duration on region 3 and at first fixation and regression path duration on region 4. These durations are expected to be longer for (8.25a) than for the other conditions. If we assume that the gap inside the subject is unexpected, then we can also expect to see for extractions out of the subject (8.25a) a higher rate of regression out (e.g. the reader going back to the relative word to check its requirement for a *de*-PP) and of regression in (e.g. once the reader reaches the object and realizes that the gap is filled by the possessive article, they goes back to the subject to check its compatibility with a gap).

A processing account based on memory costs expects the complete opposite. Such an account predicts that the reader is more likely to posit a gap inside the subject than at any other site. Reading times should then be shorter for subextractions out of the subject, and filled-gap effect to occur for subextractions out of the object. Regression path duration on region 3 and first fixation duration and regression path on region 4 are therefore expected to be longer for extractions out of the object (8.25a) than in the other conditions.

Notice however that for some scholars, like Yoshida et al. (2014), even a decrease in reading time on the subject for extractions out of the subject is compatible with the subject island hypothesis. If I understand their explanation correctly, They think that the reader never posits a gap in the subject, because it is ungrammatical. Therefore, the reader "gives up" in integrating the filler. There is a reason to suspect here a post hoc explanation (they notice a decrease of reading times and try to explain it in their theory), but more importantly, this argumentation seems to me more adequate for a Self Paced Reading task (and indeed Yoshida et al. (2014) apply the explanation to results from such a task) than in an Eye-Tracking study. As far as the reader has the opportunity to perform regressions and try to make sense from the sentence, I think that they will do so before "giving up". Hence, I leave this line of explanation aside for the present experiment, even though it casts a doubt on the actual predictions of traditional syntactic accounts that I just described, and I will consider the "giving up" scenario in Experiment 9.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.4.3.0.2 Object (region 5) If we consider as the critical region the object, then the pre-critical region is region 4 (the verb), and the spillover region is region 6. Unfortunately, in this configuration, the spillover region is also the last region, and because of potential wrap-up effects, we cannot really expect to identify spillover effects in this region. Another potentially interesting pre-critical region is region 3 (the coordination word or the relative word).

We can first compare condition (8.25a) with condition (8.25c). If we assume that subjects are islands, we expect for subextractions from the subject longer regression path durations and a higher rate of regression out (e.g. the reader realizes that the expected gap is filled by the possessive article and goes back in order to reanalyze the relative). Overall, we would expect also longer total reading times on regions 3+4+5 for this condition.

On the opposite, if we assume that shorter dependency lengths are easier to process and that there is no subject island, then we can compare reading times on the subject in the subject conditions with reading times on the object in the object conditions. We then expect that the regression path duration is longer for subextractions out of the object. Furthermore, we expect also longer total reading times on regions 3+4+5 for this condition.

We can also compare condition (8.25c) with condition (8.25b). The "subject island" approach does not make any prediction with respect to different extractions out of the object.[19] The DLT predicts less processing difficulties when the subject is a clitic. Consequently, it predicts that regression path durations are longer for (8.25c). It also predicts a higher rate of regression out (e.g. the reader going back to the relative word) for this region.

8.4.3.0.3 Relative word (region 2) It is also interesting to look at the rate of regression in for the relative word. It should be in general higher in the extraction conditions than in the coordination conditions, because there should be a higher need to check the form of the relative word. The syntactic accounts predict that extractions out of the subject trigger more regressions in than the other conditions. The processing accounts predict a gradation such that condition (8.25a) triggers less regression in than condition (8.25b), that in turn triggers less regression in than condition (8.25c).

[19] Relativized minimality probably does because of the intervening subject NP in (8.25c), but for reasons that are orthogonal to the subject island discussion.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.4.4 Procedure

We used a Latin square design, such that each participant saw each item and distractor in only one condition. The items and distractors were divided in three blocks of roughly the same amount of sentences.

We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook). Participants could make an appointment per email. On the day of the experiment, they came to the Eye-Tracking room of the Laboratoire de Linguistique Formelle (LLF) in the Université de Paris Cité[20]. At least one investigator was present all the time during the experiment. Three Ph.D. students of the LLF participated as investigators on this experiment: Céline Pozniak, Aoi Shiraishi and myself.

We conducted the experiment on Eyelink II and recorded the participant's dominant eye (following Miles's (1930) test). First, an investigator would welcome each participant and would explain shortly what was going to happen during the experiment. The participants received an information sheet in duplicate where each step of the experiment was precisely described. The information sheet also mentioned the financial retribution for their participation, and their right to stop the experiment at any moment without explanation required and still get the financial retribution. If they agreed to start the experiment they would give their signed consent at the end of the sheet. Participants then filled a second form with informations about their linguistic background (mother tongue, language spoken at home, other languages learned and proficiency, whether they ever lived in another country than France, place of birth, education and profession). This form was kept by the main investigator, but with no link to the consent form, so that they are anonymous when analysing the data.

After that, the investigator helped the participant identify their dominant eye, and wear the eye-tracking device. There was first a calibration phase, in which the participant had to fix a dot on the corners and middle of the screen.

The actual reading task then could began. A sentence would appear on the screen. The participants were asked to read the sentence on the screen as fast as possible but to take the time needed to understand the sentence. They would then press a button to proceed to the following sentence. Sometimes, a comprehension question about the question just asked would appear on the screen, with two possible answers. Participants had to choose which answer was best.

There was a first short practice block with three sentences. During the practice block, the investigator was in the room with the participant, repeated the instructions and answered potential questions. Then the investigator would leave the

[20]When the experiment was run, the university was named Université Paris-Diderot – Paris VII.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

room. There would be a short calibration phase, then participant would read the first block of sentences in a row, being able to pause as long as they wished before starting the second block. Similarly, the second block would begin with a short calibration phase, and after the second block, the participant would be able to pause as long as they wished before starting the third block. The third block also started with a short calibration phase.

At the end of the experiment, participants received 10 € of financial retribution and could ask questions if they wanted. The whole experiment took approximately one hour. Only one participant was present at a time in order to keep the room as quiet as possible.

8.4.5 Participants

The study was run in July 2016. 32 participants took part in the experiment. We present here the analysis made on the answers of 31 participants, excluding the data from one bilingual participant. The participants were 18 to 57 years old. No participant had any educational background or occupation related to language.

8.4.6 Results and analysis

Reaction times typically have a non-normal distribution with a very long tail for longer reaction times. That's why, following the usual methodology used for reading time studies, the results presented here are based on log-transformed reading times, that have a distribution closer to normal. The results in ms are log-transformed using the function `log()` under R (R Core Team 2018).

I suppressed data for skipped regions, i.e. regions for which there was no fixation at all. For each reading time measurement (e.g. first fixation duration, regression path duration), I built a subset of the data in which I suppressed outliers, i.e. measurements that were more than 3 standard deviation away from each participant's mean reading time (each region in each condition considered separately).

Figure 8.18 on page 178 shows the total reading time, and Figure 8.19 on page 178 shows the regression path duration on the experimental items.

8.4.6.0.1 Linear Mixed-Effects Models: Log-transformed reaction times can be considered as a continuous variable. To see how good a set of explanatory variables are to predict a (continuous) variable A, we run Linear Mixed-Effects Models, using the `lmer()` function under R (R Core Team 2018). One prerequisite for Linear models is that the Gaussian model is valid for the variable A. I performed a visual inspection of the residuals using the function `qqnorm()` from the R Stats

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8.18: Region means and 95% confidence intervals for the log-transformed total reading time of all conditions in Experiment 3 (Zones = 1: Matrix clause; 2: Relative word/coordination; 3: Subject; 4: Verb; 5: Object; 6:AdvP)

Figure 8.19: Region means and 95% confidence intervals for the log-transformed regression path duration of all conditions in Experiment 3 (Zones = 1: Matrix clause; 2: Relative word/coordination; 3: Subject; 4: Verb; 5: Object; 6:AdvP)

Package (R Core Team 2018), and report the results of the models in this work only if the residuals diagnostic is compelling. As in the Cumulative Link Mixed Models (see page 152), I include random slopes for all fixed effects grouped by participants and items whenever convergence was achievable, and fit a non-maximal model otherwise.

In order to test every prediction mentioned in Section 8.4.3 above, it was necessary to run many different mixed models. The interested reader is referred to Section 7 in the Appendix, in which every step of the statistical analysis is described in details. I only highlight in the present section the main findings relative to the predictions. Section 7 in the Appendix also provides more Figures that illustrate the results.

Table 8.18 on page 180 sums up the results of all models. All models have participants and items as random variables. We ran maximal models whenever possible,

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

and added length (number of characters) and frequency as covariates whenever possible (either length or frequency had sometimes to be dropped because of singularities in the model). Notice that the results must be taken with a pinch of salt, because we ran a high amount of models and did not correct the confidence level for multiple comparisons.

There is usually no significant main effect of distance in the models, except when we compare the regression path duration at extraction sites (results of region 3 for the subject conditions and of region 5 for the object condition) in model n°15. Indeed, as illustrated by Figure 8.20 on page 179, the subject conditions have longer reading times. This is not surprising given that the region 3 appears on the left of region 5. There is however no significant interaction effect between distance and extraction type in model n°15.

Figure 8.20: Regression path duration for the region 3 on one hand (subject) and the region 5 on the other hand (object) of Experiment 3 with 95% confidence intervals.

We often observe in the models a significant main effect of extraction type. Whenever there is a significant main effect, it is always such that the non-extraction conditions lead to longer reading times, more regressions in or more regressions out than the subextraction conditions. This also clearly appears on Figure 8.20, as well as on Figure 8.21 on page 181.

The most interesting effect for the predictions mentioned in Section 8.4.3 is the interaction effect between distance and extraction type. There is no evidence from the data that regression path durations are longer on the subject (model N°2) or the object (model n°9) when there is an extraction out of the subject – and no evidence of the contrary. There is also no evidence that there are more regressions out potentially due to the need to look again at the filler or the antecedent on the subject (models n°3 and n°4) or on the object (models n°10 and n°11) when there is an extraction out of the subject – and also no evidence of the contrary. The total reading time for the whole section from subject to object of

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 8.18: Results with p values of the models (LMM = Linear Mixed Model; BRMM = Binomial Regression Mixed Model; PRMM = Poisson Regression Mixed Model)

model	dependent variable	fixed effects			covariate		maximal model
		distance	extraction type	distance: extraction type	length	frequ.	
n°1 (low/high) LMM	total reading time on region 3+4+5	0.1213	<.05	0.5741	<.001	–	yes
n°2 (low/high) LMM	regression path duration on region 3	0.9238	<.01	0.4538	<.005	0.8217	yes
n°3 (low/high) BRMM	regression out on region 3	0.9906	0.7051	0.1673	<.005	0.1890	no
n°4 (low/high) PRMM	amount of regression out on region 3	0.8411	0.996	0.4062	<.01	–	no
n°5 (low/high) BRMM	regression in on region 3	0.2928	<.05	<.005	0.7446	–	no
n°6 (low/high) PRMM	amount of regression in on region 3	0.2051	<.01	<.005	0.5040	–	no
n°7 (low/high) LMM	first fixation duration on region 4	0.4151	0.4713	0.2937	0.5205	0.1397	no
n°8 (low/high) LMM	regression path duration on region 4	0.3118	0.1545	0.0585	0.2921	0.1356	no
n°9 (low/high) LMM	regression path duration on region 5	0.1482	0.1038	0.4454	0.0536	0.2014	no
n°10 (low/high) BRMM	regression out on region 5	0.4724	0.4600	0.2344	0.5704	–	no
n°11 (low/high) PRMM	amount of regression out on region 5	0.6853	0.4875	0.7646	0.1805	–	no
n°12 (medium/high) LMM	regression path duration on region 5	0.0934	<.01	0.0677	<.01	0.8521	no
n°13 (medium/high) BRMM	regresion out on region 5	0.1147	<.05	0.4702	0.1396	–	no
n°15 (low/high) LMM	regression path duration on extraction site	<.05	<.005	0.3036	<.005	<.05	no
n°16 (low/medium) BRMM	regression in on region 2	0.7502	–	–	–	0.7668	no
n°17 (low/high) BRMM	regression in on region 2	0.6061	–	–	–	0.2283	yes
n°18 (medium/high) BRMM	regression in on region 2	0.0682	–	–	–	0.6732	no
n°19 (low/medium) BRMM	amount of regression in on region 2	0.3377	0.4641	0.7308	–	0.6652	no
n°20 (low/high) PRMM	amount of regression in on region 2	0.6888	0.7167	0.6466	0.6044	0.2536	yes
n°21							

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8.21: Mean amount of regression in in Region 3 in Experiment 3

the relative is not longer for extractions out of the subject – also not longer for extractions out of the object when the distance is the highest (model n°1).

There is however a significant interaction if we compare the low and the high distance as far as regression in back to the subject is concerned: extractions out of the subject generate a lower rate and overall less regressions in than the other conditions, as illustrated by Figure 8.21. But there does not seem to be more regressions in back to the relative word (models n°16 to n°21).

There is also a small tendency, but no significant interaction effect (only a marginally significant effect), for a pullover effect on the verb. Indeed, if we compare low and high distances, regression path durations on region 4 show a small tendency such that extractions out of the subject generate shorter reading times than the other conditions (model n°8), as illustrated by Figure 8.22 on page 181.

Figure 8.22: Regression path duration for the region 4 for each condition of Experiment 3 with 95% confidence intervals.

All the results above concern a comparison of the low-memory with the high-memory conditions. We did not observe any of the significant effects predicted by the DLT (or other processing accounts based on memory costs) by comparing the low-memory with the medium-memory conditions (models n°16 and n°19) or

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

comparing the medium-memory with the high-memory conditions (models n°12, n°13, n°18 and n°21).

8.4.7 Discussion

Overall, we did not observe in the data many of the expected effects described on Section 8.4.3. Whenever we observed a significant interaction effect, it was in general more in line with the predictions of processing accounts based on memory costs than with predictions of the traditional syntactic account. The increase of regression in on the subject when there is an extraction out of the object could be an evidence that readers posit a gap inside the subject and need to come back to it to ensure that the relative phrase is really not bound to the subject. The tendency toward a spillover effect on the verb also goes in this direction: it could be caused by filled-gap effect, such that the reader has to readjust their expectation that the gap is on the subject.

Based on the illustration of Figure 8.21, I think however that the interaction effects are caused by another factor. My impression from the data is that the interaction effect comes from an increase of regression in for the subject control condition. The reason can be related to what I pointed out in the discussion of the results of the two previous experiments: *dont* relative clauses seemed preferred over the use of the anaphoric possessive article. It is possible that this possessive article is even less expected when its referent is close, as it is the case in the low-memory non-extraction condition (there is no new referent introduced between *innovation* and *son* in (8.26a)).

The main effect of extraction type observed many times in the models seems to be contradictory with the fact that there are additional costs associated with the integration of the gap (Momma et al. 2019). My only explanation is that such short distance dependencies, let alone for a construction very frequently encountered by French speakers, do not induce enough memory costs to slow down reading times. Moreover, the control conditions also induce memory costs due to a different kind of syntactic binding. Both memory costs may cancel each other out in my experiment. As noticed by Keshev & Meltzer-Asscher (2019), experiments on cataphoric constructions display interaction effects similar to those attributed to weak islands. As far as experiments on islands usually do not control for binding, the results usually attributed to islands could be caused by binding.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

8.5 Experiment 4: Acceptability Judgment study on *dont* relative clauses with long distance dependencies

In this experiment, we are testing a similar material but with long distance dependencies: the *dont* relative clause contains an embedded clause, and the NP out of which the extraction takes place is either subject or object of this embedded clause. For this experiment, we wanted to have a design similar to the long distance dependencies tested by Sprouse et al. (2016) in English and Italian. Having long distance dependencies also ensures that extractions out of the subject are "real" extractions and not a movement inside the DP as proposed by Heck (2009) (see Section 2.3.1).

8.5.1 Material and design

The experiment was an Acceptability Judgment task with a 2*3 design that I explain here in detail.

In this experiment, we do not test three different distances between *dont* and the gap, but only compare extractions out of subjects (8.27a) with extractions out of objects (8.27b), as in Sprouse et al. (2016).

(8.27) a. **Condition subject + PP-extracted:**
Google présente une innovation dont$_i$ on suppose [que [l'
Google presents an innovation of.which one suspects that the
originalité $_{-i}$] enthousiasme mes collègues sans aucune
uniqueness excites my colleagues without any
raison].
reason
'Google presents an innovation of which we suspect that the uniqueness excites my colleagues for no reason.'

b. **Condition object + PP-extracted:**
Google présente une innovation dont$_i$ on suppose [que mes
Google presents an innovation of.which one suspects that my
collègues admirent [l' originalité $_{-i}$] sans aucune raison].
colleagues admire the uniqueness without any reason
'Google presents an innovation of which we suspect that my colleagues admire the uniqueness for no reason.'

Apart from this subextraction conditions, there is also a non-extraction condition (8.28) that serves as a baseline. The non-extraction condition parallels the extraction one, but has a coordination instead of a relative clause.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(8.28) a. **Condition subject + noextr:**
Google présente une innovation, et on suppose que son
Google presents an innovation and one suspects that its
originalité enthousiasme mes collègues sans aucune raison.
uniqueness excites my colleagues without any reason
'Google presents an innovation, and we suspect that its uniqueness excites my colleagues for no reason.'

b. **Condition object + noextr:**
Google présente une innovation, et on suppose que mes
Google presents an innovation and one suspects that my
collègues admirent son originalité sans aucune raison.
colleagues admire its uniqueness without any reason
'Google presents an innovation, and we suspect that my colleagues admire its uniqueness for no reason.'

These two extraction types are very similar to the design in Sprouse et al. (2016). A third extraction type is also introduced in the design: the relative word of the relative clause is *que* instead of *dont*. Like *dont*, *que* is a complementizer, but it is used to extract direct NP objects, and not to extract *de*-PPs. Therefore, the sentences are ungrammatical, and serve as a baseline for low judgments. Notice that the switch from *dont* to *que* is relatively frequent in informal French, but strongly stigmatized as "bad" French. It is therefore not a control with a strong ungrammaticality, but is nevertheless a good low baseline for a reading task.

(8.29) a. **Condition subject + ungramm:**
Google présente une innovation qu' on suppose que l'
Google presents an innovation that one suspects that the
originalité enthousiasme mes collègues sans aucune raison.
uniqueness excites my colleagues without any reason
'Google presents an innovation that we suspect that the uniqueness excites my colleagues for no reason.'

b. **Condition object + ungramm:**
Google présente une innovation que on suppose que mes
Google presents an innovation that one suspects that my
collègues admirent l' originalité sans aucune raison.
colleagues admire the uniqueness without any reason
'Google presents an innovation of which we suspect that my colleagues admire the uniqueness for no reason.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The material is very similar to the material used in the three first experiments, but with small changes nevertheless. We planned this experiment (and some of the following ones) as the French pendant to a cross-linguistic series of studies (French-English) and tried to keep the French and English material as close to each other as possible. Some of the items of the previous experiments did not transfer well into English, that's why some changes were introduced in the French material.

Like in the previous experiments, the relation between *dont* and the gap always expresses a quality (e.g. *originalité* 'uniqueness', *beauté* 'beauty'). The noun out of which the extraction takes place is always an inanimate. We use psych verbs that come in reversible pairs (e.g. *apprécier* 'value' and *émerveiller* 'delight'), but also some transitive non-psych verbs (e.g. *commenter* 'comment').

We tested 24 items, each declined in the six conditions already described. In addition, the experiment had 36 distractors. Half of the experimental items and distractors are followed by a comprehension question. The item presented here as an example was followed by the comprehension question *Est-ce que les collègues ont raison d'être enthousiastes ?* ('Are the colleagues right to be enthusiastic?').

8.5.2 Predictions

From the different accounts presented in the first part of this work, four big different expectation patterns emerge, that I discuss briefly here.

A traditional syntactic account expects to see a superadditivity effect when extracting out of the subject. For this reason the first expectation is that the acceptability of (8.27a) is degraded compared to (8.27b). Long distance dependencies should be less acceptable than the non-extraction conditions because they are more difficult. But an interaction effect is also expected such that (8.27b) is worse than the three non-island conditions (8.27b), (8.28a) and (8.28b). Actually, (8.27a) should not be significantly better than the ungrammatical controls (8.29a) and (8.29b), and an interaction effect is expected as well, such that (8.27b) is better than these three ungrammatical conditions.

A processing account based on surprisal due to subject complexity (like Kluender (2004)) has similar expectations. The only difference is that the extraction out of the subject, even though it should be degraded, is not necessarily expected to be on the same acceptability level than ungrammatical controls. Subextractions are expected to be better than ungrammatical controls (main effect). A discourse-based account like the one expressed by Erteschik-Shir (1973) or Goldberg (2006) makes essentially the same prediction.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

A processing account based on memory costs (like Dependency Grammar or the DLT) expects the extraction out of the subject (8.27a) to have better ratings than the extraction out of the object (8.27b), the distance between *dont* and the gap being longer in the latter case. When we compare the non-extraction conditions with the subextractions, an interaction effect is expected, because extractions out of the object like (8.27b) should give rise to stronger processing difficulties. But subextractions are expected to be better than the ungrammatical controls.

The discourse-based account that we proposed with the FBC constraint does only expect a main effect of extraction types, such that the control without extraction should be better than the extraction condition, that is turn should be better than the ungrammatical controls. The account is neutral as whether there is a main effect of syntactic function (subject conditions better than object conditions or inversely), but it crucially does not expect to see any significant interaction effect.

For the sake of simplicity, we can summarize these different expectations through two major predictions: some accounts predict a "subject island" effect, and some other do not predict it, with some minor details varying between the accounts.

8.5.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure of Acceptability Judgment tasks is explained in Section 8.2.3. Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good".

The experiment took approximately 20 minutes to complete. We recruited the participants through FouleFactory (https://www.foulefactory.com), and the participants were paid 5 € for their participation. The payment was not contingent on the participants' responses to the questions about native language or place of birth.

8.5.4 Participants

The study was run in October 2019. 57 participants took part in the experiment. We present here the analysis made on the answers of the 51 participants who satisfied all criteria.[21] The 51 participants are 21 to 67 years old. 31 participants

[21]In addition to the five usual criteria, we excluded two participants who did not use the Likert scale appropriately. To calculate accuracy, we excluded not only the answers to comprehension

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

self-identify as women, 20 self-identify as men. No participant indicated having an educational background related to language.

8.5.5 Results and analysis

Figure 8.23 on page 187 gives an overview of the results of the acceptability judgment task. In the subextraction condition, the extraction out of the subject (8.27a) has an average acceptability rating of 7.63, slightly higher than extraction out of the object (8.27b) that has an average rating of 7.42. The control condition without extraction receives overall better ratings: the subject condition (8.28a) has an average acceptability rating of 8.10, and the object condition (8.28b) 7.48. The ungrammatical controls have low acceptability ratings: the subject condition (8.29a) has an average acceptability rating of 3.64, and the object condition (8.29b) 3.21.

Figure 8.23: Acceptability judgments for each condition of Experiment 4. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 8.23 suggests potential ceiling effect on the extraction conditions and the non-extraction conditions, and a potential floor effect on the ungrammatical control. Indeed, Figure 8.24 on page 188 shows indices of ceiling effects and floor effects, especially for the subject + non-extraction condition.

Another representation of the results is given by the ROC and zROC curves of the results in Figure 8.25 on page 188. There is a strong discrimination between the ungrammatical baseline and the other conditions, but no strong discrimination between coordination and subextraction. The zROC curves are slightly convex, which could be the sign for bimodality (Dillon & Wagers 2019: 21–22). This may be due to the strong effect of habituation on the ungrammatical controls (see below).

questions of the practice items and of the ungrammatical controls like (8.29), but also to some ungrammatical distractors.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8.24: Density of the ratings across conditions for Experiment 4

Figure 8.25: ROC curves (top) and zROC curves (bottom) of the grammatical conditions compared to their respective ungrammatical condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 4.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The ROC and zROC curves in Figure 8.26 on page 189 illustrate the discrimination between the subject and object conditions. The ROC curves show that the participants hardly discriminate between the subject and object conditions. The most important distinction is between the non-extraction and the subextraction conditions. As we show below, there is indeed a small tendency toward an interaction, that is however not significant. The zROC curves show straight lines, which is a visual cue that the distribution is normal.

Figure 8.26: ROC curves (top) and zROC curves (bottom) of the subject conditions compared to their respective object condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 4.

8.5.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 8.27 on page 190. All conditions undergo an habituation effect during the experiment, but to different degrees. There is a strong habituation effect for the ungrammatical controls, even though the judgments remain very low until the end of the experiment. We can also see a more important habituation effect for the object + non-extraction condition that I cannot explain.

8.5.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8.27: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 4 in the course of the experiment

and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 8.19. There is a significant effect of the syntactic function, such that the subject condition gets ratings significantly higher than the object condition. There is also a significant effect of trial (habituation), that corroborates the impression given by Figure 8.27.

Table 8.19: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.227	0.109	-2	p<.05	1.25
trial	0.021	0.006	4	p<.001	1.02

In a second model, we compare the subextraction with the non-extraction. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 8.20. There is a significant main effect of the syntactic function (in favor of the subject condition), of extraction type (in favor of the non-extraction controls), and of trial (habituation). There is no significant interaction effect. Figure 8.28 on page 191 gives a representation of the interaction: we see a weak tendency toward an interaction effect, but the confidence intervals overlap. Furthermore, if we compare the Area Under the Curve (AUC) for the ROC curves of the two grammatical conditions (see Figure 8.26 on page 189) the difference is not significant either.

We fit a third model to compare the extractions out of the subject and the ungrammatical subject condition on their own (mean centered with extraction

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 8.20: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.242	0.109	-2	p<.05	1.27
extraction type	-0.191	0.087	-2	p<.05	1.21
trial	0.018	0.004	4	p<.001	1.02
syntactic function:extraction type	0.135	0.088	2	0.1223	1.14

Figure 8.28: Interaction between syntactic function and extraction type in the Experiment 4.

coded negative and ungrammatical coded positive). We included trial number as covariate, and random slopes for fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 8.21. There is a significant effect of extraction type, such that the subextraction condition is better than the non-extraction condition (with a strong effect size: odd ratio = 6.58) and a significant effect of habituation.

Table 8.21: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	1.884	0.223	8	p<.001	6.58
trial	0.017	0.007	2	p<.05	1.02

In a fourth model, we compare the subextraction with the ungrammatical control. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, ungrammatical coded negative). We included trial number as covariate, and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 8.22. There is a main effect of syntactic function (in favor of the subject condition), of extraction type (in favor of the subextraction, with a strong effect size: odd ratio

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

= 6.82) and a main effect of trial (habituation), but no interaction effect (see also Figure 8.28 on page 191).

Table 8.22: Results of the Cumulative Link Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.164	0.079	-2	p<.05	1.18
extraction type	1.919	0.198	10	p<.001	6.82
trial	0.020	0.004	5	p<.001	1.02
syntactic function:extraction type	0.051	0.091	1	0.5766	1.05

8.5.6 Discussion

The data from Experiment 4 seems similar to what we saw in Experiment 1. If we compare the results from what is expected from a superadditivity effect, we can first notice that extractions out of the subject are significantly better than extractions out of the object (model n°1, Estimate has a negative value), contrary to what is predicted. Furthermore, there is no interaction effect to corroborate the prediction (model n°2). The extraction out of subject is significantly better than its ungrammatical control (model n°3) contrary to what the traditional syntactic approach expects, and here again there is no interaction effect (model n°4).

If we now compare the results to what is expected for accounts that do not predict a superadditivity effect, we can see that the data do not falsify the predictions. The fact that the extraction out of the subject is better than the extraction out of the object (model n°1) is in line with what the processing accounts based on memory load predicts. This subject preference is however present for all extraction types: syntactic function is a main effect for models n°2 and n°4, with no interaction effect. This means that there is no facilitation of the extraction out of the subject compared to the baseline conditions, which should be expected under a processing accounts based on memory costs. But we cannot exclude that the ceiling effect on the non-extraction conditions are responsible for cancelling out potential interaction effects.

The data is perfectly in line with what the predictions of the FBC constraint. There is a main effect of extraction type (models n°2 and n°4), and no interaction effect, as expected. Undeniably, Experiment 4 alone does not advocate much in favor or disfavor of the FBC constraint. A recurring problem the FBC constraint has to face as far as relative clauses are concerned is that it is predicting null effects. Statistical analyses can only reject a null hypothesis, never confirm it, and for this reason Experiment 4 is powerless. In my opinion though, the results

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

of the experiments on relative clauses will become very meaningful compared with the experiments on interrogatives (Experiment 10 to 13) and on *c'est*-clefts (Experiment 14). What we can however perfectly see in Experiment 4 so far is that all accounts that predict that extractions out of the subject are degraded compared to extractions out of the object are falsified.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9 Empirical data on *de qui* relative clauses

In this chapter, I present two corpus studies and five experiments. The first four experiments are acceptability judgment tasks, and work in pairs by comparing the two relative words *de qui* (Experiment 5 and 7) and *dont* (Experiment 6 and 8). The last experiment is a Self-Paced Reading task. The organization of the chapter is the following:

9.0.0.1 Corpus studies on *de qui*:

Data from Frantext show that *de qui* relative clauses behave very similarly to *dont* relative clauses. Extracting out of the subject is the most common usage of *de qui* in relative clauses. Interrogatives, however, are very different, and there is attested use of extraction out of the subject neither in direct nor in indirect questions. This may indicate that there is a cross-construction difference as far as extracting out of the subject is concerned.

9.0.0.2 Experiment 5:

In this Acceptability Judgment task, we cross extraction type (extraction / non-extraction) with syntactic function (subject / object) and test *de qui* relative clauses. The extraction takes place out of quality denoting NP (e.g. *originalité* 'originality'). Contrary to what we saw in previous experiments, extraction out of the subject gets significantly lower ratings than extractions out of the object, even if there is no interaction effect between extraction type and grammatical function.

9.0.0.3 Experiment 6:

In this Acceptability Judgment task, we test the material of Experiment 5 but with the relative word *dont* instead of *de qui*. We also use the same distractors. Extractions out of the subject do not get significantly different ratings than extractions out of the object, but the results of this experiment are questionable because we observe very strong ceiling effects.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.0.0.4 Experiment 7:

In this Acceptability Judgment task, we cross extraction type (extraction / non-extraction / ungrammatical controls) with syntactic function (subject / object) and test *de qui* relative clauses again. In this experiment, the extraction takes place out of NP that denote human relations (e.g. *associé* 'associate'). The preference for extractions out of the object observed in Experiment 5 disappears, and extractions out of the subject are significantly better than extractions out of the object. We conclude that the significant difference observed in Experiment 5 is due to an animacy mismatch between subject and object, and not the extraction out of the subject as such.

9.0.0.5 Experiment 8:

In this Acceptability Judgment task, we test the material of Experiment 7 but with the relative word *dont* instead of *de qui*. Again, extractions out of the subject are judged to be significantly better than extractions out of the object.

9.0.0.6 Experiment 9:

In this Self-Paced Reading task, we observe the online processing for *de qui* relative clauses, crossing extraction type (extraction / non-extraction / ungrammatical controls) with syntactic function (subject / object). The results do not show any obvious difficulty with extractions out of the subject. Subjects are read more quickly than objects, regardless of the extraction type. Surprisingly, we do not observe any processing cost associated with subextraction either, which may be due to our grammatical controls, or due to the experiment lacking power (e.g. not enough participants).

9.1 Corpus studies on *de qui*

This chapter summarizes the results of two corpus studies previously published in Abeillé & Winckel (2020) that looked at the distribution of occurrences of *de qui* in Frantext for texts written between 1900 and 1913, and texts written between 2000 and 2013. Contrary to *dont*, *de qui* can be used not only in relative clauses but also in interrogatives.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.1.1 Motivation

The main aim of this study is to see whether we can find in *de qui* relative clauses the contrast between subextractions from the subject and subextractions from the object claimed by Tellier (1990, 1991), and that Stepanov (2007) and Heck (2009) afterwards took as granted in their own analyses. Furthermore, *de qui* not being restricted to relative clauses and *c'est*-clefts, we can look at other kinds of very common extractions: interrogatives. Hence, we wanted to see whether there are any extractions out of the subject with *de qui* in these different constructions, and if so if there is at least a big difference in frequency when compared to extractions out of the object. We test two time periods in order to see if there is an evolution of this usage over the last century, since we want to take into account the possibility that Tellier's (1990) acceptability judgments reflect an older usage of *de qui* and that extraction out of the subject is a rather new innovation in formal French.

Furthermore, we also want to annotate the kind of verb used in the corpus to see if extractions out of subjects are restricted to certain types of verbs, as assumed by Chomsky (2008). If this was to be the case for *de qui* even though it is not the case for *dont*, then one possible explanation would be that Chomsky is right and that examples with *dont* are not real cases of subextraction but rather some kind of hanging topic (as claimed by Uriagereka 2012).

Because *de qui* is a filler for several filler-gap dependencies, we expect differences across constructions. If we assume a view of island based on information structure, then relative clauses and interrogatives for example may show different patterns as far as extraction out of the subject is concerned, because the filler in a relative clause is background or topic, whereas the filler in an interrogative is more similar to a focus.

9.1.2 Procedure

In parallel to the two corpus studies conducted on Frantext for *dont* (see Section 8.1), we searched in (ATILF et al. Version décembre 2016) the 2000–2013 subcorpus and the 1900–1913 subcorpus. We found 449 occurrences of *de qui* for 2000–2013 and 271 for 1900–1913. These corpus studies have been conducted with Anne Abeillé (Université de Paris, LLF, CNRS). The results of this corpus study are published in Abeillé & Winckel (2020).

Table 9.1 shows the distribution of the constructions *de qui* appears in. In the majority of cases, *de qui* is used in a relative with an antecedent. It is also commonly used in interrogatives, and we can find a few examples of free relative clauses and *c'est* clefts.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 9.1: Occurrences of *de qui* in Frantext

	Frantext 2000–2013	Frantext 1900–1913
relative clauses with an antecedent	201	172
free relative clauses	0	3
c'est clefts	0	5
direct and indirect questions	129	70
noise	119	21
Total	**449**	**271**

The three free relatives are all extractions of the complement of the verb. One example is reported in (9.1).

(9.1) Heureux [[de qui]$_i$ une parole nouvelle jaillit avec violence $_{-i}$] !
blessed of who a speech new flows.out with violence
(Connaissance de l'Est, Paul Claudel, 1907)
'Blessed (be the one,) from who a new speech flows out violently.'

The other occurrences were noise, i.e. *qui* free relatives like (9.2a), and free choice uses like (9.2b).

(9.2) a. le geste craintif de [qui cherche secours] (Programme
the gesture fearful of who seeks help
sensible, Anne-Marie Garat, 2012)
'the fearful gesture of who is seeking help'

b. ne jamais être spécialiste de Proust, ni de [qui que ce
NEG never be.INF specialist of Proust or of who that it
soit] (Signes de vie, le pacte autobiographique 2, Philippe
may.be
Lejeune, 2005)
'to never be a specialist of Proust, or of whoever it may be'

I will first present the results for the relative clauses, and then for interrogatives and *c'est*-clefts.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.1.3 Results and analysis for relative clauses

It is worth noticing that 149 among the 201 relative clauses with *de qui* (hence 73.13%) in Frantext 2000-2013 are from one single author, Anne-Marie Garat. This may be a sign that using *de qui* in relative clauses is – at least for this time period – stylistically marked. This was an additional motivation to look at whether the results we had for *de qui* over the period 2000–2013 were independently confirmed for the period 1900–1913, where the author in question is obviously absent. Since the results are coherent, we think that the overrepresentation of this one author does not disqualify the study.

Table 9.2 gives an overview of the different functions of *de qui* in the corpus.[1] They are also represented in Figure 9.1 on page 200.

Table 9.2: Distribution of *de qui* relative clauses in Frantext

Frequency	Frantext 2000–2013	Frantext 1900-1913
Verb	33 (17.01%)	31 (18.45%)
Noun		
Subject	54 (27.84%)	38 (22.62%)
Object	30 (15.46%)	15 (8.93%)
Predicate	8 (4.12%)	4 (2.38%)
Cplt of Preposition	37 (19.07%)	42 (25.00%)
Adjective	2 (1.03%)	1 (0.60%)
Preposition	30 (15.46%)	37 (22.02%)

Except being an adjunct, all possible functions of a *de*-PP, pied-piping included, are present in our subcorpus. *De qui* can be complement of a verb (9.3), of a noun (9.4), of an adjective (9.5) or of a preposition (9.6).

9.1.3.0.1 Some examples of *de qui* as verb complement:

(9.3) a. Sa majesté et monsieur, frère du roi, [de qui]
His majesty and Monsieur brother of.the king of who
[dépend $_{-i}$ surtout l' octroi du privilège], verraient
relies especially the granting of.the privilege would.see
avec faveur le neveu du postulant près d' entrer
with preference the nephew of.the applicant near of enter.INF

[1]Data missing in the Table are relative clauses without a gap, verbless relative clauses and relative clauses with different gap sites, which we excluded.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.1: Distribution of *de qui* relative clauses in Frantext

au séminaire. (L'Enfant d'Austerlitz, Paul Adam, 1902)
at.the seminary

'His majesty and Monsieur, brother of the king, on who relies especially the granting of the privilege, would view favourably the applicant's nephew being about to enter the seminary.'

b. Un homme responsable de ses actes est un homme [de qui]$_i$
a man responsible of his actions is a man of who
[on peut tout craindre $_{}_i$]. (Pense à demain, Anne-Marie
one can everything fear
Garat, 2010)

'A man accountable for his actions is a man from who anything can be feared.'

9.1.3.0.2 Some examples of *de qui* as noun complement:

(9.4) a. **Subject noun:**
Et en effet, il a l' air, maintenant, d' un vieux pigeon [de
and in effect he has the air now of an old pigeon of
qui]$_i$ [le coeur $_{}_i$] bat. (Mes Cahiers : t. 3 : 1902-1904, Maurice
who the heart beats
Barrès, 1904)

'And indeed he looks now like an old pigeon whose heart is beating.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. Elle y a rejoint, un temps, l' exil de sa soeur, [de qui]$_i$
she there has joined a while the exile of her sister of who
[le vieux mari $_{-i}$] a eu la délicatesse de s' éclipser
the old husband has had the thoughtfulness of REFL vanish
rapidement. (Pense à demain, Anne-Marie Garat, 2010)
quickly

'She joins there a while her sister's exile, whose old husband was thoughtful enough to vanish quickly.'

c. **Object noun:**
Ne sommes - nous pas [...] le peuple [de qui]$_i$ saint Bernard
NEG are we not the folk of who saint Bernard
a exprimé [l' âme $_{-i}$], le pays de la chevalerie. (Mes
has expressed the soul the country of the chivalry
Cahiers : t. 9 : 1911-1912, Maurice Barrès, 1912)

'Aren't we the folk whose soul saint Bernard expressed, the country of the chivalry.'

d. De là je fus conduit à la prison de Regina Coeli où je
from there I was brought at the prison of Regina Coeli where I
fus interrogé par le juge instructeur [de qui]$_i$ je rejetai [la
was questioned by the judge instructor of who I rejected the
première déclaration $_{-i}$]. (Vie et mort de Paul Gény, Philippe
first statement
Artières, 2013)

'I was brought from there to the Regina Coeli prison where I was questioned by the investigating judge whose first statement I rejected.'

e. **Predicate noun:**
Mais que j' aime vous entendre et vous voir,
but how I love you.ACC hear.INF and you.ACC see.INF
vous [...] [de qui]$_i$ je me sens, à chaque instant, [la soeur
you of who I REFL feel at every moment the sister
aînée $_{-i}$] ! (Claudine à l'école, Colette, 1900)
older

'But how I love hearing and seeing you, you of whom I feel every second as (if I were) the oldest sister!'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

f. C' est elle qui l' a posée, non sa bru, [de
it is her who it.ACC has installed not her daughter-in-law of
qui]$_i$ c' est pourtant [la dernière trouvaille $__i$]. (Pense à demain,
who it is yet the last idea
Anne-Marie Garat, 2010)

'She was the one who installed it, not her daughter-in-law, whose new idea it was yet.'

g. **Noun complement of a preposition:**
Vous tous, voyez celui [aux pieds de qui]$_i$ [je me suis
you all watch this.one at.the feet of who I REFL am
mise $__i$] ! (La Ville [2e version], Paul Claudel, 1901)
put

'You all, watch the man at the feet of whom I placed myself.'

h. Dans dix ans, Amélie serait une jeune fille [[dans la
in ten years Amélie would.be a young woman in the
vie de qui]$_i$ j' aurais peut-être un rôle $__i$] [...]. (D'autres
life of who I would.have maybe a role
vies que la mienne, Emmanuel Carrère, 2009)

'Ten years from now, Amélie may be a young woman in the life of who I would maybe play a role.'

9.1.3.0.3 Some examples of *de qui* as adjective complement:

(9.5) a. [...] je vois chez lui la haine de l' étranger, du
I see by him the hatred of the stranger of.the
"monsieur" [de qui]$_i$ son père semblait [inférieur $__i$]. (Mes
sir of who his father seemed inferior
Cahiers : t. 2 : 1898-1902, Maurice Barrès, 1902)

'In him, I see the hatred against the stranger, against this "sir" to whom his father seemd inferior."

b. À quoi sert - il de [...] classer la dynastie des criminels
at what helps it of class.INF the dynasty of.the criminals
[de qui]$_i$ nous sommes [issus $_$]. (Programme sensible,
of who we are originating
Anne-Marie Garat, 2012)

'What does it help to classify the dynasty of criminals from who we originate.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.1.3.0.4 Some examples of *de qui* as preposition complement:

(9.6) a. Il fut la petite église des campagnes [autour de qui]$_i$ [s'
it was the small church of.the country around of who REFL
assemblaient $__i$ quelques chaumes] [...]. (Histoire de l'art :
gathered some thatched.cottages
L'Art médiéval, Elie Faure, 1912)
'It was the small country church around which some thatched cottages gathered.'

b. [...] que venait - il faire parmi les étudiants anémiés
what came he do.INF among the students anemic
[[autour de qui]$_i$ rôdaient $__i$ les idées noires et les
around of who lurked the thoughts black and the
BK] ? (À défaut de génie, François Nourissier, 2000)
tuberculosis
'What was he looking for among the anemic students around who black thoughts and tuberculosis were lurking?'

There is always a large amount of extractions out of the NP (subject, object or predicate), but also a lot of pied-piping. However, in Frantext 2000-2013, all but two occurrences are by the same author: Anne-Marie Garat. The two exceptions are extractions out of the object. Therefore, although extractions out of the subject are again the most common usage in 2000-2013, all occurrences are from only one author. Extractions out of the subject are only the second most common usage for 1900-1913, which is nevertheless very high. Thus, we can be confident that the corpus data contradicts Tellier's (1990)'s claim that off-topic extractions are impossible with *de qui*.

9.1.3.0.5 Subject position Like for *dont*, extractions out of a postverbal subject are very rare, but attested. We find three occurrences, all in the subcorpus 1900–1913, and all involving body parts. One example can be seen in (9.7).

(9.7) le père Anselme, [de qui]$_i$ voltigeaient [les boucles angéliques $__i$]
the father Anselme of who fluttered the curls angelic
sur un col gras (L'enfant d'Austerlitz, Paul Adam, 1902)
on a collar oily
'Father Anselme, whose angelic curly hair fluttered down on an oily collar'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Among all extractions out of the subject, there are no long distance dependencies. For three extractions out of a subject, there is a parenthetical adjunct between *de qui* and the subject. One example is reproduced in (9.8).

(9.8) Eliot Kidman [de qui]$_i$, se prévalait - il, [la mère $_{-i}$] était une
Eliot Kidman of who REFL prided he the mother was an
authentique Cheyenne (Pense à demain, Anne-Marie Garat, 2010)
authentic Cheyenne
'Eliot Kidman whose mother, so he prided himself, was an authentic Cheyenne'

9.1.3.0.6 Verb types Table 9.3 shows the types of verbs involved in the extractions out of the subject. Exactly like for *dont* relative clauses, all kind of verbs are attested. Transitives (9.9a), unergatives (9.9b) and state verbs (9.9c) are frequent. There are only a few occurrences of passives (9.9d), unaccusatives (9.9e) and mediopassives (9.9f).

Table 9.3: Type of verbs in the extractions out of the subject among *dont* relative clauses

Type of verb	Frantext 2000–2013	Frantext 1900–1913
Passive	3 (5.56%)	2 (5.26%)
Unaccusative	2 (3.70%)	2 (5.26%)
Mediopassive	4 (7.41%)	3 (7.89%)
Transitive	23 (42.59%)	14 (36.84%)
Unergative	11 (20.37%)	10 (26.32%)
State	11 (20.37%)	7 (18.42%)

(9.9) a. lui [de qui]$_i$ [la trogne $_{-i}$] inspire la caricature (Pense à
him of who the face inspires the caricature
demain, Anne-Marie Garat, 2010)
'him, whose face inspires caricature' (i.e. makes people want to caricature it)

b. [des] femmes de cet âge, [de qui]$_i$ [les charmes $_{-i}$] [...] ont
DET women of this age of who the charms have
grandi d' année en année (La Leçon d'amour dans un parc, René
grown of year in year
Boylesve, 1902)
'women as old, whose charms have grown with the years'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

c. toi [de qui] [l' âme $_{-i}$] est si merveilleusement jumelle de la
you of who the soul is so wonderfully twin of the
mienne (Le Journal d'une femme de chambre, 1900)
mine
'you whose soul is so onderfully twin with mine'

d. ces gens [de qui]$_i$ [le nom $_{-i}$] n' a plus été
these people of who the name NEG has not.more been
prononcé (Pense à demain, Anne-Marie Garat, 2010)
pronounced
'these people whose name has not been pronounced anymore'

e. [des] serpents géants [...] [de qui]$_i$ [la tête $_{-i}$] et [la queue $_{-i}$]
DET snakes giant of who the head and the tail
seraient restées enfouies De Goupil à Margot : histoire de bêtes,
would.be stayed buried
Louis Pergaud, 1910)
'giant snakes whose head and tail would still be buried'

f. nous [de qui] [le vouloir $_{-i}$] s' étale dru comme la
us of who the will REFL spread thick like the
crinière des bêtes La Vie unanime, Jules Romains, 1908)
mane of.the beasts
'we whose will is thick like a beast's mane'

We can compare the types of verbs involved in extractions out of the subject with the types of verbs involved in other kinds of extractions. Figure 9.2 on page 206 illustrates this for Frantext 1900–1913, but the data is similar for Frantext 2000–2013. There is no significant difference between the two groups, both of which have many transitives and unergatives. Notice that in both groups the frequency of passives and mediopassives is not significantly above zero. The frequency of unaccusatives in the relatives with an extraction out of the subject is not significantly above zero. This goes against the idea that extractions out of the subject are restricted to passives and unaccusatives: in fact, these types of verbs are very rare. This is an important difference with *dont* relative clauses, which I cannot explain (but the relative word seems to be the decisive factor, not extraction out of the subject).

Figure 9.3 on page 206 shows the distribution between transitive verbs and

[2]See page 133 for the confidence intervals (here six comparisons). The percentage is given for each group (extraction out of the subject on one hand, other extraction on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.2: Frantext 1900–1913: Distribution of the type of verb involved among extractions out of the subject, compared to other type of extractions in *de qui* relative clauses[2]

Figure 9.3: Distribution of the transitive verbs in *de qui* relative clauses[3]

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

non-transitive verbs, and we can see that, even though there are less transitive verbs in the extractions out of the subject than in the other kinds of *de qui* relative clauses, the difference is not significant.[4] Contrary to *dont* relative clauses, we cannot confirm that there are more non-transitive verbs than transitive verbs among the extractions out of the subject for the *de qui* relative clauses.

9.1.3.0.7 Other factors Numerus and definiteness of the antecedent do not seem to follow any specific pattern. Section 7 in the Appendix provides the interested reader with more details.

Extractions out of the subject are in majority restrictive, in contrast with *dont* relative clauses, and contrary to our expectations.

If we look at the most common semantic relations holding between *de qui* and its head noun, we can see that *de qui* and *dont* relative clauses in Frantext 1900–1913 are remarkably similar. On the contrary, the distribution varies in Frantext 2000–2013 for extractions out of the subject: there are more part-of-whole relations in *dont* relative clauses, more quality (e.g. beauty) or relational (e.g. mother) relations in *de qui* relative clauses. Given the wide variety of possible semantic relationships, the data is a bit too sparse to draw any clear conclusions, but it seems to indicate that the use of *dont* and *de qui* has become specialized in the 21st century.

In Abeillé & Winckel (2020) we present comprehensive statistical models to attempt to predict the usage of *dont* or *de qui* based on our data. These models were very exploratory and did not clearly identify one or more decisive factors. I invite the reader to consult this article to learn more.

9.1.4 Results for interrogatives

If we exclude verbless and gapless interrogatives, we find 75 interrogatives in Frantext 2000–2013 (33 direct, 42 indirect)[5], and 51 interrogatives in Frantext 1900–1913 (32 direct, 19 indirect), see Table 9.4.

[3]See page 133 for the confidence intervals (here two comparisons). The percentage is given for each group (a group = one kind of extraction in one corpus).

[4]Pearson's Chi-squared Tests performed on each subcorpus confirm that the differences are not significant. Pearson's Chi-squared Tests are performed using the function `chisq.test()` from the R Stats Package (R Core Team 2018).

[5]26 direct questions (78.79%) and 13 indirect questions (30.95%) are from Anne-Marie Garat again. She is therefore also relatively overrepresented in the interrogatives, even though less so than in the relative clauses.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 9.4: *De qui* interrogatives in Frantext

	Frantext 2000–2013	Frantext 1900–1913
direct questions	78	47
- with a verb and a gap	33	32
- verbless	25	13
- *de qui* in situ	20	2
indirect questions	51	23
- with a verb and a gap	42	19
- verbless	5	4
- *de qui* in situ	4	0
Total	**129**	**70**

Table 9.5 and Figure 9.4 on page 209 give an overview of the different functions of *de qui* in the corpus. *De qui* can be complement of a verb (9.10), of a noun (9.11), of an adjective (9.12) or of a preposition (9.13).

Table 9.5: Distribution of *de qui* interrogatives in Frantext

Frequency	Frantext 2000–2013	Frantext 1900-1913
Verb	49 (65.33%)	38 (74.51%)
Noun		
Object	2 (2.67%)	0
Indirect object	3 (4.00%)	0
Predicate	11 (14.67%)	6 (11.76%)
Cplt of Preposition	7 (9.33%)	6 (11.76%)
Adjective	1 (1.33%)	1 (1.96%)
Preposition	2 (2.67%)	0

9.1.4.0.1 Some examples of *de qui* as verb complement:

(9.10) a. [De qui]$_i$ devons - nous recevoir nos ordres $_{-i}$, à la fin ? (Les
of who must we receive.INF our orders at the end
Bienveillantes, Jonathan Littell, 2006)

'From who should we really get our orders?'

b. Et lorsqu' il lui demanda [de qui]$_i$ [elle tenait ces
and when he her.DAT asked of who she hold these
détails $_{-i}$], elle lui dit que c' était de Lucien
details she him.DAT said that it was of Lucien

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.4: Distribution of *de qui* interrogatives in Frantext

Lévy-coeur [...]. (Jean-Christophe : Dans la maison, Romain Lévy-coeur
Rolland, 1909)

'And when he asked her from who she got these details, he said that it was from Lucien Lévy-coeur.'

9.1.4.0.2 Some examples of *de qui* as noun complement:

(9.11) a. **Object noun:**

[...] [de qui]$_i$ as - tu utilisé [les voix $__i$] ? (La vie possible de
of who have you used the voices
Christian Boltanski, Christian Boltanski & Catherine Grenier, 2007)

'Whose voices did you use?'

b. **Indirect object:**

[...] il a vu [de qui]$_i$ [...] cette morne et interminable liste
he has seen of who this bleak and endless list
avait le chagrin de faire part de [la soudaine et
had the grief of do.DO announcement of the sudden and
tragique disparition $__i$] [...]. (La voix des mauvais jours et des
tragic loss
chagrins rentrés, Jean-Luc Benoziglio, 2004)

'He saw who this endless bleak list was very sorry to announce the sudden and tragic loss of.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

c. **Predicate noun:**
[De qui]$_i$ est - ce [la faute $_{-i}$] ? (Mon évasion, Benoîte Groult,
of who is it the mistake
2008)
'Whose mistake is it?'

d. [De qui] était - il [la proie $_{-i}$] ? (Jean-Christophe :
of who was he the prey
L'Adolescent, Romain Rolland, 1905)
'Of who was he the prey?'

e. **Noun complement of a preposition:**
[…] [au service de qui]$_i$ se mettait - il $_{-i}$? (Dans la main du
at.the service of who REFL put he
diable, Anne-Marie Garat, 2006)
'At whose disposal did he put himself?'

f. [De la part de qui]$_i$ venez - vous $_{-i}$? Aimé Pache, peintre
of the behalf of who come you
vaudois, Charles-Ferdinand Ramuz, 1911)
'On behalf of who are you coming?'

9.1.4.0.3 Some examples of *de qui* as adjective complement:

(9.12) a. Il voulait savoir [de qui]$_i$ j' étais [enceinte $_{-i}$], depuis quand.
he wanted know.INF of who I was pregnant since when
(L'événement, Annie Ernaux, 2000)
'He wanted to know who made me pregnant, since when.'

b. Et [de qui]$_i$ pourriez - vous être [enceinte $_{-i}$], Marianne ? (Le
and of who could you be.INF pregnant Marianne
Journal d'une femme de chambre, Octave Mirbeau, 1900)
'And of who could you be pregnant, Marianne?'

9.1.4.0.4 An example of *de qui* as preposition complement:

(9.13) Sergueï Sergueïevitch, [à côté de qui]$_i$ es - tu assis $_{-i}$? (Un roman
Sergueï Sergueïevitch at next of who are you sitting
russe, Emmanuel Carrère, 2007)
'Sergueï Sergueïevitch, next to whom are you sitting?'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Of course, the absence of any extraction out of the subject among interrogatives is striking, especially because it is the most common use in relative clauses. A difference between relative clause and interrogatives in this respect is not expected by Tellier's (1990) proposal. In general, there are very few extractions out of a NP: 16 occurrences (21.33% of all interrogatives) in Frantext 2000–2013 and 6 occurrences (11.76%) in Frantext 1900–1913.

Notice that for Frantext 2000–2013, extractions out of a direct object, out of an indirect object, out of an adjective, and *de qui* as the complement of a preposition are all non-significantly higher than zero. For Frantext 1900–1913, extractions out of an adjective are non-significantly higher than zero, and there are no extractions out of a direct or indirect object, and no case in which *de qui* is the complement of a preposition.

The most common usage for *de qui* in interrogatives, by far, is to be the complement of a verb. The presence of extractions out of the indirect object is surprising, but all three occurrences reported are from the same sentence in one specific text (and no other occurrence can be found in the other corpus studies we conducted). Hence, we can consider this an exceptional case, even though it is an indicator that extractions out of a PP are not utterly ruled out by syntax.

9.1.5 Results for *c'est*-clefts

WE can find *c'est*-clefts only on Frantext 1900–1913. Among the five *c'est*-clefts, three are pied-piping cases like (9.14a) where *de qui* is the complement of a noun complement of a preposition, and two are extractions out of an object NP like (9.14b). Two of the pied-piping cases are presentationals.

(9.14) a. C' était lui, l' ennemi [sur la tête de qui]$_i$ [je devais mettre
it was him the enemy on the head of who I must put.INF
les charbons ardents $_{-i}$] ! (A.O. Barnabooth, ses oeuvres
the coal lighted
complètes : le Pauvre chemisier ; Poésies ; Journal intime, Valery
Larbaud, 1913)
'It was him, the enemy on whose head I had to pour the lighted
coal!'

b. Alors il inclinait l' entretien sur Châteaubedeau, et c'
then he led the conversation on Châteaubedeau and it
était celui - là [de qui]$_i$, dans l' ombre, il étranglait [le
was this there of who in the shadow he choked the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

fantôme $_i$]. (La Leçon d'amour dans un parc, René Boylesve, 1902)
ghost
'He then led the conversation on Châteaubedeau, and it was this one that he secretly choked the ghost of.' (intended: he secretly choked the ghost of Châteaubedeau)

9.1.6 General conclusion on the corpus studies on *de qui*

Both corpus studies on *de qui* show that extractions out of the subject are a frequent usage in relative clauses. It is not a recent usage, because, for both time periods, extracting out of the subject is more frequent than extracting out of the object (even though this difference is not significant). In this respect, *de qui* (as a relative word) does not differ from *dont* in our data.

Extractions out of a subject NP are not restricted to a certain type of verbs. Transitive verbs are frequent among extractions out of the subject. However, chi-square tests and regression models show that in Frantext 2000–2013 and in Frantext 1900–1913 there are significantly less transitive verbs for extractions out of a subject NP than for the other usages of *dont* and *de qui*. There are also more passives in extractions out of the subject than in the other kinds of extractions. This can explain why scholars find extractions out of the subject less natural with transitive verbs and more natural with passives: the frequency may play a role in this intuition. However, it does not explain why extractions out of the subject of a transitive verb are marked by some scholars as ungrammatical.

For both relative words, we find some long distance dependencies, even though they seem to be very rare in Frantext. In general, *dont* is far more used than *de qui*, but this seems to be one of the only few differences between the two relative words. There is also a tendency to use many part-of-whole relations (especially for body parts) when extracting out of the subject (more than when extracting out of the object). More importantly, *de qui* is attested only by a limited set of authors in Frantext, whereas *dont* seems to be more common. Using *de qui* may thus have a stylistic "flavor", and this could be one reason why scholars have diverging intuitions about its use.

We can notice a big difference in the usage of *de qui* between relative clauses and interrogatives. For the latter, there is a strong tendency to use *de qui* almost exclusively for extractions of the complement of the verb. Extractions out of NPs are rare (whereas they are very frequent in relative clauses), and there is no attested extraction out of a subject NP. This can be related to the fact that subjects tend to be topics, and that focusing a part of a topic would create a discourse

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

clash, and is therefore dispreferred in well-edited production data like the ones we can find in Frantext.

9.2 Experiment 5: Acceptability Judgment study on *de qui* relative clauses with an animate antecedent and an animacy mismatch between subject and object

Corpus results presented in Section 9.1 suggest that the relative clauses in *dont* and *de qui* are similar with respect to extraction out of the subject. However, there is a long tradition in assuming that extractions out of the subject with *dont* are exceptional because *dont* is not a pronoun, or because it has genitive case. This was proposed first by Tellier (1990, 1991), and then echoed by Stepanov (2007) and Heck (2009), even though already criticized by Godard (1988) (see the whole discussion in Section 2.3.1). That's why we consider useful to test *de qui* relative clauses with a methodology similar to the one adopted in the previous experiments for *dont* relative clauses.

9.2.1 Material and design

The experiment is an Acceptability Judgment task with a 2*2 design. The design is very similar to the design of Experiment 4, but there is no ungrammatical control. We compare extractions out of subjects (9.15a) with extractions out of objects (9.15b), and have for each one a non-extraction control with a coordination (9.16a) and (9.16b).

(9.15) a. **Condition subject + PP-extracted:**
J' ai exclu un garçon [de qui]$_i$ [l' arrogance $_{-i}$] rebute
I have excluded a boy of who the arrogance repels
mes collègues.
my colleagues
'I excluded a boy of who the arrogance repels my colleagues.'

b. **Condition object + PP-extracted:**
J' ai exclu un garçon de qui mes collègues détestent l'
I have excluded a boy of who my colleagues hate the
arrogance.
arrogance
'I excluded a boy of who my colleagues hate the arrogance.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(9.16) a. **Condition subject + noextr:**
J' ai exclu un garçon et son arrogance rebute mes
I have excluded a boy and his arrogance repels my
collègues.
colleagues
'I excluded a boy and his arrogance repels my colleagues.'

b. **Condition object + noextr:**
J' ai exclu un garçon et mes collègues détestent son
I have excluded a boy and my colleagues hate his
arrogance.
arrogance
'I excluded a boy and my colleagues hate his arrogance.'

It is not possible to use the same material as in Experiment 4 because it has inanimate antecedents and *de qui* requires animate antecedents. But the relation between *dont* and the gap expresses again a quality (e.g. *arrogance* 'arrogance', *violence* 'violence') and we use again psych verbs that come in reversible pairs (e.g. *rebuter* 'repel' and *détester* 'hate').

We tested 20 items, each declined in the four conditions already described. In addition, the experiment had 42 distractors. Each item and distractor was followed by a comprehension question. The item presented here as an example was followed by the comprehension question *Qui est arrogant ?* ('Who is arrogant?').

9.2.2 Predictions

The predictions for this experiment (and for all following experiments on relative clauses) are in general similar to the predictions already mentioned in Experiment 4. They are summarized in Table 9.6 on page 215.

9.2.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure for Acceptability Judgment tasks is described in Section 8.2.3. Participants had to rate the sentences on a Likert-scale from 1 to 10, 1 being labeled as "bad" and 10 being labeled as "good". After each sentence, participants had to answer a comprehension question. A question appeared on the screen (for example *Qui est arrogant ?*, 'Who is arrogant?'), and two possible answers appeared under the question. Participants had to click on the appropriate answer in order to access the following sentence.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 9.6: Predictions of the different accounts for Experiments 5, 6, 7 and 8 (relative clauses)

	Predictions				
	"subject island" accounts			no-island accounts	
	"traditional" syntactic account	processing account with surprisal due to subject complexity	BCI account (Goldberg 2006)	account based on linear distance (DG, DLT)	FBC constraint account
extractions out of the subject vs. extractions out of the object	(a) <(b)	(a) <(b)	(a) <(b)	(a) >(b)	(a) ⩾ (b)
extractions vs. non-extractions	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)	interaction effect, such that (b) <(a,c,d)	main effect of extraction + no interaction
extractions out of the subject vs. ungrammatical control	(a) ≃ (e)	(a) >(e)	(a) >(e)	(a) >(e)	(a) >(e)
extractions vs. ungrammatical controls	interaction effect, such that (b) >(a,e,f)	main effect of grammaticality	main effect of grammaticality	main effect of grammaticality	main effect of grammaticality

(a) Condition subject + PP-extracted
(b) Condition object + PP-extracted
(c) Condition subject + no extraction
(d) Condition object + no extraction
(e) Condition subject + ungrammatical
(f) Condition object + ungrammatical

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The experiment took approximately 20 minutes to complete. We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

9.2.4 Participants

The study was run between April and October 2017. 75 participants took part in the experiment. I present here the analysis made on the answers of the 60 participants who satisfied all criteria.[6] The 60 participants are 19 to 79 years old. 41 participants self-identify as women, 19 self-identify as men. Four participants (6.67%) indicated having an educational background related to language.

9.2.5 Results and analysis

Figure 9.5 on page 217 gives an overview of the results of the Acceptability Judgment task.[7] In the subextraction condition, the extraction out of the subject (9.15a) has an average acceptability rating of 5.02, slightly lower than extraction out of the object (9.15b) that has an average rating of 5.36. The control condition without extraction receives overall better acceptability judgements: the subject condition (9.16a) has an average acceptability rating of 7.80, and the object condition (9.16b) 7.62.

Figure 9.5 suggests potential ceiling effect on the non-extraction conditions. Compared to the extractions out of NPs with *dont*, extractions out of NPs with *de qui* do not display ceiling effects. This is corroborated by Figure 9.6 on page 217: we show a clear ceiling effect for the non-extraction conditions, but not for the extraction conditions. However, the subject + extraction does not have a clear normal distribution.

Another representation of the results is given by the ROC and zROC curves of the results in Figure 9.7 on page 218. There is a strong discrimination between the non-extraction conditions (grey baseline) and the extraction condition (blue lines). The zROC curve for the object condition is a straight line parallel to the baseline, but not the zROC for the subject condition. It corroborates Figure 9.6: the repartition of the results for the subject condition is not completely normal.

[6] In addition to the five usual criteria, we excluded three participants who did not use the whole Likert scale. To calculate accuracy, we excluded not only the answers to comprehension questions of the practice items, but also one series of distractors that have an overall accuracy rate of 71% only.

[7] We involuntarily introduced a typo on one condition of one experimental item, and for this reason we exclude the whole item from the results and treat it as a distractor. The results I am giving here are therefore based on 19 experimental items.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.5: Acceptability judgments for each condition of Experiment 5. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 9.6: Density of the ratings across conditions for Experiment 5

Indeed, if we look at the results for slots of the experiment on Figure 9.8 page 218, we see that the distribution looks more like a normal distribution. I think that the non-normal distribution of the subextraction ratings is due to the high habituation of acceptability of subextractions (see below).

The ROC and zROC curves in Figure 9.9 on page 219 show the discrimination between the subject and object conditions. The ROC curves show that the participants hardly discriminate between the subject and object conditions. The zROC curves are relatively straight.

9.2.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 9.10 on page 219. The non-extraction condition does not display any habituation effect. There is even a slight decrease of acceptability for the subject non-extraction condition. The extraction conditions show however a strong habituation.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.7: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 5.

Figure 9.8: Density of the ratings across conditions for the beginning (first quartile, left) and the end (fourth quartile, right) of Experiment 5

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.9: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 5.

Figure 9.10: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 5 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.2.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for the fixed effect grouped by participants and items. The results of the model are reported in Table 9.7. There is a significant effect of the syntactic function, such that the object condition gets ratings significantly higher than the subject condition. There is also a significant effect of trial (habituation).

Table 9.7: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(>z|)	Odd.ratio
function	0.201	0.088	2	p<.05	1.22
trial	0.011	0.004	2	p<.05	1.01

In a second model, we compare the subextraction with the non-extraction. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 9.8. There is a significant main effect of extraction type (in favor of the non-extraction controls). There is no significant main effect of syntactic function, no significant main effect of trial (habituation) and no significant interaction effect. Figure 9.11 on page 221 gives a representation of the interaction: we see a weak tendency toward an interaction effect. Furthermore, if we compare the AUC (see Figure 9.9 on page 219) the difference is not significant either.

Table 9.8: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
function	0.078	0.068	1	0.2489	1.08
extraction type	-1.635	0.234	-7	p<.001	5.13
trial	0.004	0.003	1	0.2093	1.00
function:extraction type	0.110	0.078	1	0.1604	1.12

9.2.6 Discussion

The results of Experiment 5 are puzzling. On one hand it seems more compatible with accounts that expect a superadditivity effect, because there is a significant

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.11: Interaction between syntactic function and extraction type in the Experiment 5.

difference between extractions out of the subject and extractions out of the object, such that extractions out of the object have better ratings than extractions out of the subject (model n°1). On the other hand, there is no significant interaction effect. This latter fact can be due to a weakness of the experiment: the experiment may have not enough participants to let a small size effect appear. The size effect of the interaction must then be rather small. A small size effect is not expected by a traditional syntactic account, but can be compatible with processing accounts based on subject complexity.

The results are in contradiction with what a processing account based on memory costs expects, because the extraction out of the subject should be better than the extraction out of the object. The results are also unexpected under the FBC constraint.

In the next experiment, we will test the same material with *dont* instead of *de qui*, in order to see if we reproduce the same results.

9.3 Experiment 6: Acceptability Judgment study on *dont* relative clauses with an animate antecedent and an animacy mismatch between subject and object

In this study, we are testing the same material than in the previous experiment, but replace the relative word *de qui* by *dont*. We did this in reaction to the results of the previous study. Indeed, we saw extractions out of the subject having lower ratings than extractions out of the object, contrary to the previous experiments on *dont* (Experiments 1 to 4). In the previous experiments, we always tested *dont* relative clauses with an inanimate antecedent. This study aims to be a parallel experiment to Experiment 5.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.3.1 Material and design

This experiment reproduces the design of the previous one. It is therefore an Acceptability Judgment task with a 2*2 design, and we tested the following material:

(9.17) a. **Condition subject + PP-extracted:**
J' ai exclu un garçon dont$_i$ [l' arrogance $_{-i}$] rebute
I have excluded a boy of.which the arrogance repels
mes collègues.
my colleagues
'I excluded a boy of which the arrogance repels my colleagues.'

b. **Condition object + PP-extracted:**
J' ai exclu un garçon dont mes collègues détestent
I have excluded a boy of.which my colleagues hate
l' arrogance.
the arrogance
'I excluded a boy of which my colleagues hate the arrogance.'

(9.18) a. **Condition subject + noextr:**
J' ai exclu un garçon et son arrogance rebute mes
I have excluded a boy and his arrogance repels my
collègues.
colleagues
'I excluded a boy and his arrogance repels my colleagues.'

b. **Condition object + noextr:**
J' ai exclu un garçon et mes collègues détestent son
I have excluded a boy and my colleagues hate his
arrogance.
arrogance
'I excluded a boy and my colleagues hate his arrogance.'

We tested the same 20 items and the same 42 distractors than in Experiment 5. Each item and distractor was also followed by the same comprehension question than in experiment 5 (e.g. for the example material: *Qui est arrogant ?*, 'Who is arrogant?').

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.3.2 Predictions

The predictions for this experiment are similar to the predictions summarized in Table 9.6 on page 215.

However, notice that a syntactic approach like Tellier's (1991) (the hypothesis that extractions out of the subject with *dont* are an exception because *dont* is special compared to *de qui*) expects that the extraction out of the subject is not worse than the extraction out of the object, and expects no interaction between extraction type and syntactic function.

On the other hand, if we reproduce in this experiment the disadvantage against extractions out of the subject, then it could be an indication that the results of Experiment 5 are due to the animate antecedent.

9.3.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was exactly similar to the procedure of Experiment 5. Participants had to rate the sentences on a Likert-scale from 1 to 10, 1 being labeled as "bad" and 10 being labeled as "good". After each sentence, participants had to answer a comprehension question.

The experiment took approximately 20 minutes to complete. We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

9.3.4 Participants

The study was run between August and September 2017. 28 participants took part in the experiment. We present here the analysis made on the answers of the 25 participants who satisfied all criteria.[8] The 25 participants are 18 to 71 years old. 15 participants self-identify as women, 10 self-identify as men. Four participants (16%) indicated having an educational background related to language.

9.3.5 Results and analysis

Figure 9.12 on page 224 gives an overview of the results of the Acceptability Judgment task.[9] All experimental conditions are very high: an average rating

[8]To calculate accuracy, we excluded not only the answers to comprehension questions of the practice items, but also one series of distractors that have an overall accuracy rate of 75% only (the same distractors that had been mentioned in the previous experiment).

[9]We have the same typo than in Experiment 5, and for this reason we exclude again the whole item from the results and treat it as a distractor. The results we are giving here are therefore

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

of 9.10 for extraction out of the subject (9.17a), of 8.73 for extractions out of the object (9.17b), of 8.60 for the subject control (9.18a) and of 8.67 for the object control (9.18b).

Figure 9.12: Acceptability judgments for each condition of Experiment 6. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

However, it seems very clear that we have ceiling effects in all conditions, and this is corroborated by Figure 9.13 on page 224. The zROC curves in Figure 9.14 on page 225 also show that the distribution is not normal, because the lines are far from being straight.

Figure 9.13: Density of the ratings across conditions for Experiment 6

The by-participant ratings for the extraction conditions are represented on Figure 9.15 on page 226: we can see clearly that a large proportion of the participants gave the maximum rating for the extractions conditions, regardless of the syntactic function.

based on 19 experimental items.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.14: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 6.

9.3.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 9.16 on page 226. Like in the previous experiment, the extractions conditions show a stronger habituation effect than the non-extraction conditions, but with no strong difference between extractions out of subjects and extractions out of objects.

9.3.5.0.2 Comparing the subextraction from subject with the subextraction from object We present here the results of two models. However, we have to bear in mind that the distribution is not normal, as shown above. The results are therefore not very reliable.

We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for fixed effect and covariate grouped by participants and items. The results of the model are reported in Table 9.9. There is not significant difference between the two extraction.

In a second model, we compare the subextraction with the non-extraction. We fit a model crossing syntactic function and extraction type (mean centered with

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.15: Acceptability judgments for the extraction conditions (out of subjects and out of objects) for each participant of Experiment 6. The blue box-and-whisker plots indicate the first and third quartiles of the results. Black points are mean ratings, and blue points are outliers.

Figure 9.16: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 6 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 9.9: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.070	0.324	-0	0.8286	1.07
Trial	0.024	0.018	1	0.1717	1.02

extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 9.10. There is a significant main effect of trial (habituation), but no other significant effect. Figure 9.17 on page 227 gives a representation of the interaction: we see a weak tendency toward an interaction effect. Furthermore, if we compare the AUC, the difference is not significant either.

Table 9.10: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.201	0.201	-1	0.3193	1.22
extraction	0.132	0.271	0	0.628	1.14
Trial	0.023	0.007	3	p<.005	1.02
syntactic function:extraction	-0.009	0.206	-0	0.9664	1.01

Figure 9.17: Interaction between syntactic function and extraction type in the Experiment 6.

9.3.6 Discussion

Experiment 6 is really problematic, because results for all conditions are very high. We can see ceiling effects (Figures 9.12 and 9.13), and visual cues of a non-normal distribution (Figure 9.14). The results of the models do not show main

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

effect of interaction effects of the syntactic function or of the extraction type, but we cannot be sure of the results of models based on data that are not normally distributed. However, we see a main effect of habituation (model n°2): This fact shows that the model is powerful enough to identify some effects, even though the effect of habituation is not very strong (odd ratio of 1.02).

Therefore Experiment 6 fails to answer the question it was supposed to answer. That's the reason why we will adopt an alternative strategy for the next experiment.

9.4 Experiment 7: Acceptability Judgment study on *de qui* relative clauses with animate subject and object

In the experimental items of the Experiments 5 and 6, there is an animacy mismatch between the subject and the object of the relative clause. The main verb is a psych verb, with either a experiencer object (extraction out of the subject) or an experiencer subject (extraction out of the object), and the extraction always takes place out of the NP denoting the stimulus. The stimulus is always a quality noun, and therefore inanimate, while the experiencer is always animate.

In a Self-Paced Reading study, Gennari & McDonald (2008) tested object relative clauses. The verb of the relative clause was always a psych-verb also, and they used a design crossing extraction of the stimulus and of the experiencer with active and passive form following a 2*2 design. When the verb was in active form, the object was extracted, when the verb was in passive form, the subject was extracted. (9.19) gives an example of the material tested. Participants also had to answer a comprehension question, most of the time associated to the content of the relative clause.

(9.19) a. **Extraction of the experiencer (animate) + active**
The director that the movie pleased _ had received a prize at the film festival.

b. **Extraction of the stimulus (inanimate) + active**
The movie that the director watched _ had received a prize at the film festival.

c. **Extraction of the experiencer (animate) + passive**
The director that _ was pleased by the movie had received a prize at the film festival.

d. **Extraction of the stimulus (inanimate) + passive**

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The movie that _ was watched by the director had received a prize at the film festival.

A graphical representation of the reading times is given in Figure 9.18 on page 229. Gennari & McDonald find a significant effect of animacy on the reading time of zone 5, of zone 6 and of zone 7–9, such that extractions of the animate experiencer are longer to read than extractions of the inanimate stimulus. They also report a significant interaction on zones 7 to 9, such that extractions of the object experiencer are longer to read than extractions of the subject experiencer or extractions of the stimulus. These results correlated also with the results of comprehension questions: participants made more mistake in extractions of the object animate experiencer (69% accuracy on average) than in the other conditions (between 81% and 84% accuracy on average).

Figure 9.18: Residual reading times per word position in Gennari & McDonald's reading and comprehension study (Gennari & McDonald 2008: 171)

We can conclude from this experiment that animacy is a factor that has an impact on the processing of extractions. Gennari & McDonald (2008) have animacy mismatch between the subject and the object of the relative clauses (for the active forms), similar to the animacy mismatch we have in Experiments 5 and 6. In

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

these experiments, we do not have extractions of the inanimate object like Gennari & McDonald (2008), but extractions out of the inanimate object. However, the effect of animacy on subextractions from NP has never been studied as far as we know, and the interaction observed in Experiment 6 could be related to this factor.

That's the reason why, in this Experiment 7, we test *de qui* relative clauses again, but with both experiencer and stimulus being animate. The results of this study have already been published in Abeillé & Winckel (2020), but we did not have the opportunity to get into the details of the results in this publication.

9.4.1 Material and design

In Experiment 5, contrary to all experiments with *dont* relative clauses, extractions out of the NP were rated relatively low compared to the baseline. However, in Experiment 5, we had no ungrammatical baseline to see how degraded the subextraction is rated. That's why, for Experiment 7, we use a 2*3 design, i.e. a design very similar to Experiment 4. We compare extractions out of subjects (9.20a) with extractions out of objects (9.20b), and have for each one a non-extraction control with a coordination (9.20c) and (9.20d) and an ungrammatical control with the preposition *de* missing (9.20e) and (9.20f).

(9.20) a. **Condition subject + PP-extracted:**
J' ai pris un avocat, de qui l' associé aide mon cousin
I have taken a lawyer of who the associate helps my cousin
sans contrepartie financière.
without counterpart financial
'I took a lawyer of who the associate helps my cousin without financial compensation.'

b. **Condition object + PP-extracted:**
J' ai pris un avocat, de qui mon cousin aide l' associé
I have taken a lawyer of who my cousin helps the associate
sans contrepartie financière.
without counterpart financial
'I took a lawyer of who my cousin helps the associate without financial compensation.'

c. **Condition subject + noextr:**
J' ai pris un avocat, et l' associé de cet avocat aide
I have taken a lawyer and the associate of this lawyer helps

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

mon cousin sans contrepartie financière.
my cousin without counterpart financial
'I took a lawyer and the associate of this lawyer helps my cousin without financial compensation.'

d. **Condition object + noextr:**
J' ai pris un avocat, et mon cousin aide l' associé de
I have taken a lawyer and my cousin helps the associate of
cet avocat sans contrepartie financière.
this lawyer without counterpart financial
'I took a lawyer and my cousin helps the associate of this lawyer without financial compensation.'

e. **Condition subject + ungrammatical:**
J' ai pris un avocat, qui l' associé aide mon cousin
I have taken a lawyer who the associate helps my cousin
sans contrepartie financière.
without counterpart financial
'I took a lawyer who the associate helps my cousin without financial compensation.'

f. **Condition object + ungrammatical:**
J' ai pris un avocat, qui mon cousin aide l' associé
I have taken a lawyer who my cousin helps the associate
sans contrepartie financière.
without counterpart financial
'I took a lawyer who my cousin helps the associate without financial compensation.'

Because both subject and object are animate, we can use the same verb in all conditions. Many of the verbs of the relative clause are psych-verbs (e.g. *effrayer* 'scare') but not all verbs (e.g. *aider* 'help'). Subject and objects NP expressed relational (e.g. *cousin* 'cousin', *associé* 'associate'). Complements of relational nouns are highly relevant in the sense of Chaves (2012: Section 3.1.2) because the existence of the referent they denote is presupposed by the relational noun: one can only be "cousin" with respect to someone else. For the NP that should not be interpreted as bearing the gap, there is always the possessive determiner *mon/ma* ('my').

We tested 20 items, each declined in the six conditions already described. In addition, the experiment had 24 distractors. Around 1/3 of the items and distractors

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

are followed by a comprehension question. The item presented here as an example was followed by the comprehension question *Cet avocat a-t-il un associé ?* ('Does this lawyer have an associate?').

9.4.2 Predictions

The change of animacy is not expected to have any impact on the outcome of subject island structures. Therefore, the predictions are the same that are summarized in Table 9.6 on page 215.

9.4.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous acceptability judgment tasks (see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good". After some sentences, participants had to answer a comprehension question.

The experiment took approximately 20 minutes to complete. The participants received no financial reward for taking part in the experiment. We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

9.4.4 Participants

The study was run between September and October 2018. 35 participants took part in the experiment. We present here the analysis made on the answers of the 26 participants who satisfied all criteria.[10] The 26 participants are 18 to 75 years old. 19 participants self-identify as women, six self-identify as men. Five participants (20%) indicated having an educational background related to language.

9.4.5 Results and analysis

Figure 9.19 on page 233 gives an overview of the results of the Acceptability Judgment task.[11] In the subextraction conditions, the extraction out of the subject

[10]To calculate accuracy, we excluded not only the answers to comprehension questions of the practice items, but also the extractions out of the object that have an overall accuracy rate of 69% only.

[11]We involuntarily introduced a typo on one condition of one experimental item, and for this reason we exclude the whole item from the results and treat it as a distractor. The results we are giving here are therefore based on 19 experimental items.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(9.20a) has an average rating of 5.15, slightly higher than extraction out of the object (9.20b) that has an average rating of 4.64. The control conditions without extraction receive overall better acceptability judgements: the subject condition (9.20c) has an average rating of 7.90, and the object condition (9.20d) 7.65. The ungrammatical controls have lower ratings: the subject condition (9.20e) has an average rating of 3.53, and the object condition (9.20f) 3.41.

Figure 9.19: Acceptability judgments for each condition of Experiment 7. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 9.19 suggests potential ceiling effect, but only on the non-extraction conditions. There is also a possible floor effect for the ungrammatical controls. We have a confirmation that *de qui* extractions out of NPs are judged in the middle of the scale, contrary to *dont* extractions. The distribution of the ratings is illustrated by Figure 9.20 on page 234: we observe a clear ceiling effect for the non-extraction conditions and a small floor effect for the ungrammatical controls. The object ungrammatical controls may have a small bimodality, with some items rated relatively high in the scale. The subextraction conditions show no ceiling or floor effect, but the ratings do not seem really normally distributed either, the curve being relatively flat. Looking at the z-scored ratings (z-score for each participant) in Figure 9.21 on page 234, we can see two peaks for both subextractions, suggesting a bimodality. For both subject and object subextraction, the peaks are situated on the right and left side of a z-score 0. Participants seem to either classify the subextractions on a subjectively high level or low level, but not in the middle of their scale.

Another representation of the results is given by the ROC and zROC curves of the results in Figure 9.22 on page 235. The ROC curves show that participants discriminate between ungrammatical baselines and the other conditions. Unsurprisingly, the discrimination is stronger for the non-extractions conditions than for the subextraction conditions. The zROC curves are not very straight, which

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.20: Density of the ratings across conditions for Experiment 7

Figure 9.21: Density of the z-transformed ratings across conditions for Experiment 7

corroborates what we saw on 9.20. Several conditions seem to have a bimodal distribution.

The ROC and zROC curves in Figure 9.23 on page 236 show the discrimination between the subject and object conditions. The ROC curves show that the participants hardly discriminate between the subject and object conditions, but there seems to be a slight preference for the subject conditions (cuves below the baseline). The zROC curves are relatively straight.

9.4.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 9.24 on page 236. The non-extraction condition do not display any habituation effect. The subextraction conditions show however a strong habituation. The habituation is even stronger for the ungrammatical + subject control: this condition has very low rating at the beginning of the experiment, and receives ratings close to the extractions out of the object at the end of the experiment.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.22: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 7.

9.4.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for the fixed effect grouped by participants and items. The results of the model are reported in Table 9.11. There is a significant effect of the syntactic function, such that the subject condition gets ratings significantly higher than the object condition. There is also a significant effect of trial (habituation).

Table 9.11: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.353	0.153	-2	p<.05	1.42
trial	0.036	0.013	3	p<.005	1.04

In a second model, we compare the subextraction with the non-extraction. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and participants and items as random factors. The results of

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.23: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 7.

Figure 9.24: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 7 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the model are reported in Table 9.12. There is a significant main effect of syntactic function (in favor of the subject), of extraction type (in favor of the non-extraction controls) and of trial (habituation) but no interaction effect. If we compare the AUC (green and red curves on Figure 9.23 on page 236), the difference is not significant either. Figure 9.25 on page 237 gives an representation of the interaction: we see indeed that all line seem almost perfectly parallel (and may be perfectly parallel without the ceiling effect on the non-extraction conditions).

Table 9.12: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.225	0.112	-2	p<.05	1.25
extraction type	-1.316	0.134	-10	p<.001	3.73
trial	0.022	0.009	2	p<.05	1.02
syntactic function:extraction type	-0.079	0.110	-1	0.4747	1.08

Figure 9.25: Interaction between syntactic function and extraction type in the Experiment 7.

9.4.5.0.3 Comparing the subextraction from subject with the ungrammatical controls We fit a third model to compare the extractions out of the subject and the subject ungrammatical controls on their own (mean centered with subextraction coded positive and ungrammatical coded negative). We included trial number as covariate, and random slopes for the fixed effect grouped by participants and items. The results of the model are reported in Table 9.13. There is a significant effect of extraction type, such that the extraction out of the subject gets ratings significantly higher than its ungrammatical control. There is also a significant effect of trial (habituation).

In a fourth model, we compare the subextraction with the ungrammatical controls. We fit a model crossing syntactic function (mean centered with ob-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 9.13: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	1.381	0.262	5	p<.001	3.98
trial	0.058	0.016	4	p<.001	1.06

ject coded positive, subject coded negative) and extraction type (grammaticality). We included trial number as covariate, and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 9.14. There is a significant main effect of syntactic function (in favor of the subject), of extraction type (in favor of the extraction conditions) and of trial (habituation) but no interaction effect.

Table 9.14: Results of the Cumulative Link Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.265	0.122	-2	p<.05	1.30
extraction type	1.101	0.199	6	p<.001	3.01
trial	0.039	0.009	4	p<.001	1.04
syntactic function:extraction type	-0.120	0.116	-1	0.302	1.13

9.4.6 Discussion

In Experiment 5, extractions out of the subject receive lower ratings than extractions out of the object, with a significant interaction effect. In this experiment, extractions out of the subject receive higher ratings than extractions out of the object, but without interaction effect. The factor that changed between Experiment 5 and this experiment is the animacy mismatch between subject and object. Indeed, based on the experiment made by Gennari & McDonald (2008), we can see that extractions of the object are judged better when the object is inanimate and the subject animate than when the object is animate and the subject inanimate. This could indicate a general preference for a configuration in which the subject is animate and the object inanimate, a pattern very often observed for agentive verbs, and therefore very frequent. Extractions, because they involve processing difficulties, reveal this preference that is probably less strongly reflected on ratings for easier sentences, like our grammatrical controls. The significant difference that we see in Experiment 5 can therefore be explained as a superadditive effect resulting from the processing difficulty linked to extraction and the pro-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

cessing difficulty linked to the infrequent configuration (subject inanimate and object animate).

This explanation seems more adequate than an explanation based on the existence of a syntactic subject island: if the extraction out of the subject was indeed ungrammatical, its decrease of acceptability in Experiment 7 should be much stronger. The explanation based on a processing superadditive effect linked to complex subjects is not satisfactory either, because Experiment 7 should replicate the results of Experiment 5 if it was the case.

As far as Experiment 7 is concerned, the fact that extractions out of the subject have significantly better ratings than extractions out of the object is in contradiction with the expectations of most accounts (based on syntax and processing) that predict a superadditivity effect. The results also do not display the expected interaction effect. The fact that the extraction out of the subject is significantly better than an ungrammatical control is unexpected if subjects are syntactic islands.

Processing accounts based on memory costs expect that the extraction out of the subject has better acceptability judgments than the extraction out of the object, but they also expect a significant interaction, contrary to the FBC discourse-based account. The results of Experiment 7 do not falsify these two kinds of accounts.

Where does the significant difference between extraction out of the subject and extraction out of the object come from? Figure 9.26 on page 240 shows the ratings for each participant. Out of 25 participants, only five have a higher mean rating for extractions out of objects. But the difference between subject and object is not very large, and most participants give similar ratings to both: If we extract for each participant their mean rating for extractions out of object and their mean rating for extractions out of subject, the difference is on average 0.42 (standard deviation: 1.2). The participants' behavior is therefore relatively homogeneous.

There is a bit more variability between items. Three items show a strong preference for the extraction out of the object over the extraction out of the subject (i.e. the average rating for extractions out of the object is more than 2 points over the average rating for extractions out of the subject), like (9.21):

(9.21) a. **Condition subject + PP-extracted:**
J' ai un dentiste, de qui l' assistante aime bien ma mère
I have a dentist of who the assistant likes well my mother

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.26: Ratings of the subextraction conditions for each participant in the Experiment 7.

malgré ses plaintes continuelles.
despite her complaint perpetual
'I have a dentist, of who the assistant likes my mother despite her perpetual complaint.'

b. **Condition object + PP-extracted:**
J' ai un dentiste, de qui ma mère aime bien l' assistante
I have a dentist of who my mother likes well the assistant
malgré ses plaintes continuelles.
despite her complaint perpetual
'I have a dentist, of who my mother likes the assistant despite her perpetual complaint.'

Five other items show a strong preference for the extraction out of the subject over the extraction out of the object (i.e. the average rating for extractions out of the subject is more than 2 points over the average rating for extractions out of the object), like (9.22):

(9.22) a. **Condition subject + PP-extracted:**
Il y a ce collègue, de qui le stagiaire impressionne
it there has this colleague of who the trainee impresses

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

mon stagiaire pendant la préparation d' une conférence.
my trainee during the preparation of a conference
'There is this colleague, of who the trainee impresses my trainee during a conference preparation.'

b. **Condition object + PP-extracted:**
Il y a ce collègue, de qui mon stagiaire impressionne
it there has this colleague of who my trainee impresses
le stagiaire pendant la préparation d' une conférence.
the trainee during the preparation of a conference
'There is this colleague, of who my trainee impresses the trainee during a conference preparation.'

Most of the time however, the difference between the two conditions is small. I was not able to identify any clear parameter to account for the variability between items.[12]

In general, the preference for extractions out of the subject over extractions out of the object seems to be a general tendency, and not an effect created by some specific items or participants. The effect size is not big (model n°1 gives an odd ratio for the syntactic function of 1.42), as could be expected from an effect that reflects small processing preferences.

9.5 Experiment 8: Acceptability Judgment study on *dont* relative clauses with an animate antecedent and animate subject and object

We built Experiment 8 as a parallel experiment to Experiment 7, in order to make sure that the relative clauses tested in Experiment 7 have similar results when the relative word is *dont*.

9.5.1 Material and design

We use the same material and the same design than in Experiment 7, but with *dont* instead of *de qui* for the subextraction conditions. The ungrammatical control are built with *que*, similarly to Experiment 4.

[12] In (9.22), subject and object are the same noun, but this does not seem to play a role: There are several items that have the same noun for subject and object, and not all of them show a strong subject preference (one of them even shows a strong object preference).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(9.23) a. **Condition subject + PP-extracted:**
J' ai pris un avocat, dont l' associé aide mon cousin
I have taken a lawyer of.which the associate helps my cousin
sans contrepartie financière.
without counterpart financial
'I took a lawyer of which the associate helps my cousin without financial compensation.'

b. **Condition object + PP-extracted:**
J' ai pris un avocat, dont mon cousin aide l' associé
I have taken a lawyer of.which my cousin helps the associate
sans contrepartie financière.
without counterpart financial
'I took a lawyer of which my cousin helps the associate without financial compensation.'

c. **Condition subject + noextr:**
J' ai pris un avocat, et l' associé de cet avocat aide
I have taken a lawyer and the associate of this lawyer helps
mon cousin sans contrepartie financière.
my cousin without counterpart financial
'I took a lawyer and the associate of this lawyer helps my cousin without financial compensation.'

d. **Condition object + noextr:**
J' ai pris un avocat, et mon cousin aide l' associé de
I have taken a lawyer and my cousin helps the associate of
cet avocat sans contrepartie financière.
this lawyer without counterpart financial
'I took a lawyer and my cousin helps the associate of this lawyer without financial compensation.'

e. **Condition subject + ungrammatical:**
J' ai pris un avocat, que l' associé aide mon cousin
I have taken a lawyer that the associate helps my cousin
sans contrepartie financière.
without counterpart financial
'I took a lawyer that the associate helps my cousin without financial compensation.'

f. **Condition object + ungrammatical:**

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

J' ai pris un avocat, que mon cousin aide l' associé
I have taken a lawyer that my cousin helps the associate
sans contrepartie financière.
without counterpart financial
'I took a lawyer that my cousin helps the associate without financial compensation.'

The 20 experimental items were the same than in Experiment 7, but distractors were not. The experiment had 36 distractors, some of which were ungrammatical. Half of the experimental items and distractors were followed by a comprehension question. The item presented here as an example was followed by the comprehension question *Cet avocat a-t-il un associé ?* ('Does this lawyer have an associate?').

9.5.2 Predictions

The predictions for this experiment are similar to the predictions for the previous experiment. They are summarized in Table 9.6 on page 215.

9.5.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous acceptability judgment tasks (see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good". After some sentences, participants had to answer a comprehension question.

The experiment took approximately 20 minutes to complete. We recruited the participants through FouleFactory (https://www.foulefactory.com), and the participants were paid 5 € for their participation. The payment was not contingent on the participants' responses to the questions about native language or place of birth.

9.5.4 Participants

The study was run in October 2019. 61 participants took part in the experiment. I present here the analysis made on the answers of the 52 participants who satisfied all criteria.[13] The 52 participants are 23 to 73 years old. 29 participants

[13]To calculate accuracy, we excluded not only the answers to comprehension questions of the practice items and of the ungrammatical controls, but also of the ungrammatical distractors.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

self-identify as women, 22 self-identify as men. One participant (1.92%) indicated having an educational background related to language.

9.5.5 Results and analysis

Figure 9.27 on page 244 gives an overview of the results of the Acceptability Judgment task. In the subextraction conditions, the extraction out of the subject (9.23a) has an average rating of 7.68, higher than extraction out of the object (9.23b) that has an average rating of 6.14. The subject control condition without extraction (9.23c) has an average rating of 7.43, a bit lower than the extraction. The object control condition without extraction (9.23d) has an average rating of 6.55, a bit higher than the extraction. The ungrammatical controls have very low ratings: the subject condition (9.23e) has an average rating of 1.77, and the object condition (9.23f) 1.98.

Figure 9.27: Acceptability judgments for each condition of Experiment 8. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 9.27 suggests potential ceiling effect for the extraction and non-extraction conditions, but especially for the subject variant. There is also a possible floor effect for the ungrammatical controls. The ratings for *dont* relative clauses are again in this experiment very high, but participants seem to use the scale more widely than in Experiment 6. The distribution of the ratings is illustrated by Figure 9.28 on page 245: we see a clear floor effect for the ungrammatical controls, and some ceiling effects for the other conditions, but especially for the subject variants.

Another representation of the results is given by the ROC and zROC curves of the results in Figure 9.29 on page 245. The ROC curves show that participants discriminate between ungrammatical baselines and the other conditions. We observe that the lines group by syntactic function rather than by extraction type:

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.28: Density of the ratings across conditions for Experiment 8

the subject variants build larger curves than the object variants. The zROC curves are relatively straight and parallel to the baseline.

Figure 9.29: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 8.

The ROC and zROC curves in Figure 9.30 on page 246 show the discrimination between the subject and object conditions. The discrimination is almost non-existent for the ungrammatical controls, but more important for the two other conditions. The zROC curves are relatively straight and parallel to the baseline.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.30: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 8.

9.5.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 9.31 on page 246. We can see a slight decrease of the ratings during the experiment for the extractions out of subjects. Extractions out of objects in the contrary show a strong habituation effect. The habituation is also strong for the ungrammatical controls, but they remain very low during the whole experiment.

Figure 9.31: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 8 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.5.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for the fixed effect and covariate grouped by participants and items. The results of the model are reported in Table 9.15. There is a significant effect of the syntactic function, such that the subject condition gets ratings significantly higher than the object condition. There is also a significant effect of trial (habituation).

Table 9.15: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.818	0.146	-6	p<.001	2.27
trial	0.023	0.009	3	p<.01	1.02

We fit a second model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive), but this time crossing it with trial number. We added random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 9.16. The results are in line with model n°1, and there is no significant interaction between syntactic function and trial number.

Table 9.16: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-1.164	0.257	-5	p<.001	3.20
trial	0.015	0.007	2	p<.05	1.01
syntactic function:trial	0.013	0.007	2	0.0523	1.01

In a third model, we compare the subextraction with the non-extraction. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 9.17. There is a significant main effect of syntactic function (in favor of the subject), and of trial (habituation) and a significant interaction effect. Figure 9.32 on page 248 shows indeed that lines cross, even though the confidence intervals overlap. If we compare the AUCs (green and red curves on Figure 9.30 on page 246) however, the difference is not significant.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 9.17: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.686	0.120	-6	p<.001	1.98
extraction type	0.074	0.105	1	0.4828	1.08
trial	0.024	0.008	3	p<.005	1.02
syntactic function:extraction type	-0.195	0.099	-2	p<.05	1.21

Figure 9.32: Interaction between syntactic function and extraction type in the Experiment 8.

9.5.5.0.3 Comparing the subextraction from subject with the ungrammatical controls We fit a fourth model to compare the extractions out of the subject and the subject ungrammatical controls on their own (mean centered with subextraction coded positive and ungrammatical coded negative). We included trial number as covariate, and random slopes for the fixed effect and covariate grouped by participants and items. The results of the model are reported in Table 9.18. There is a significant effect of extraction type (grammaticality), such that the extraction out of the subject gets ratings significantly higher than its ungrammatical control. There is no significant effect of trial.

Table 9.18: Results of the Cumulative Link Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	3.140	0.351	9	p<.001	23.11
trial	0.013	0.009	1	0.1618	1.01

In a fifth model, we compare the subextraction with the ungrammatical controls. We fit a model crossing syntactic function (mean centered with object coded positive, subject coded negative) and extraction type (grammaticality). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

in Table 9.19. There is a significant main effect of syntactic function (in favor of the subject), of extraction type (in favor of the extraction conditions) and of trial (habituation). There is also a significant interaction.

Table 9.19: Results of the Cumulative Link Mixed Model (model n°5)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.358	0.096	-4	p<.001	1.43
extraction type	2.529	0.270	9	p<.001	12.54
trial	0.016	0.006	3	p<.05	1.02
syntactic function:extraction type	-0.456	0.097	-5	p<.001	1.58

9.5.6 Discussion

The results of Experiment 8 are generally in line with the results of Experiment 7. The general advantage for the subject variants is confirmed (main effect of syntactic function in model n°3 and n°5). This is surprising given that complex subjects are claimed to be dispreferred compared to complex objects, especially with transitive verbs (Kluender 2004).

Participants rate extractions out of the subject significantly better than extractions out of the object in this experiment. This is again in contradiction with what we might expect from a subject island.

Whether extractions out of the object are more difficult to process is not very clear. We find a significant interaction in model n°3, but the more conservative method of comparing the AUCs does not give a significant difference.

We can find again some variability between participants and between items. No item shows a strong preference for the extraction out of the object over the extraction out of the subject, but many items show a strong preference for the extraction out of the subject over the extraction out of the object (i.e. the average rating for extractions out of the subject is more than 2 points over the average rating for extractions out of the object). These items are however not necessarily the same items that show a strong preference for the extraction out of the subject in Experiment 7. I conclude that there is no evidence that some items are biased toward one or the other subextraction, and that the variation between items is probably random.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.6 Experiment 9: Self Paced Reading study on *de qui* relative clauses with an animate antecedent and animate subject and object

This experiment is an online study variant of Experiment 7. Our goal is to see how participants process subextractions from subjects and objects.

9.6.1 Material and design

We used in Experiment 9 similar material (and the same distractors) as in Experiment 7.[14] We made some small changes in the material in order to avoid repetition inside the same sentence (e.g. *de qui les étudiants étonnent mes étudiants* 'of who the students astonish the students') and in order to have both subject and object noun of the same length (with +/- one character). Like in Experiment 7, we compare extractions out of subjects (9.24a) with extractions out of objects (9.24b), and have for each one a non-extraction control with a coordination (9.24c) and (9.24d) and an ungrammatical control with the preposition *de* missing (9.24e) and (9.24f). We present here in square brackets the words that have been presented together on the screen (8 zones):

(9.24) a. **Condition subject + PP-extracted:**
[J' ai pris]$_1$ [un avocat]$_2$ [de qui]$_3$ [le confrère]$_4$ [aide]$_5$ [mon parrain]$_6$ [sans]$_7$ [contrepartie]$_8$.
I have taken a lawyer of who the colleague helps my godfather without counterpart
'I took a lawyer of who the colleague helps my godfather without compensation.'

b. **Condition object + PP-extracted:**
[J' ai pris]$_1$ [un avocat]$_2$ [de qui]$_3$ [mon parrain]$_4$ [aide]$_5$ [le confrère]$_6$ [sans]$_7$ [contrepartie]$_8$.
I have taken a lawyer of who my godfather helps the colleague without counterpart
'I took a lawyer of who my godfather helps the colleague without compensation.'

c. **Condition subject + noextr:**

[14] More exactly, Experiment 7 was intended as a calibration study for the Self Paced Reading experiment 9.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

[J' ai pris]$_1$ [un avocat]$_2$ [et]$_3$ [son confrère]$_4$ [aide]$_5$ [mon parrain]$_6$ [sans]$_7$ [contrepartie]$_8$.
I have taken a lawyer and his colleague helps my godfather without counterpart
'I took a lawyer and his colleague helps my godfather without compensation.'

d. **Condition object + noextr:**
[J' ai pris]$_1$ [un avocat]$_2$ [et]$_3$ [mon parrain]$_4$ [aide]$_5$ [son confrère]$_6$ [sans]$_7$ [contrepartie]$_8$.
I have taken a lawyer and my godfather helps his colleague without counterpart
'I took a lawyer and my godfather helps his colleague without compensation.'

e. **Condition subject + ungrammatical:**
[J' ai pris]$_1$ [un avocat]$_2$ [qui]$_3$ [le confrère]$_4$ [aide]$_5$ [mon parrain]$_6$ [sans]$_7$ [contrepartie]$_8$.
I have taken a lawyer who the colleague helps my godfather without counterpart
'I took a lawyer who the colleague helps my godfather without compensation.'

f. **Condition object + ungrammatical:**
J' ai pris un avocat, qui mon parrain aide le confrère sans contrepartie.
I have taken a lawyer who my godfather helps the colleague without counterpart
'I took a lawyer who my godfather helps the colleague without compensation.'

Around 1/3 of the experimental items and distractors are followed by a comprehension question.

9.6.2 Experimental method

Self-Paced Reading studies are online experiments. This method was first introduced by Just et al. (1982). Like in Eye-Tracking experiments, the underlying assumption in Self Paced Reading studies is that participants' reading pace slows down (and hence their reading time increases) when participants are having difficulties to process a chunk of sentence. The methodology is therefore comparable to Eye-Tracking experiments, but the data collected is less diverse.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

In a Self-Paced Reading experiment, parts of the sentence (or text) are presented one at a time on the screen. The participants establish themselves the reading pace by pressing a key or button to get from one region to the next. Contrary to Eye Tracking experiments (Section 8.4), participants cannot compensate memory difficulties by coming back to the filler. Difficulties in retrieving the filler's information, difficulties of integration, or difficulties with an improbable gap site are assumed to be reflected in reading times.

9.6.3 Predictions

In general, all accounts assume that subextractions induce more processing costs than non-subextraction. Therefore, when comparing the extraction conditions (9.24a) and (9.24b) and the non-extraction conditions (9.24c) and (9.24d), we expect to see a penalty for (9.24a) on the reading times for the subject (even though we will see that there is one exception to this prediction) and a penalty for (9.24b) on the reading times for the object. .

The predictions in terms of reading times from accounts that expect a penalty for extracting out of the subject are not completely clear. Syntactic approaches assume that the participant do not attempt to posit a gap inside the subject, because they knows that it is an infelicitous position for a gap. Processing accounts based on subject complexity also assume that the participants do not attempt to posit a gap inside the subject, because a gap in this position is unexpected (e.g. because complex subjects are not frequent and therefore not expected if we follow Kluender 2004). But this can lead to two different scenarios.

The first scenario is the following: The (participant's) parser is surprised to find a gap in the subject that it did not anticipate. The consequence is that reading times for extractions out of the subject increase more than reading times for extractions out of the object (interaction effect). In reference to Kenstowicz's (2001) notion of surprisal, I call this the "surprisal" scenario.

The second scenario is the following: The parser, when reading the subject, does not posit any gap inside the subject, because it is highly improbable. The consequence is that there is no increase of reading time for (9.24a) compared to (9.24c). This is the approach of Yoshida et al. (2014). The prediction is thus to see an interaction effect such that extraction out of the object (9.24b) has higher reading times than the other conditions (9.24a), (9.24c) and (9.24d). The processing difficulties caused by the subextraction from the subject may arise later in the sentence, at the end, when the parser is left with a filler that it was not able to integrate at any point, because *de qui* in (9.24a) cannot be the complement of

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the object noun and cannot be the complement of the verb. I call this the "giving up" scenario.

A processing account based on memory costs on the other hand assumes the following scenario: When encountering the filler, the parser anticipates a gap at the closest possible site, i.e. in the subject. In the condition with subextraction out of the subject (9.24a), this expectation is met. In the condition with subextraction out of the object (9.24b), the parser has to revise this prediction and posit another gap at the closest possible site. This results in filled-gap effects on the subject (see Section 3.1 about filled-gap effects). The consequence is that reading times for extractions out of the object increase more than reading times for extractions out of the subject in this region. I call this the "asap" scenario.

An account based on the FBC constraint expects no special behavior of subject subextractions compared to object subextractions. Therefore, reading times for extractions out of the object increase as much as reading times for extractions out of the subject. I call this the "nothing to report" scenario.

We will look at the results of the experiment and and see which scenario is closest to the observed pattern. However, it is important to notice beforehand that reading time data are very messy, and difficult to interpret. The predictions I just gave of the different scenarios are themselves debatable, because they are way too simple and cannot reflect every processing factors that we have to take into account when trying to explain the results. Most of the time, the results of Self Paced Reading experiments are first presented, and then the authors draw from the data a scenario of what could have been happening on a post hoc manner.

9.6.4 Procedure

We built 12 lists, using a Latin square design, such that each participant saw each item and distractor in only one condition. The items were pseudo-randomized, to avoid having two items in the same condition following each other, and two non-distractors following each other.

We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook). Participants could make an appointment per email. On the day of the experiment, they came to the experimental room of the Laboratoire de Linguistique Formelle (LLF) in the Université de Paris[15]. At least one investigator was present all the time during the experiment. Two Ph.D. students of the LLF participated as investigators on this experiment: Aixiu An and myself.

[15]When the experiment was run, the university was named Université Paris-Diderot – Paris VII.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

We conducted the experiment on the E-Prime experimental software (Psychology Software Tools, Pittsburgh, PA). Each participant was first welcomed by an investigator. The investigator explained shortly what would happen during the experiment. The participants received an information sheet in duplicate where each step of the experiment was precisely described. The information sheet also mentioned the financial retribution for their participation, and their right to stop the experiment at any moment without explanation required and still get the financial retribution. If they agreed to start the experiment they would give their signed consent at the end of the sheet. The participants kept one information sheet and the second one was given to the main investigator (myself). No link was made between the consent form and the experimental results, so that the results are anonymous.

The Self Paced Reading task could then begin. Participants sat in front of a computer. For every item, the sentence would appear on the screen, with all letters replaced by a placeholder. The participants would press the mouse button to make the words of the first zone appear, then press it again to make the words of the first zone disappear and the words of the second zone appear, and so on. At the end of the sentence, they would press the mouse button again to access the next step of the experiment. For about 1/3 of the items, a comprehension sentence would then appear, with two possible answers. Participants had to choose which answer was best, before proceeding to the next item. The participants were instructed to read the sentences on the screen as fast as possible but to take the time needed to understand the sentence.

At the end of the experiment, participants received 8 € as financial retribution and could ask questions if they wanted. The whole experiment took approximately 20 minutes to complete. Only one participant was present at a time in order to keep the room as quiet as possible.

9.6.5 Participants

The study was run between November 2018 and February 2019. 48 participants took part in the experiment. All participants were monolingual native speakers of French (this was a requirement of the recruitment announcement). 47 participants have more than 75% accuracy on the comprehension questions.[16] We give here the results based on these 47 participants.

[16]To calculate accuracy, we excluded the answers to comprehension questions of the practice items and of the ungrammatical conditions (9.24e) and (9.24f).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

9.6.6 Results and analysis

We excluded outliers for every zone: taking only the experimental items into account (i.e. ignoring practice items and distractors that have very different zones), we calculated each participant's mean and standard deviation and excluded reading times that are over 3 standard deviations from the mean; we also calculated for each condition the mean and standard deviation and excluded reading times that are over 3 standard deviations from the mean.

The distribution of the reading times is not normal, and we are using here for this reason the log-transformed reading times, that is more close to a normal distribution. The results in ms are log-transformed using the function `log()` under R (R Core Team 2018). We also often use the reading times by character (the total reading time of the zone divided by the number of characters) for the graphs.

Figure 9.33 on page 255 gives an overview of the reading times during the experiment. We can see that the non-extraction conditions are generally read

Figure 9.33: Average log-transformed reading times by character for each condition of Experiment 9
(Zones = 1: matrix clause; 2: antecedent; 3: relative phrase/coordination; 4: Subject; 5: Verb; 6: Object, 7: 1st part of AdvP, 8: 2nd part of AdvP)

more quickly than the extraction conditions, and the ungrammatical conditions are read more slowly. There is also more variation between conditions where the conditions actually differ from each other: zones 3 to 6. There is still some variation on zones 1 and 2, which can only be coincidental given that the participants saw the same words on the screen in every condition. We cannot draw any conclusion from the variation across extraction types on zone 3, which is probably an artefact of the important difference in length (e.g. *et* vs. *de qui*). On zone 4 (subject of the relative) and 5 (verb of the relative), the subject conditions are read longer than the object conditions (except for the ungrammatical control, where subject and object conditions are almost indistinguishable). On zone 6 (object of the relative) however, the reading times for the object conditions increase. We

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

see in this respect no obvious difference between subextraction and anaphoric binding (linking the possessive article to his antecedent). Figure 9.34 on page 256 gives a closer look at the zones 4, 5 and 6 in the non-extraction and subextraction conditions.

Figure 9.34: Average log-transformed reading times by character for the grammatical conditions of Experiment 9 (zones 4, 5 and 6 only) (Zones = 4: Subject; 5: Verb; 6: Object)

9.6.6.0.1 Effect of frequency We attributed a frequency value to the zone 4, 5 and 6 based on the frequency of the head noun for zone 4 and 6 and on the frequency of the verb for zone 5. The value of frequency is taken from lexique.org[17]. The distribution of the frequency is not normal, and we are using for this reason here the log-transformed frequency, that is more close to a normal distribution.

An overview of the effect of frequency on the different conditions is given in Figure 9.35 on page 257 (for the sake of clarity, we do not represent the ungrammatical controls). In general, we observe an impact of frequency on reading times: more frequent words are read more quickly. This effect seems stronger for the subject conditions (which have, as we have seen, longer reading times) than for the object conditions.

Looking only at the subextraction site (i.e. only the two subextraction conditions, and the reading times of zone 4 for the extraction out of subject and of zone 6 for the extraction out of object), we fit a first model crossing syntactic function (mean centered with subject coded positive and object coded negative) and log-transformed frequency. The variable to be explained are log-transformed reading times. We included characters (the number of characters of the zone), participants and items as random factors. The results of the model are reported in Table 9.20. There is a significant main effect of frequency, but no interaction

[17]The Lexique database was implemented by Boris New and Christophe Pallier. We used the frequency of the lemma, called `freqlemfilm2` and based on the frequency in French subtitles.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.35: Evolution of the reading times (log-transformed reading times by character) depending on the frequency (log-transformed frequency) for subextraction and non-extraction conditions of Experiment 9.

effect. The frequency effect is not significantly different in extraction out of the subject and extractions out of the object on the extraction site.

Table 9.20: Results of the Linear Mixed-Effects Model (model n°1)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	6.540	0.070	124.7	93	< 0.001	692.40
syntactic function	-0.046	0.051	266.9	-0.90	0.3689	1.05
frequency	-0.025	0.011	262.3	-2.28	0.0231	1.03
syntactic function:frequency	-0.001	0.011	265.9	-0.11	0.9128	1.00

9.6.6.0.2 Effect of extraction on extraction site Now looking at the subject (zone 4) in the subject conditions, we fit a second model to compare the extractions out of the subject with their non-extraction control (mean centered with subextraction coded negative and non-extraction coded positive). We included log-transformed frequency as covariate, and characters, participants and items as random factors. The results of the model are reported in Table 9.21. There is a significant main effect of frequency, but no effect of extraction type. Non-extractions are read more quickly, but not significantly more quickly, than the subextractions (for subjects).

We fit a third model to compare this time the extractions out of the object with its non-extraction control (mean centered with subextraction coded negative and non-extraction coded positive), i.e. on zone 6. We included log-transformed frequency as covariate, and characters, participants and items as random factors. The results of the model are reported in Table 9.22. There is no significant dif-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 9.21: Results of the Linear Mixed-Effects Model (model n°2)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	6.481	0.073	37.8	89	< 0.001	652.79
extraction type	-0.035	0.021	25.0	-2	0.1132	1.04
frequency	-0.033	0.013	21.4	-2	< 0.05	1.03

ference between the subextraction and its non-extraction control. Again, non-extractions are read more quickly, but not significantly more quickly, than the subextractions (for objects).

Table 9.22: Results of the Linear Mixed-Effects Model (model n°3)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	6.590	0.088	44.9	75	< 0.001	728.01
extraction type	-0.020	0.020	100.6	-1	0.3046	1.02
frequency	-0.026	0.015	19.2	-2	0.0967	1.03

9.6.6.0.3 Do reading times for extractions out of the subject increase more/less than reading times for extractions out of the object? ("surprisal" and "giving up" scenarios) In a fourth model, we compare the two extraction sites: zone 4 for extractions out of the subject and their non-extraction control, and zone 6 for extractions out of the object and their non-extraction control. We fit a model crossing syntactic function (mean centered with subject coded positive and object coded negative) and extraction type (mean centered with extraction coded positive and non-extraction coded negative). We included log-transformed frequency as covariate, and characters, participants and items as random factors. The results of the model are reported in Table 9.23. There is a significant main effect of syntactic function (such that objects are read more slowly), and a significant main effect of frequency. In line with models n°2 and n°3, there is no significant main effect of extraction type. There is also no significant interaction. Figure 9.36 on page 259 gives a representation of the interaction with only a small tendency toward an interaction effect.

9.6.6.0.4 Do reading times for extractions out of the object increase more than reading times for extractions out of the subject in zone 4? ("asap" scenario) In a fifth model, we compare on zone 4 the difference between the subextractions and their respective non-extraction controls. We fit a model crossing syn-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 9.23: Results of the Linear Mixed-Effects Model (model n°4)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	6.525	0.060	52.8	108	< 0.001	681.69
extraction type	-0.025	0.014	551.8	-2	0.0788	1.03
syntactic function	-0.064	0.014	556.7	-5	< 0.001	1.07
frequency	-0.028	0.009	18.0	-3	< 0.01	1.03
extraction type:syntactic function	-0.011	0.014	560.1	-1	0.4381	1.01

Figure 9.36: Interaction between syntactic function and extraction type on the respective extraction site in the Experiment 9. Reading times are indicated as log-transformed reading times by character.

tactic function (mean centered with subject coded positive and object coded negative) and extraction type (mean centered with extraction coded positive and non-extraction coded negative). We included log-transformed frequency as covariate, and characters, participants and items as random factors. The results of the model are reported in Table 9.24. There is a significant main effect of extraction type (such that subextractions are read more slowly), and a significant main effect of frequency. There is no significant main effect of extraction type, and no significant interaction. Figure 9.37 on page 260 gives an representation of the interaction: lines are perfectly parallel.

Table 9.24: Results of the Linear Mixed-Effects Model (model n°5)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	6.426	0.056	75.5	114	< 0.001	617.90
extraction type	-0.043	0.016	18.8	-3	< 0.05	1.04
syntactic function	0.014	0.013	373.8	1	0.2850	1.01
frequency	-0.023	0.008	44.9	-3	< 0.01	1.02
extraction type:syntactic function	0.007	0.013	507.3	1	0.5945	1.01

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 9.37: Interaction between syntactic function and extraction type on zone 4 (subject of the relative) in Experiment 9. Reading times are indicated as log-transformed reading times by character.

9.6.7 Discussion

Even though participants discriminate strongly between subextractions with *de qui* and their non-extraction controls, we cannot find any strong effect due to the subextraction itself in reading times (models n°2, n°3 and n°4). One possible explanation relies in our choice for the non-extraction control condition of a coordination with anaphoric binding (the possessive article). Keshev & Meltzer-Asscher (2019: 641) conducted an experiment on anaphoric binding, using Sprouse et al.'s superadditivity design for islands and their data showed a marginal interaction effect ($p = 0.08$). The retrieval costs for anaphoric binding may cancel out the costs of extraction in our design. On the contrary, in Experiment 7, the non-extraction controls are a complex NP with a non-anaphoric *de*-complement.

In Experiment 9, we unfortunately failed at finding any statistically significant evidence for any of the differences expected by the different scenarios. The reason may be that we are fronting the "nothing to declare" scenario, where, indeed, no difference is expected (except the difference between extraction and non-extraction just mentioned). The reason may however also be that the experiment does not have enough participants for the effects to lead to a significant result.

To conclude, none of the scenarios we have presented in the prediction section is falsified by the experiment. The less probable is however the "surprisal" scenario, given the tendency in Figure 9.36 that is opposite to the one predicted by this scenario.

What this experiment shows again is that, if there is any effect of subextractions out of the subject on reading times, then this effect has to be really subtle.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

10 Corpus studies on other relative clauses

10.1 Corpus study on *duquel*

10.1.1 Motivation

We have seen that *de qui* relative clauses have many extractions out of the subject, whereas *de qui* interrogatives have none. The filler *duquel* (lit. 'of the which') can also be used for extracting *de*-PPs. If the contrast between relative clauses and interrogatives is robust, we expect to find many extractions out of the subject in *duquel* relative clauses as well.

10.1.2 Procedure

We use the same corpus than for the previous corpus studies: Frantext (ATILF et al. Version décembre 2016). Because there is some good evidence that extracting out of the subject is neither a frequent usage, nor used to be more frequent, we looked only at texts in Frantext published between 2000 and 2013 (222 texts, about 13.3 million tokens).

The lemme *duquel* can be realized in four forms: *duquel* (masculin singular), *de laquelle* (feminin singular), *desquels* (masculin plural or masculin+feminin plural), *desquelles* (feminin plural). In Frantext, *duquel, desquels* and *desquelles* are tagged under the lemma "duquel", but *de laquelle* is tagged as two different lemmas 'de" and "lequel" (lit. 'the which'). For this reason, we ran two different queries, one looking for the lemma "duquel" and one looking for the words "de laquelle". In the following, we combine the results of the two queries as a single corpus study.

The two queries combined give 955 occurrences of *duquel*, that we annotated like in the previous corpus studies. The results confirm that *duquel* is mostly used in relative clauses, but show also that it is possible to use it in interrogatives. There are 941 relative clauses with an antecedent, seven direct and indirect questions and four *c'est*-clefts. The three remaining occurrences are noise, i.e. passages written in non-contemporary French.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The seven interrogatives (three direct questions and four indirect questions) are too few to draw any meaningful conclusion. Notice however that there are no extractions out of the subject (see Figure 10.1 on page 262).

Figure 10.1: Distribution of *duquel* interrogatives in Frantext 2000–2013[1]

The four *c'est*-clefts are all pied-piping cases like (10.1), where *de qui* is either the complement of a preposition or the complement of a noun complement of a preposition. The pied-piped PP is an adjunct with respect to the verb of the relative clause. All *c'est*-clefts but (10.1) are presentational.

(10.1) C' est le résultat du Congrès radical [à la suite
it is the result of.the congress radical at the following
duquel]$_i$ [Herriot, Sarraut, Queuille et Perrier ont
of.the.which Herriot Sarraut Queuille and Perrier have
démissionné $_{-i}$]. (Journal : 1928, Christian Lazard, 2012)
resigned
'It is the result of the Congress of the Radical Party following which Herriot, Sarraut, Queuille and Perrier resigned.'

The following section gives the results for the relative clauses.

[1]See page 133 for the confidence intervals (here three comparisons).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

10.1.3 Results and analysis

We exclude five relative clause without a gap and 11 verbless relative clauses. The distribution of the function of *de qui* for the remaining 925 relative clauses with an antecedent and a verb are given in Table 10.1 and represented in Figure 10.2 on page 263.

Table 10.1: Distribution of *duquel* relative clauses in Frantext 2000–2013

	Frequency	%
Verb	46	4.97
Noun		
Subject	7	0.76
Object	10	1.08
Predicate	2	0.22
Cplt of Preposition	567	61.30
Adjective	4	0.43
Preposition	286	30.92
Adjunct	3	0.32

Figure 10.2: Distribution of *duquel* relative clauses in Frantext 2000–2013[2]

[2]See page 133 for the confidence intervals (here eight comparisons).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Duquel relative clauses differ a lot from *de qui* relative clauses. Here, pied-piping cases are used almost exclusively (more than 90% of the occurrences). Even when *duquel* is the *de*-complement of a subject or object noun, the whole NP is sometime pied-piped, as illustrated in example (10.2). This phenomenon, very common in English, is in French stylistically marked, but possible. Notice that both examples are from the same author, and my subjective impression is that both relative clauses (especially 10.2a), unlike the relative clauses cited so far, are close to unfelicitous.

(10.2) a. une publication traînante autour de mon lit où un film
a work lying around of my bed where a movie
avec cet acteur, [la tête duquel]$_i$ [$__i$ était reproduite], que
with this actor the head of.the.which was reproduced that
je reconnus (La dissolution, Jacques Roubaud, 2008)
I recognized
'a work lying under my bed where a film with this actor, the head of which was reproduced, I recognized it/him(?)'

b. j' ai switché un moment dans la lignée temporelle, moment
I have switched a moment in the line timely moment
[la durée duquel]$_i$ [je ne peux préciser $__i$] (La
the duration of.the.which I NEG can specify.INF
Bibliothèque de Warburg : version mixte, Jacques Roubaud, 2002)
'I switch for a moment in the time-line, a moment the duration of which I can't specify.'

Extractions out of NPs are in general very rare with *de quel* + N, so that a quantitative analysis is not very appropriate in this case. Extractions out of the subject are however attested, as well as extractions out of the object. Extractions out of the predicate is the only kind of extraction that is not significantly more frequent than zero.

There are six extractions out of a subject NP. Five of them are from Anne-Marie Garat, among which three are subjects of transitive verbs, like (10.3).

(10.3) ce livre sans images, carte ni gravure [...], duquel [la
this book without illustration map nor engraving of.the.which the
reliure _] tache les doigts de moisissure et [les feuilles _] sentent
binding stains the finders of mold and the pages smell
l' amande amère (La Première fois, Anne-Marie Garat, 2013)
the almond bitter

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

'this book without any illustration, map or engraving, whose binding stains the fingers with mold and whose pages smells like bitter almond'

The last one is a long-distance dependency with an extraction out of the subject of an embedded question. Hence, it is a violation of two alleged islands: subject island and wh-island.

(10.4) l' ordinateur de plastique tout neuf, duquel$_i$ il vous avait
the computer of plastic all new of.the.which he you.DAT had
demandé [à quoi servaient [les prises de branchement $__i$, là ,sur
asked at what are.used the plugs of connection there on
le côté]] (Mécanique, François Bon, 2001)
the side
'the brand new plastic computer, of which he had asked you what the connection plugs there on the side were good for'

Other extractions out of the subject are attested in this corpus, even though not directly reflected by Table 10.1 and Figure 10.2. Example (10.5) is an extraction out of a subject, even though *duquel* is not directly a complement of the subject noun (it is annotated as complement of a noun complement of a preposition).

(10.5) la poubelle du verre usagé, [au sujet de laquelle]$_i$
the trash of.the glass used at.the subject of the.which
circula [une pétition $__i$ de riverains ulcérés] (Programme sensible,
circulates a petition of residents upset
Anne-Marie Garat, 2012)
'the glass recycle bin, about which a petition of upset residents circulated'

Notice however, that *au sujet de laquelle* in (10.5) could also potentially be analysed as an adjunct:

(10.6) Une pétition de riverains ulcérés circule [au sujet de
a petition of residents upset circulates at.the subject of.the
la poubelle de verre usagé].
trash of the glass used
'A petition of upset residents circulated about the glass recycle bin.'

It is not the case for example (10.7), an extraction out of a infinitival subject (even though *duquel* is annotated as complement of a preposition).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(10.7) une vieillesse tissée de filaments du passé [au - devant
an old.age woven of filament of.the past at.the ahead
duquel]$_i$ [revenir $_{-i}$] fatigue. (Pense à demain, Anne-Marie
of.the.which come.back.INF tires
Garat, 2010)
'An old age woven with filament from the past ahead of which coming back is tiring' (intended: It is tiring to come back ahead to your own past.)

10.1.3.0.1 Subject position Figure 10.3 on page 266 shows the proportion of

Figure 10.3: Proportion of subject-verb inversion in *de qui* relative clauses

postverbal subjects in the *duquel* relative clauses. The distribution is similar than for *de qui*: Postverbal subject are frequent when *duquel* is a verb complement or in pied-piping structures, but there are some extractions out of an inverted subject (even though this inversion increases the distance between the filler and the gap).

10.1.3.0.2 Other factors As already mentioned, there are not enough extractions out of the subject (and in general not enough non-pied-piping structures) to make any meaningful comparison. It is for example not possible to compare the different types of verbs, but extractions out of the subject of transitive verbs are attested, cf. example (10.3).

Notice on Figure 10.4 on page 267, which shows the numerus and definiteness of the antecedent and the restrictiveness of the relative clauses, that most of the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

extractions out of the subject are non-restrictive. It is also the case for extractions of the complement of the verb, but not for other extractions out of NPs.

Figure 10.4: Numerus and definiteness of the antecedent and restrictiveness of *duquel* relative clauses

Figure 10.5 on page 267 illustrates the different semantic relations holding be-

Figure 10.5: Filler relation to noun in extractions out of subjects and out of objects[3]

tween the filler and the head noun, and their proportions, comparing extractions

[3]See page 133 for the confidence intervals (here three comparisons for subjects and five com-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

out of the subject and out of the object. Even though we have very few occurrences (hence the very large confidence intervals), the frequent relations found in *de qui* relative clauses are attested: part-of-whole for extractions out of the subject and patient for extractions out of the object.

10.1.4 Conclusion

The filler *duquel* seems to be used almost exclusively (more than 90% of the time) for pied-piping. Exactly like *de qui* relative clauses, the usage for extractions out of NPs seem to be stylistically marked (it is used only by a very small subset of authors), except the usage in pied-piping constructions.

There are however some attested extractions out of the subject, in a proportion similar to the extractions out of the object. Both have a frequency significantly above zero. There is therefore no strong evidence in favor of the "subject island" hypothesis. On the contrary, the data show that extractions out of the subject are possible in spontaneous production, and not rarer than extractions out of the object. There are not only extractions out of the subject NP, but also long distance dependencies and one extraction out of an inverted subject.

We can also find one attested example of an extraction out of an infinitival subject. Of course, one data point is not much of an evidence, but corpus studies are probably not the good methodology to investigate infinitival and sentential subjects, that are already a rare phenomenon. I come back to infinitival sentential subjects in Sections 13.1 and 13.2 with two experimental studies.

The results of the corpus study on relative clauses with *de qui* tell us therefore more about extractions out of subjects than this corpus study, but *duquel* relative clauses do not contradict the previous findings.

10.2 *Avec* + *wh-* in Frantext

10.2.1 Motivation

All previous corpus studies in this section deal with the extraction of *de*-PPs, and especially with *de*-PPs complements of subject head nouns. We showed that extraction out of subjects are attested (and frequent) in relative clauses, and not attested in questions.

It has however been argued that the relative word in such relative clauses is not extracted from the subject, but is instead a sort of hanging topic (Jurka

parisons for objects). The percentage is given for each group (extraction out of the subject on one hand, other extraction on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

2010, Uriagereka 2012). Following such analysis, *de*-PPs are good candidates for being topics because the relation they express is imprecise and can thus be an "aboutness" relation. If this is true, then other prepositions with a more specific semantic content should not show the same pattern than *de qui*, *duquel* or *dont* in our corpus, and be more similar to interrogatives.

For this reason, we conducted a last corpus study on *avec* ('with') + *wh-*. Its use should be more restricted than for the previous relative and *wh*-words, because it is a potential complement for only a small set of nouns. We thus expect to have less occurrences overall. The aim of this corpus study is to see if we find the same pattern with *avec* + *-wh* than with *de qui* (i.e. extractions out of the subject in relative clauses, with a frequency similar to the frequency of extractions out of the object, and no attested extraction out of the subject in interrogatives).

10.2.2 Procedure

We again used Frantext 2000–2013 to run our query. Because we expect a low frequency of *avec* + *wh* overall, we ran several queries: we looked for *avec qui* ('with who'), for *avec quoi* ('with what'), and for the lemmas *avec lequel* ('with which') (and thus its feminine and plural derivates *avec laquelle, avec lesquels* and *avec lesquelles*). In the following, we combine the results of these three queries as a single corpus study.

There are in total 1058 occurrences of *avec* + *wh-*, that we annotated like in the previous corpus studies.[4] We identified 930 relative clauses with an antecedent, five free relatives, 100 direct and indirect questions and eight *c'est*-clefts. The 15 remaining occurrences are noise, i.e. *qui* free relatives like (10.8a), and free choice uses like (10.8b).

(10.8) a. Je veux pouvoir danser jusqu' à l' aube et dormir avec
I want can.INF dance.INF until at the dawn and sleep.INF with
[qui me plaît] [...]. (Qu'as-tu fait de tes frères ?, Claude
who me.ACC appeal
Arnaud, 2010)
'I want to be able to dance until dawn and sleep with whom I like.'

[4]Esma Tanis, a student auxiliary in the research program "Long-distance Dependencies in French: Comparative Analyses (HPSG and the Minimalist Program)", helped with the annotation.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. Je déteste me fâcher avec [qui que ce soit]. (Ceux qui savent
I hate REFL quarrel with who that it it
comprendront, Anna Gavalda, 2000)
'I hate quarreling with whoever it might be.'

I will first present the results for the relative clauses, and then the results of interrogatives and *c'est*-clefts.

10.2.3 Results and analysis for relative clauses

We exclude two gapless relative clauses and one verbless relative clause (a fragment) from the results presented in this section. For the remaining 927 relative clauses, the distribution of *avec* + *wh-* is given in Table 10.2 and represented in Figure 10.6 on page 271.

Table 10.2: Distribution of *avec* + *wh-* relative clauses in Frantext 2000–2013

	Frequency	%
Verb	334	36.03
Noun		
Subject	15	1.62
Object	72	77.77
Predicate	32	3.45
Adjective	20	2.16
Adjunct	454	48.98

Avec + *wh-* can thus be complement of a verb (10.9), of a noun (10.10) or of an adjective (10.11), or be an adjunct (10.12).

10.2.3.0.1 An example of *avec* + *wh-* as verb complement:

(10.9) Le jeune homme [avec qui]$_i$ [elle avait « fauté » $_{-i}$] ne devait
the yound man with who she had sinned NEG must.PAST
pas être beaucoup plus âgé. (Retour à Reims, Didier Eribon, 2009)
not be.INF much more old
'The yound man with who she had "sinned" was probably not much older.'

[5]See page 133 for the confidence intervals (here six comparisons).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 10.6: Distribution of *avec* + *wh*- relative clauses in Frantext 2000–2013[5]

10.2.3.0.2 Examples of *avec* + *wh*- as noun complement:

(10.10) a. **Subject noun:**
Pas la même chose d' avoir son beau-frère pour patron
not the same thing of have.INF his brother-in-law for boss
plutôt que quelqu'un [avec lequel]$_i$ [aucun lien $_{-i}$] n'
instead that someone with the.which no link exists
existe ! (L'arrivée de mon père en France, Martine Storti, 2008)

'(It is) not the same thing to have your brother-in-law as a boss instead of someone with whom no link exists!'

b. **Object noun:**
Pourquoi ai - je choisi cette ville, [avec laquelle] je n'
why have I chosen this city with the.which I NEG
avais [aucune attache familiale $_{-i}$] ? (Impératif catégorique :
had no attachment familial
récit, Jacques Roubaud, 2008)

'Why did I choose this city, with which I had no family attachment?'

c. **Predicate:**

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Tel était l' avis de Samira, [avec laquelle]$_i$ Fatoumata était
so was the opinion of Samira with the.which Fatouma was
[en total désaccord $_i$]. (Ils sont votre épouvante et vous
in complete disagreement
êtes leur crainte, Thierry Jonquet, 2006)

'This was the opinion of Samira, with which Fatouma was completely at odds.'

10.2.3.0.3 An example of *avec* + *wh-* as adjective complement:

(10.11) Ce qui est refoulé, c' est [...] ce [avec quoi]$_i$ il est [relié $_i$] [...].
it who is repressed it is it with what he is linked
(Fenêtres, Jean-Bertrand Pontalis, 2000)

'The repressed, it's that with which he is linked.'

10.2.3.0.4 Examples of *avec* + *wh-* as an adjunct:

(10.12) a. Il passait ses nuits [...] à manipuler un énorme et
he spent his nights at manipulate.INF a hudge and
antique poste de radio [avec lequel]$_i$ [il écoutait les ondes
ancient station of radio with the.which he listened the waves
révolutionnaires du monde entier $_i$]. Tigre en papier, Olivier
revolutionary of.the world whole
Rolin, 2002)

'He spent his nights manipulating a hudge and ancient radio station with which he listened the revolutionary waves from the whole world.'

b. Michel Dalberto, [avec qui]$_i$ [j' allais à l' école enfant $_i$], a
Michel Dalberto with who I went at the school child has
donné un premier récital de piano remarqué [...]. (Qu'as-tu fait
given a first concert of piano notable
de tes frères ?, Claude Arnaud, 2010)

'Michel Dalberto, with who I went to school as a child, gave a notable first piano concert.'

c. Et quand Camille s' étonnait de la rapidité [avec laquelle]$_i$
and when Camille REFL wonder of the rapidity with the.which
[ils s' étaient engagés $_i$], ils la regardaient
they REFL were engaged they her.ACC looked

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

bizarrement. Ensemble, c'est tout, Anna Gavalda, 2004)
weirdly
'And when Camille wondered about the rapidity with which they engaged, they looked at her weirdly.'

The first noticeable difference between *de*-PP and *avec*-PP is that the latter is mostly used as an adjunct. Indeed, *avec* ('with') is often used either to introduce an instrumental (10.12a), an co-attendant to the event (10.12b), or to introduce an adverbial of manner (10.12c).

The second noticeable difference is that there are few extractions out of the NP: 12.83% of the relative only are an extraction out of a NP.[6] Also, it is the first corpus results that shows a significantly fewer proportion of extractions out of a subject NP compared to extractions out of an object NP (the confidence intervals do not overlap).

For extractions of *de*-PPs, the most common usage in relative clauses was to extract out of the subject NP. It is not the case here for extractions of the *avec*-PP. However, the frequency of the extractions out of subjects is significantly above zero, not significantly lower than extractions from predicates or adjectives (that have never been claimed to be islands to extractions). Notice also, as illustrated by Figure 10.7 on page 274, that, if we only look at nominal subjects (i.e. the subjects out of which extraction is possible), there are more extractions out of the subject than out of the object or the predicate[7].

Avec-PP are, as expected only complement to a small subset of nouns. For extractions out of subjects: *combat* ('fight'), *contact* ('contact'), *démarche* ('procedure'), *entente* ('understanding'), *lien* ('link'), *pourparlers* ('negociations'), *rapport* ('relationship'), *relation* ('relation'), *sympathie* ('sympathy') and *vie* ('life'). Most of them are also attested for extractions out of objects.

10.2.3.0.5 Subject position Figure 10.8 shows the proportion of postverbal subjects in the *avec* + *wh-* relative clauses (manual annotation). Among the extractions out of NPs, there is only two postverbal subject, in extractions out of the subject:

[6]Anne-Marie Garat also uses few extractions out of NPs. 13.33% of the extractions out of a subject, 11.11% of the extractions out of an object and 3.12% of the extractions out of a predicate are written by her.

[7]All extractions out of a predicate but two have a structure similar to (10.10c), i.e. *en* ('in') + N: *en relation* ('in relation'), *en contact* ('in contact'), *en guerre* ('in war'), etc. The two exceptions are *à l'aise* ('at ease') and *amie* ('friend').

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 10.7: Distribution of *avec* + *wh*- by subject types

Figure 10.8: Proportion of subject-verb inversion in *dont* relative clauses

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(10.13) a. M. Jouvet en personne […], [avec qui]$_i$ se menaient [les
Mr Jouvet in person with who REFL held the
pourparlers $_{-i}$ pour adapter La Machine infernale] (L'enfant
negociations for adapt.INF the machine infernal
des ténèbres, Anne-Marie Garat, 2008)
'Mr Jouvet in person, with whom negociations to adapt The Infernal Machine were ongoing.'

b. ces étrangers [avec lesquels]$_i$ – c' est le paradoxe de la
these strangers with the.which it is the paradox of the
situation – pouvait s' engager [une relation $_{-i}$ plus
situation could REFL initiate a relation more
confiante, plus intime, plus intense qu' avec nos amis] (La
confident more intimate more intense than with our friends
vie sexuelle de Catherine M. précédé de Pourquoi et Comment,
Catherine Millet, 2001)
'these strangers with whom – that's the paradox of this situation – a more confident, more intimate, more intense relationship could be initiated than with our friends'

Notice that in example (10.13b), there is in addition a parenthetical clause standing between the filler and the relative clause, increasing the distance between filler and gap.

10.2.3.0.6 Verb types There are not enough extractions out of the subject in order to have meaningful statistics on the types of verbs involved in these relative clauses. We can however mention that there are no passives among these extractions, but five mediopassives, as in (10.13), and one unaccusative. There are two transitives: one example is given in (10.14).

(10.14) les personnes [avec qui]$_i$ [la relation $_{-i}$] pouvait prendre un tour
the persons with who the relation could take.INF a turn
sexuel (La vie sexuelle de Catherine M. précédé de Pourquoi et
sexual
Comment, Catherine Millet, 2001)
'the persons with whom the relation could take on a sexual character.'

10.2.3.0.7 Other factors Figure 10.9 on page 276 shows the numerus and definiteness of the antecedent and the restrictiveness of the relative clauses.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 10.9: Numerus and definiteness of the antecedent and restrictiveness of *avec* + *wh*- relative clauses

No factor seems to play an important role in distinguishing subjects from objects. Extractions out of NPs seems to be non-restrictive in a higher proportion than the other kinds of extractions.

10.2.4 Results for interrogatives

There are 100 *avec* + *wh*- interrogatives in Frantext 2000–2013, 66 direct questions and 34 indirect questions. If we exclude the 53 verbless interrogatives and six *avec* + *wh*- in situ, there are 41 interrogatives with one gap site, 22 direct questions and 19 indirect questions.

The distribution of the function of *avec* + *wh*- among the 41 interrogatives with one gap is given in Table 10.10 and on Figure 10.3 page 276.

Table 10.3: Distribution of *avec* + *wh*- interrogatives in Frantext 2000–2013

	Frequency	%
Verb	25	60.98
Adjective	1	2.44
Adjunct	15	36.59

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 10.10: Distribution of *avec* + *wh*- interrogatives in Frantext 2000–2013[8]

Only three functions are attested: the *avec*-PP is either the complement of a verb (10.15), of an adjective (10.16), or is an adjunct (10.17). Extractions out of NPs are not attested.

10.2.4.0.1 An example of *avec* + *wh*- as verb complement:

(10.15) [...] je ne sais pas [avec qui]$_i$ [tu es $__i$], mais tu n' es pas
I NEG know not with whom you are but you NEG are not
avec Véro. (Un roman russe, Emmanuel Carrère, 2007)
with Véro
'I don't know with whom you are, but you're not with Véro.'

10.2.4.0.2 An example of *avec* + *wh*- as adjective complement:

(10.16) [...] [avec quoi]$_i$ il ne serait pas
with what he NEG would.be not in.agreement
[d'accord $__i$] [...] ? (Mécanique, François Bon, 2001)

'With what would he not be in agreement?'

[8]See page 133 for the confidence intervals (here three comparisons).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

10.2.4.0.3 An example of *avec* + *wh-* as an adjunct:

(10.17) [Avec qui]$_i$ [tu fêtes Noël $__i$] ? (Les carnets blancs, Mathieu Simonet, 2010)
with who you celebrate Christmas
'With whom are you celebrating Christmas?'

10.2.5 Results for *c'est*-clefts

Seven out of the eight *c'est*-clefts are focalizations: the *avec*-PP is a complement of the verb (10.18a) or of the object (10.18b). The only extraction out of a subject is a presentational *c'est*-cleft (10.18c).

(10.18) a. C' est le genre d' idée [avec quoi]$_i$ [on joue $__i$] [...]. (Un roman russe, Emmanuel Carrère, 2007)
it is the kind of idea with what one plays.
'It's the kind of ideas with which people play.'

b. C' est quelqu'un [avec qui]$_i$ tu peux faire [une sorte de ping-pong mental $__i$] [...]. (La vie possible de Christian Boltanski, Christian Boltanski, 2007)
it is someone with who you can do.INF a kind of ping-pong mental
'It is someone with who you can play some kind of mental ping pong.'

c. C' était un homme vif et perspicace, [avec qui]$_i$ [les conversations $__i$] allaient bon train [...]. (La vie sexuelle de Catherine M. précédé de Pourquoi et Comment, Catherine Millet, 2001)
it was a man bright and perspicacious with who the discussions went well train
'It was a bright and perspicacious man, with who the discussions were vivid.'

10.2.6 Conclusion

This corpus study shows us that *avec* + *wh-* is used differently in relative clauses and in interrogatives. In both, speakers use it mostly to build adjuncts or to extract the complement of a verb, but they only extract out of NPs in relative clauses. Especially, there is no extraction out of a subject NP attested in interrogatives. In

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

this respect, *avec* + *wh-* has a pattern similar to the different relative and interrogative words to extract *de*-PP that I presented in my different corpus studies.

On the other hand, the results of this study differ from the results of the previous studies in the fact that there are more occurrences of *avec* + *wh-* to extract out of object NPs than out of subject NPs in relative clauses. There is no clear evidence in the corpus for the underlying reason behind this important difference between *avec*-PPs and *de*-PPs. It cannot satisfactorily be explained by syntactic accounts based on subject island, because there are still 15 felicitous extractions out of subject, that are not degraded or especially weird compared to the extractions out of objects. Postulating a subject island would also not account for the difference across constructions.

One more convincing possibility is given by Kluender (2004), who relies on several corpus and experimental studies to show that complex subjects are dispreferred in many languages. Therefore, I propose the following explanation: PP complements of head nouns are perceived as more complex to process when their preposition is semantically more defined. The preposition *de* is not strongly defined, and thus a NP containing a *de*-PP is not perceived as complex. For this reason, extracting a *de*-PP does not require a strong processing overload, in addition to the processing load of the extraction itself. Extracting an *avec* complement however, because the preposition has a more definite semantic content, is perceived as more complex. Speakers will then tend to produce more "complex" NPs as object rather than as subject. On the other hand, NPs with *de*-complements , even though they are syntactically as complex as the NPs with *with*-complements, are perceived as semantically less complex, and in this case, the usual subject preference in extractions is reflected in the data (extractions out of the subject are as frequent or more frequent than extractions out of the object). It is beyond the scope of this work, but a corpus study with annotation of the complexity of subjects and objects (regardless of subextraction) would be necessary to test this claim. I expect that, the more complex the NP[9], the less it tends to be realized as a subject.

[9]A complexity scale could be the following: clitics < nouns without complement < nouns with a *de*-complement < nouns with another PP complement < infinitival subjects < sentential subjects.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

11 Empirical data on questions

In this chapter, I present four experiments on interrogatives. All are Acceptability Judgment tasks, and are designed to replicate the previous experiments on relative clauses with similar material but for a different construction. To the best of my knowledge, no account except our proposal based on the FBC constraint expects different results across constructions. But we will see that, exactly like in the corpus studies, there is a sharp contrast between relative clauses and interrogatives as far as extractions out of subjects are concerned.

Experiment 10: In this Acceptability Judgment task, we crossed extraction type (extraction / non-extraction / ungrammatical controls) with syntactic function (subject / object) and tested *de quel* + N interrogatives. The extraction takes place out of quality denoting NP (e.g. *originalité* 'uniqueness'), using material similar to Experiment 4. The extraction out of the subject gets significantly lower ratings than the extraction out of the object, and there is a significant interaction such that the extraction out of the subject has lower ratings than the non-extraction controls. However, it has better ratings than the ungrammatical controls.

Experiment 11: In this Acceptability Judgment task, we used the same material as in Experiment 10, but the *wh*-word in the subextraction condition is in situ. We crossed question type (with *wh*-word / polar question) with syntactic function (subject / object) and test *de quel* + N interrogatives. There is no significant difference between the condition with the *wh*-word inside the subject NP and the condition with the *wh*-word inside the object NP. There is also no significant interaction. This result is unexpected by the FBC constraint, except if in situ questions have a different information structure than questions with the *wh*-word extracted.

Experiment 12: In this Acceptability Judgment task, we crossed extraction type (extraction / non-extraction / ungrammatical controls) with syntactic function (subject / object) and tested *de qui* interrogatives. The extraction takes place out of an NP denoting a social relation (e.g. *associé* 'associate'), using a material similar to Experiment 7. The extraction out of the subject

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

gets significantly lower ratings than the extraction out of the object, and there is a significant interaction such that the extraction out of the subject has lower ratings than the non-extraction controls. The results would be very similar to the results of Experiment 10 but for the very low acceptability of *de qui* subextractions: extractions out of the subject are actually not significantly better than ungrammatical controls.

Experiment 13: In this Acceptability Judgment task, we crossed extraction type (extraction / non-extraction / ungrammatical controls) with syntactic function (subject / object) and tested *de quel* + N interrogatives in a long distance dependency. Extractions out of the subject have lower ratings than extractions out of the object, but the difference is not significant. Overall, the results are relatively similar to the long distance dependencies in relative clauses.

11.1 *De quel* in Frantext

11.1.1 Motivation

This corpus study is the "interrogative" counterpart of the study on *duquel* (section 10.1. We expect *duquel* and *de quel* + N to be synonymous, but whereas *duquel* is almost exclusively used in relative clauses, *de quel* can only be used in interrogatives. If the contrast between relative clauses and interrogatives found in the corpus studies on *de qui* is robust, we expect to find no extractions out of the subject in *de quel* interrogatives.

11.1.2 Procedure

Because this corpus study should be a counterpart to the previous one, we use the same corpus: Frantext 2000–2013. We look for the combination of the two lemmas 'de" and "quel", that can be realized in four forms: *de quel* (masculin singular), *de quelle* (feminin singular), *de quels* (masculin plural or masculin+feminin plural), *de quelles* (feminin plural).

This query gives 445 occurrences of *de quel*, that we annotated like in the previous corpus studies. The results confirm that *duquel* is not used in relative clauses, and most of the time used in interrogatives. There are 426 direct and indirect questions and 14 exclamatives. The five remaining occurrences are noise.

There are no extractions out of the subject in exclamatives. Nine of the exclamatives are fragments, without a verb. In two of them, *de quel* + N is in situ, like

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(11.1a). The three remaining one are: one extraction of the complement of a verb (11.1b), one extraction out of an adjective and one adjunct.

(11.1) a. Vous m' avez trahi, abusé [de quelle façon] ! (Dans la
you me.ACC have betryed abused of which manner
main du diable, Anne-Marie Garat, 2006)
'You betrayed me, abused me on such a way!'

b. [De quelle tendresse infinie]$_i$ [mon cher mari m' a
of which gentleness endless my dear husband me.ACC has
entourée $_{-i}$] ! (Journal sous l'Occupation en Périgord : 1942-1945,
surrounded
Jeanne Pouquet, 2006)
'With which endless gentleness did my dear husband surround me!'

The following section gives the results for the interrogatives.

11.1.3 Results and analysis

Among the 426 interrogatives with *de quel* + N, there are 259 direct questions and 167 indirect questions. If we exclude the 109 verbless interrogatives and 13 *de qui* in situ, there are 304 interrogatives with one gap, 159 direct questions and 145 indirect questions.

The distribution of the *de quel* + N interrogatives with one gap is given in Table 11.1 page 284 and on Figure 11.1 page 283.

Table 11.1: Distribution of *de quel* + N interrogatives in Frantext 2000-2013

	Frequency	%
Verb	197	64.80
Noun		
Object	6	1.97
Predicate	15	4.93
Cplt of Preposition	13	4.28
Adjective	13	4.28
Preposition	4	1.32
Adjunct	56	18.42

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.1: Distribution of *de quel* + N interrogatives in Frantext 2000–2013[1]

De quel + N can be complement of a verb (11.2), of a noun (11.3), of an adjective (11.4) or of an preposition (11.5), or be an adjunct (11.6). All categories are significantly over a frequency of zero.

11.1.3.0.1 An example of *de quel* + N as verb complement:

(11.2) Je ne sais pas [de quelles « revues d' analyses »]$_i$ [disposait $_{-i}$
I NEG know not of which journal of analyses possessed
la bibliothèque de la Faculté des sciences] [...]. (Une vie brève,
the library of the Faculty of.the Sciences
Michèle Audin, 2012)
'I don't know which analysis journal the library of the Faculty of Sciences possessed.'

11.1.3.0.2 Examples of *de quel* + N as noun complement:

(11.3) a. **Object noun:**
[De quelle infortune] portait - il [l' infirmité $_{-i}$] [...] ?
of which misfortune carried he the infirmity
(L'enfant des ténèbres, Anne-Marie Garat, 2008)
'Of which misfortune did he carry the infirmity?'

[1]See page 133 for the confidence intervals (here seven comparisons).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. **Predicate noun:**
[[D]e quel royaume minuscule – le plus petit d' Europe —]$_i$
of which kingdom tiny the most small of Europe
est - il [le petit roi $_{-i}$] ? (Formation, Pierre Guyotat, 2007)
is he the small king
'Of which tiny kingdom – the smallest in Europe – is he the small king?'

c. **Noun complement of a preposition:**
[Au terme de quelle histoire]$_i$ [a -t- il choisi cette part -
at.the end of which events has 0[2] he chosen this side
là de l' humanité $_{-i}$] ? (La Vie sauve, Lydie Violet, 2005)
there of the humanity
'At the end of which events did he choose this side of humanity?'

11.1.3.0.3 An example of *de quel* + N as adjective complement:

(11.4) [De quel impensable maternel et paternel]$_i$ étais - je [issue $_{-i}$] ?
of which unthinkable maternal and paternal was I originating
(Comment j'ai vidé la maison de mes parents, Lydia Flem, 2004)
'From which maternal and paternal unthinkable was I coming?'

11.1.3.0.4 An example of *de quel* + N as the complement of a preposition:

(11.5) Je ne sais pas [vis-à-vis de quels artistes] [j' ai des
I NEG know not toward of which artists I have some
dettes $_{-i}$]. (Autoportrait, Édouard Levé, 2005)
debt
'I don't know toward which artists I have debts.'

11.1.3.0.5 An example of *de quel* + N as an adjunct:

(11.6) [De quel droit] lui assure -t- on que son chagrin cessera
of which right her.DAT assures 0 one that her pain will.cease
un jour ? (Et le jour pour eux sera comme la nuit, Ariane, Bois,
one day
2009)

[2]In subject-verb inversion, a so-called euphonic *t* appears between the verb and the subject for avoiding to vowels to follow each other. This euphonic *t* has no semantic content and is glossed as *0*, following the glossing guideline in Blaszczak et al. (2007: 79).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

'By what right do they assure her that her pain will be over one day?'

We can see that the most common usage is to extract the complement of the verb, and that even pied-piping cases are relatively rare compared to *duquel* relative clauses. There are very few extractions out of a NP (6.91%, half of them being from Anne-Marie Garat).

11.1.4 Conclusion

If we compare *duquel* and *de quel* + N, we can see that relative clauses and interrogatives show very different patterns. This corroborates what we see for *de qui* relative clauses and interrogatives.

The dominant usage in *de qui* and *de quel* + N interrogative is to extract the complement of the verb, and extractions out of NPs are rare. There is also no attested extractions out of the subject. In relative clauses on the other hand, we find extractions out of NPs, and among them extractions out of NPs.

This cross-construction difference is only expected if we take into account the discourse status of these two constructions as in the FBC constraint.

11.2 Attested extractions out of the subject in interrogatives

Even though our corpus studies on *de qui* and *de quel* did not find any extractions out of subjects in interrogatives, it is possible to find some on Internet. I will present here a few occurrences we were able to find, will comment on them and will show how they are compatible with a discourse-based analysis.

11.2.1 Examples with a pre-defined set of alternatives

The following example can be found in a quiz on a website where visitors can create and take quizzes on any possible subject. Here, the subject of the quiz is the "Kids United".[3]

(11.7) De qui l' anniversaire tombe -t- il le 27 ?
of who the birthday falls 0 it the 27
'Of who is the birthday on the 27th?'

[3]https://www.quizz.biz/quizz-1027073.html,lasaccess14/03/2020

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The Kids United was a French musical group of five children when this quiz was released (28/12/2006). The question in (11.7) is followed by a set of possible responses: the names of the five members of the group at that time, Gabriel, Gloria, Esteban, Erza and Nilusi. Many of the previous and following questions in the quiz have the same set of possible responses. The aim of the quiz is indeed to allow participants to test their knowledge of the members of the group: how old they are, what countries they are from, what musical instrument they can play, what are their favorite colors or superheroes, etc.

We can therefore conclude that the extracted element *de qui* ('of who') in (11.7) only superficially opens the set of alternatives among which the right answer has to be chosen, because this set of alternatives was already defined beforehand, if not by the topic of the quiz at least by the previous questions. In this case, the extraction is probably a weaker focus because of that, and the extraction is facilitated.

The second example is similar in this respect. It can be found on a tutorial website[4] explaining how to play a game called "guess what I see":

(11.8) Vous pourrez choisir le premier espion de différentes façons. Par
you will.can choose the first spy of different manners for
exemple, vous pourrez [...] demander [de qui]$_i$ [l' anniversaire$_{-i}$]
example you will.can ask.INF of who the birthday
est le plus proche [...].
is the most close
'There are different ways to choose the first spy. For example, you can ask of who the birthday is the closest.'

In this case, participants in the game must choose a first player (or first "spy"), and asking for their birthday is one method of selecting the first player among others. It is clear beforehand that the first player must be chosen among the players of the game. Again, the set of alternatives was known and part of the Common Ground. This could make the extraction less focal, and thus make the discourse clash less pronounced.

11.2.2 Questions with a pre-defined answer (rhetorical question)

The first example comes from a political speech given by the Iranian president Mahmoud Ahmadinejad.[5]

[4]https://fr.wikihow.com/jouer-%C3%A0-%C2%AB-devine-ce-que-je-vois-%C2%BB, last access 14/03/2020

[5]https://www.voltairenet.org/article171526.html, last access 14/03/2020

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(11.9) [De quel pays]$_i$ [la dépense militaire $_{-i}$] dépasse annuellement
of which country the budget military exceeds yearly
mille milliards de dollars [...] ?
thousand billion of dollars
'Of which country does the military budget exceed 100 Bn. dollars?'

This is obviously a translation from the original speech, and we have to bear in mind that the syntax of the original text can have an influence on the syntax of the translation. This question follows a series of other questions very clearly targeting the USA, with explicit mentions of the nuclear bombs in Hiroshima and Nagasaki and the events of the 11th September 2001 among others. As such, the answers to the preceding series of questions has systematically been "the USA", and the hearer/reader is primed to assume that this is the answer to this question as well. In this case, we can even consider the extracted element *de quel pays* ('of which country') to be more a topic continuation than a focus, and the rest of the utterance can be considered as the focal domain with new pieces of information. It can be paraphrased as: *speaking of this country, its military budget exceeds 100 Bn. dollars*. The question is a rhetorical question, and the particular status of the extracted element can explain why extraction is felicitous and facilitated.

The second example is part of a piece of poetry from 1741, an epitaph for the "Duke of Bourbon", found on a website[6] that collects satirical poetry of the 18th century. I assume that Louis IV Henri de Bourbon-Condé (1692–1740) is meant. The author of the poem is unknown.

(11.10) Au fond de ce noir monument
at.the depth of this black memorial
Sais - tu [de qui]$_i$ [le corps $_{-i}$] repose ?
know you of how the body rests
C' est d' un Condé, non pas le Grand.
it is of a Condé NEG not the Great
'In the depth of this memorial
Do you know whose body rests?
It is the one of a Condé, not the Great[7] one'

[6] https://satires18.univ-st-etienne.fr/texte/ci-g%C3%AEt-m-le-duc-de-prie-fr%C3%A8res-p%C3%A2ris/epitaphe-de-m-le-duc-de-bourbon, last access 14/03/2020

[7] This is a reference to Louis II de Bourbon, Prince of Condé (1621–1686), also called the "Great Condé", the most famous member of the Condé family.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

In this case also I consider that the question is rhetorical. The title "Epitaphe de M. le duc de Bourbon" already revealed who the epitaph is for and hence whose body is meant. The question is a rhetorical way to highlight the disgrace of the Duke (he fell into disgrace and was exiled by the King at the end of his life) and hints that he may not be worthy of being known (hence also the allusion to his famous ancestor, with whom the Duke cannot compare).

11.2.3 Conclusion on the attested extractions out of subjects found on Internet

These four examples are the only ones that I could find on the Internet so far.[8] There is no practical way to run a query to identify systematically similar examples, because the noise would be too important: As shown in our corpus studies, extractions out of the subject in interrogatives are very rare.

In all of the examples, the status of the alternative set opened by the focalization of the extracted element is very particular, because it was already predefined in the Common Ground (and sometimes reduced to a set of one element). In the case of example (11.9), I am not sure that it is a focalization at all.

If we assume that the difficulty of extracting out of the subject in interrogatives comes from the fact that focalizing part of a backgrounded element leads to a discourse clash and to infelicity, then we can explain why these extractions are felicitous. We can consider that the element extracted in these special examples is less focal than in prototypical interrogatives, because it does not really introduce an alternative set to the Common Ground. Because of this, we have to assume that being focus is not categorical, but is continuous: an element can be more or less focused, and can be more or less backgrounded. I will come back to this important point in Section 15.1.

11.3 Experiment 10: Acceptability Judgment study on *de quel wh*-questions with *wh*-extraction

In this first experiment on questions, we tested *de quel* questions. In Section 11.1, I presented a corpus study on *de quel* interrogatives. We saw that, contrary to the corpus studies on relative clauses, we cannot find any extraction out of the subject in Frantext involving *de quel* + N. We are now testing this kind of interrogative with an experimental design.

[8] I thank Anne Abeillé who discovered examples (11.7) and (11.9).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

11.3.1 Material and design

To build the material for Experiment 10, we took the material of Experiment 4 as a baseline and turned the items into interrogatives, without the long distance dependency. We test the long distance dependency version in Experiment 13. For the subextraction conditions, we use *est-ce que* interrogatives (lit. 'is it that') because they allow us to avoid subject-verb inversion and are natural in written and spoken form.

(11.11) a. **Condition subject + PP-extracted:**
[De quelle innovation]$_i$ est - ce que [l' originalité $_{-i}$]
of which innovation is it that the uniqueness
enthousiasme mes collègues sans aucune raison ?
excites my colleagues without any reason
'Of which innovation does the uniqueness excite my colleagues for no reason?'

b. **Condition object + PP-extracted:**
[De quelle innovation]$_i$ est - ce que mes collègues admirent [l'
of which innovation is it that my colleagues admire the
originalité $_{-i}$] sans aucune raison ?
uniqueness without any reason
'Of which innovation do my colleagues admire the uniqueness for no reason?'

For the non-extraction condition, we use polar questions (11.12), also build with *est-ce que*.

(11.12) a. **Condition subject + noextr:**
Est - ce que l' originalité de cette innovation enthousiasme
is it that the uniqueness of this innovation excites
mes collègues sans aucune raison ?
my colleagues without any reason
'Does the uniqueness of this innovation excite my colleagues for no reason?'

b. **Condition object + noextr:**
Est - ce que mes collègues admirent l' originalité de cette
is it that my colleagues admire the uniqueness of this
innovation sans aucune raison ?
innovation without any reason
'Do my colleagues admire the uniqueness of this innovation for

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

no reason?'

For the ungrammatical controls, we use the material of the subextraction conditions, and leave out the preposition of the extracted element.

(11.13) a. **Condition subject + ungramm:**
[Quelle innovation]$_i$ est - ce que [l' originalité $_{-i}$] enthousiasme
which innovation is it that the uniqueness excites
mes collègues sans aucune raison ?
my colleagues without any reason
'Which innovation does the uniqueness excite my colleagues for no reason?'

b. **Condition object + ungramm:**
[Quelle innovation]$_i$ est - ce que mes collègues admirent [l'
which innovation is it that my colleagues admire the
originalité $_{-i}$] sans aucune raison ?
uniqueness without any reason
'Which innovation do my colleagues admire the uniqueness for no reason?'

The items are very close to the ones used in Experiment 4: the relation between *de quel* + N and the gap always expresses a quality (e.g. *originalité* 'uniqueness', *beauté* 'beauty'). The noun out of which the extraction takes place is always an inanimate. We use psych verbs that come in reversible pairs (e.g. *apprécier* 'value' and *émerveiller* 'delight'), but also some transitive non-psych verbs (e.g. *commenter* 'comment').

We tested 24 items, each declined in the six conditions already described. In addition, the experiment had 32 distractors, also interrogatives. Each experimental item and distractor is followed by a comprehension question. The comprehension questions do not have the form of an interrogative, in order to distinguish them from the sentences to be rated. Instead, they have the form of a statement, and the participants were asked to confirm by clicking on *Oui* ('Yes') or infirm by clicking on *Non* ('No'). The item presented here as an example is followed by the comprehension question *Les collègues ont raison d'être enthousiastes.* ('The colleagues are right to be enthusiastic.'). The participants' accuracy on these comprehension questions is very good for all conditions, which means that they did understand the task correctly.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

11.3.2 Predictions

Because the design remains very similar to the experiments we presented on relative clauses, and because only the discourse based account of the FBC constraint expects a cross-construction difference for extractions, the predictions for the results of this Acceptability Judgment task (and all following Acceptability Judgment tasks on interrogatives) remain the same than previously for all accounts but the FBC constraint account.

The predictions are summarized in Table 11.2 on page 293. The questions in this experiment are presented in isolation, without any specific context. For this reason, we assume that the participants will postulate the subject to be the topic of the utterance. Because questions, contrary to relative clauses, are a focalisation, the FBC constraint is violated. Following this hypothesis, we expect to see a superadditivity effect in disfavor of extractions out of the subject: extractions out of the subject (11.11a) should be degraded compared to extractions out of the object (11.11b), and an interaction effect is expected, such that the extractions out of the subject (11.11a) have also lower ratings than the non-extraction controls (11.12a) and (11.12b). However, a violation of the FBC constraint should not lead to ungrammaticality, and extractions out of the subject (11.11a) should have better ratings than their ungrammatical controls (11.13a). To summarize, the account based on the FBC constraint has similar expectation as Kluender (2004) or Goldberg (2006) as far as *wh*-questions are concerned.

11.3.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous Acceptability Judgment tasks (see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 1 to 10, 1 being labeled as "bad" and 10 being labeled as "good". After each sentence, participants had to answer a comprehension question.

The experiment took approximately 20 minutes to complete. The participants received no financial reward for taking part in the experiment. We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

11.3.4 Participants

The study was run in October 2017. 55 participants took part in the experiment. We present here the analysis made on the answers of the 47 participants who

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 11.2: Predictions of the different accounts for Experiments 10, 12 and 13 (interrogatives with extraction)

	Predictions				
	"subject island" accounts			no-island accounts	
	"traditional" syntactic account	processing account with surprisal due to subject complexity	BCI account (Goldberg 2006)	account based on linear distance (DG, DLT)	FBC constraint account
extractions out of the subject vs. extractions out of the object	(a) <(b)	(a) <(b)	(a) <(b)	(a) >(b)	(a) <(b)
extractions vs. non-extractions	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)	interaction effect, such that (b) <(a,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)
extractions out of the subject vs. ungrammatical controls	(a) ≃ (e)	(a) >(e)	(a) >(e)	(a) >(e)	(a) >(e)
extractions vs. vs. ungrammatical controls	interaction effect, such that (b) >(a,e,f)	main effect of grammaticality	main effect of grammaticality	main effect of grammaticality	main effect of grammaticality

(a) Condition subject + PP-extracted
(b) Condition object + PP-extracted
(c) Condition subject + no extraction
(d) Condition object + no extraction
(e) Condition subject + ungrammatical
(f) Condition object + ungrammatical

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

satisfied all criteria.[9] The 47 participants are 18 to 76 years old. 34 participants self-identify as women, 13 self-identify as men. Six participants (12.77%) indicated having an educational background related to language.

11.3.5 Results and analysis

Figure 11.2 on page 294 gives an overview of the results of the Acceptability Judgment task. In the subextraction conditions, the extraction out of the subject (11.11a) has an average acceptability rating of 4.53, lower than the extraction out of the object (11.11b) that has an average rating of 6.39. The non-extraction conditions are rated higher: the subject control condition (11.12a) has an average acceptability rating of 8.41, and the object control condition (11.12b) has an average acceptability rating of 7.95. The ungrammatical controls have very low acceptability ratings: the subject condition (11.13a) has an average acceptability rating of 2.27, and the object condition (11.13b) of 2.73.

Figure 11.2: Acceptability judgments for each condition of Experiment 10. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 11.2 suggests a potential ceiling effect for non-extraction condition and a potential floor effect for the ungrammatical controls. The subextraction conditions however seems distributed along the whole scale. The exact distribution of the ratings is illustrated by Figure 11.3 on page 295: it shows especially a floor effect for the ungrammatical subject condition. The ratings for the subextraction conditions seem to be distributed almost evenly along the scale, with a small peak at the bottom of the scale for the extractions out of subject and at the top for the extractions out of object.

[9]To calculate accuracy, we excluded not only the answers to comprehension questions of the practice items and of the ungrammatical controls, but also of some distractors that had a low accuracy rate.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.3: Density of the ratings across conditions for Experiment 10

Another representation of the results is given by the ROC and zROC curves of the results in Figure 11.4 on page 295. The ROC curves show that participants discriminate between the ungrammatical baselines and the other conditions. Corroborating what we see on Figure 11.2, the non-extraction conditions build larger curves than the subextraction conditions. The zROC curves are relatively straight and parallel to the baseline.

Figure 11.4: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 10.

The ROC and zROC curves in Figure 11.5 on page 296 show the discrimination

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

between the subject and object conditions. We see that the discrimination is in favor of the object condition for subextractions and the ungrammatical controls (the curves are over the baseline), and in favor of the subject for the controls without extraction. The zROC curves are slightly convex.

Figure 11.5: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 10.

11.3.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 11.6 on page 297. We can see clearly that the ratings are grouped by extraction type on the graph: non-extraction at the top, subextractions in the middle, ungrammatical controls at the bottom. A discrimination between subject and object is only clear for the subextraction conditions. All conditions but the non-extraction controls undergo habituation. Despite the habituation, the extractions out of the subject do not reach at the end of the experiment the acceptability ratings that the extractions out of the object display at the beginning of the experiment. They also do not seem to undergo a stronger habituation than the extractions out of the object. These are cues that the degradation in acceptability of the extractions out of the subject compared to extractions out of the object is very robust.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.6: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 10 in the course of the experiment

11.3.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for the fixed effect grouped by participants and items. The results of the model are reported in Table 11.3. There is a significant effect of the syntactic function, such that the object condition gets ratings significantly higher than the subject condition. There is also a significant effect of trial (habituation).

Table 11.3: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	1.067	0.198	5	p<.001	2.91
trial	0.022	0.007	3	p<.005	1.02

In a second model, we compare the subextractions with the non-extractions. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 11.4. There is a significant main effect of syntactic function (in favor of the object), a significant main effect of extraction type (non-extractions are rated higher), and a significant main effect of trial (habituation). There is also a signifcant interaction effect. Figure 11.7 on page 298 shows indeed a strong decrease of ratings for the extractions out of subjects compared to the other conditions. The difference is also significant ($p < 0.005$) if we compare the the AUCs (green and red curves on Figure 11.5 on page 296).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 11.4: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.316	0.136	2	p<.05	1.37
extraction type	-1.835	0.240	-8	p<.001	6.26
trial	0.024	0.008	3	p<.005	1.02
syntactic function:extraction type	0.767	0.142	5	p<.001	2.15

Figure 11.7: Interaction between syntactic function and extraction type in the Experiment 10.

11.3.5.0.3 Comparing the subextraction from subject with the ungrammatical controls We fit a third model to compare the extractions out of the subject and the subject ungrammatical controls on their own (mean centered with subextraction coded positive and ungrammatical coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 11.5. There is a significant effect of extraction type, such that the extraction out of the subject gets significantly higher ratings than its ungrammatical control. There is also a significant effect of trial (habituation).

Table 11.5: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	2.342	0.395	6	p<.001	10.40
trial	0.039	0.012	3	p<.005	1.04

In a fourth model, we compared the subextraction with the ungrammatical controls. We fit a model crossing syntactic function (mean centered with object coded positive, subject coded negative) and extraction type (grammaticality). We included trial number as covariate, and random slopes for all fixed effects

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

grouped by participants and items. The results of the model are reported in Table 11.6. There is a significant main effect of syntactic function (in favor of the object), of extraction type (in favor of the extraction conditions) and of trial (habituation). There is also a significant interaction, such that extractions out of the object are rated higher than all other conditions.

Table 11.6: Results of the Cumulative Link Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.836	0.188	4	p<.001	2.31
extraction type	2.200	0.305	7	p<.001	9.02
trial	0.021	0.005	4	p<.001	1.02
syntactic function:extraction type	0.299	0.112	3	p<.01	1.35

11.3.6 Discussion

The results of Experiment 10 strikingly differ from the results of all previous experiments on relative clauses. When extracting out of subjects by means of a *wh*-question, we observe an "island effect": the ratings are lower than for extractions out of the object (model n°1), and there is a significant interaction (model n°2). The interaction is significant even with the more conservative method of comparison of the AUCs.

However, even if the extractions out of the subject receive low ratings, they remain significantly more acceptable than the ungrammatical controls with a preposition missing (model n°3).

These results are expected by the FBC constraint. They are also compatible with processing accounts based on surprisal and with other discourse-based accounts, but these accounts cannot explain why we did not find similar results for the relative clauses. The traditional syntactic account is falsified by the significant difference between subextractions from the subject (11.11a) and ungrammatical controls (11.13a). If extracting out of the subject is ruled out for syntactic reasons, there is no explanation why they are rated higher than another syntactic violation (preposition missing). Lastly, the results are completely unexpected under an account based on memory costs.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

11.4 Experiment 11: Acceptability Judgment study on *de quel wh*-questions with the *wh*-word in-situ

In general, a distinction is made between languages with *wh*-ex-situ and with *wh*-in-situ. But even languages with *wh*-ex-situ usually allow the *wh*-element to remain in-situ in order to express echo questions or mirative questions.

As we have seen, French belongs to the category of languages with *wh*-ex-situ, as do all Romance languages. Most Romance languages do not accept the in-situ option for information seeking questions. This is not the case for French (Cheng & Rooryck 2000) nor for Portuguese (Ambar 2002), in which the in-situ variant is acceptable, even beyond echo questions and mirative questions.

(11.14) a. French:
Jean a acheté quoi ?
Jean has bought what
'What did Jean buy?'

b. Portuguese: O João comprou o quê? (Kaiser & Quaglia 2015)
DET João bought DET what
'What did João buy?'

The echo and mirative questions differ in French from the in-situ information seeking questions from a prosodic and from a syntactic[10] point of view. They also differ from a pragmatic point of view, but we will come back to this point in the discussion below.

Interrogatives with in-situ *wh*-words are interesting for our topic. On one hand, syntactic accounts usually assume a covert movement (in order to check a *wh*- feature): If this is the case, interrogatives with an in-situ *wh*-word should pattern with interrogatives with extractions (like in Experiment 11). On the other hand, processing and discourse-based accounts usually assume that island effect are a product of extractions: Interrogatives with an in-situ *wh*-word should therefore not show any penalty when extracting out of the subject. For the FBC constraint however, extraction is not a relevant factor, so the constraint should apply as well, except if in-situ questions in French have a special information structure.

[10]Generally speaking, information seeking in-situ questions are more syntactically constrained than other in-situ questions. According to Schlonsky (2012), the *wh*-element cannot be within the scope of a negation. Some authors also argue that the *wh*-element cannot be inside an embedded clause introduced by a non-factive verb, but the evidence seems weak. For a summary of these debates, see Kaiser & Quaglia (2015).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

11.4.1 Material and design

In this experiment, we adapt the material from the previous experiment. The subextraction condition have no extraction, but have *de quel* + N in-situ respectively inside the subject NP and the object NP:

(11.15) a. **Condition subject + *wh* in-situ:**
[L' originalité de quelle innovation] enthousiasme mes
the uniqueness of which innovation excites my
collègues sans aucune raison ?
colleagues without any reason
'The uniqueness of which innovation excite my colleagues for no reason?'

b. **Condition object + *wh* in-situ:**
Mes collègues admirent [l' originalité de quelle innovation]
my colleagues admire the uniqueness of which innovation
sans aucune raison ?
without any reason
'My colleagues admire the uniqueness of which innovation for no reason?'

We use the same polar condition than in Experiment 10 as a 'non-island' control:

(11.16) a. **Condition subject + no-wh:**
Est - ce que l' originalité de cette innovation enthousiasme
is it that the uniqueness of this innovation excites
mes collègues sans aucune raison ?
my colleagues without any reason
'Does the uniqueness of this innovation excite my colleagues for no reason?'

b. **Condition object + no-wh:**
Est - ce que mes collègues admirent l' originalité de cette
is it that my colleagues admire the uniqueness of this
innovation sans aucune raison ?
innovation without any reason
'Do my colleagues admire the uniqueness of this innovation for no reason?'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Contrary to experiment 10, we do not have ungrammatical controls, because we though they would make the experiment unnecessarily long.

We tested the same 24 items than in Experiment 10, each declined in the four conditions I just described. In addition, the experiment had 36 distractors. Some of the distractors are interrogatives, some of them are declaratives, some also are ungrammatical. Around 60% of the experimental items and distractors are followed by a comprehension question. The comprehension questions sometimes have the form of an interrogative, and sometimes are declaratives. For answering comprehension questions, the participants always had the choice between *Oui* ('Yes') or *Non* ('No').[11] The participants' accuracy on these comprehension questions is very good for all conditions, which shows that they understood correctly the task.

11.4.2 Predictions

Movement in Minimalism is usually motivated by the need for the extracted element to check a *wh*-feature high in the syntactic structure. In this explanation, the movement is necessary for interpretation purposes, and in order for the element to have its *wh*-form. Consequently, scholars like Watanabe (1992) or Bošković (1998) assume a covert movement for in-situ questions: the element would move in the deep structure, but its phonological realization remains in-situ. Chinese has frequently been used as an evidence that there is indeed a covert movement: even though there is no (overt) extraction in Chinese, interrogatives seem to be subject to island constraints (Huang 1982, Cheng 1991).

Hence, such a syntactic account predicts a subject island effect in French: *wh*-words inside of the subject (11.15a) should be degraded compared to *wh*-words inside of the object (11.15b), and an interaction effect is expected, such that *wh*-words inside of the subject (11.15a) are also worse than the non-extraction controls (11.16a) and (11.16b).

In this case, the discourse based account of the FBC constraint expects also the same results. If in-situ *wh*-words are a focalization, then the FBC constraint is violated when the *wh*-word is in a subject, that is prophetically backgrounded.

Among Minimalism, the movement hypothesis for in-situ questions has been challenged by Comorovski (1996), Reinhart (1997) and Adli (2006), among others. According to them, there is no evidence of covert movement and thus of the

[11] The item presented here as an example happens not to have a comprehension question in this experiment. For example, a sentence like *La couleur de quelle fleur charme les vieilles dames durant leur promenade matinale ?* ('The color of which flower delights the old ladies during their morning walk?') is followed by the comprehension question *Les vieilles dames se promènent le matin ?* ('The old ladies go for a walk in the morning?').

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

necessity of feature checking.[12] Especially, Reinhart (1997) presents data from Chinese and Korean that contradict Huang (1982) and Cheng (1991). This variant of the syntactic approach predicts null effects for this experiment. Processing accounts, or other discourse-based accounts than the FBC, make the same predictions.

In any case, a main effect of question type is expected, for independent reasons: previous studies show that in-situ *wh*-questions receive low ratings in French (Thiberge 2018).[13] This is probably a distortion effect caused by social desirability (Edwards 1957), given that in-situ *wh*-questions are usually considered to belong to non-standard colloquial French. Coveney (1996: 98) shows that prescriptive French grammars strongly stigmatize in-situ questions as colloquial speech. This question type is also associated with a lower social status. Thiberge (2018) conducted a between-subject study in which participants had to read an interview and give their impression on the journalist. The only difference between the conditions was the type of question used by the journalist. The results show that the journalist was judged overall less educated and from a lower sociological background when he produced in-situ questions. Thiberge (2018) concludes that participants are negatively biased against in-situ questions. The journalist was also judged younger and less "parisian" than with an ex-situ question with subject-verb inversion.[14] Hence, there seem to be a strong rejection from participants for this type of questions in reading tasks.

11.4.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous Acceptability Judgment tasks (see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good". After some sentences, participants had to answer a comprehension question.

The experiment took approximately 20 minutes to complete. The participants received no financial reward for taking part in the experiment. We recruited the

[12] Cheng & Rooryck (2000) propose a somewhat alternative view, in which a *wh*-morpheme checks the *wh*-feature such that there is no need for movement of the *wh* word. See Adli (2006) for a criticism of their main argument (the intonation of in-situ questions) in French.

[13] However, Adli (2006) compares in-situ questions with ex-situ questions in French through a graded acceptability judgment task and a Self-Paced reading task, and finds no significant difference in either acceptability or reading times. In the acceptability judgment task, the experimental item follows a context sentence evoking a colloquial situation. This may be the reason why she does not see a contrast between question types.

[14] This stigmatization applies also partly for ex-situ questions without inversion.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

11.4.4 Participants

The study was run between July and September 2018. 30 participants took part in the experiment. We present here the analysis made on the answers of the 24 participants who satisfied all criteria.[15] The 24 participants are 21 to 73 years old. 19 participants self-identify as women, three self-identify as men. Three participants (12.50%) indicated having an educational background related to language.

11.4.5 Results and analysis

Figure 11.8 on page 304 gives an overview of the results of the Acceptability Judgment task. For the *wh*-word in-situ inside the subject (11.15a), the average rating is 6.25. It is slightly higher than for the *wh*-word in-situ inside the object (11.15b) that has an average rating of 6.09. The conditions without *wh*-word are rated higher: the subject control condition (11.16a) has an average acceptability rating of 8.97, and the object control condition (11.16b) has an average acceptability rating of 8.54.

Figure 11.8: Acceptability judgments for each condition of Experiment 11. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 11.8 suggests potential ceiling effect for the control conditions. This is indeed confirmed by the distribution in Figure 11.9 on page 305. The ratings for the conditions with the *wh*-word in-situ seem to be distributed almost evenly along the scale, with a small peak at the top of the scale.

[15] To calculate accuracy, we excluded not only the answers to comprehension questions of the practice items and of the ungrammatical controls, but also of the ungrammatical distractors.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.9: Density of the ratings across conditions for Experiment 11

Another representation of the results is given by the ROC and zROC curves of the results in Figure 11.10 on page 306. The ROC curves show that participants discriminate between the conditions with the *wh*-word in-situ (the baseline) and the polar questions. The object and subject curves are very close. The zROC curves for the subject condition is not parallel to the baseline, which, following Dillon & Wagers (2019), can be the sign that there is more variance in one condition. We used the function `var.text()` from the package `stats` (R Core Team 2018) for a two-by-two comparison of the variances and, indeed, the variance differs significantly for every conditions except if we compare the two conditions with a *wh*-word in-situ.

The ROC and zROC curves in Figure 11.11 on page 307 show the discrimination between the subject and object conditions. We can see that participants hardly discriminate between the subject and the object variants. Again, the zROC curve for the polar question is not parallel to the baseline.

11.4.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 11.12 on page 307. We can see clearly that the ratings are grouped by question type on the graph: the polar questions are at the top, the questions with a *wh*-word at the bottom. Subject and object variants are relatively similar: the polar question shows almost no habituation effect, while there is a strong habituation effect for the questions with a *wh*-word in-situ. At the end of the experiment, the in-situ questions are very close to the polar ones.

11.4.5.0.2 Age Previous experiments show that older participants reject more strongly in-situ interrogatives than younger participants (Thiberge 2018: 72). Figure 11.13 on page 308 shows the effect of age on participant's rating (z-scored ratings) in this experiment. The results are surprising: object conditions are unaffected by the factor of age, but the subject conditions seem to be, especially when

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.10: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 11.

the *wh*-word is inside the subject. Older participants seem to accept in-situ *wh*-word better in subjects than in objects, and better than younger participants. We therefore fit a first model to predict the ratings of the questions with an in-situ *wh*-word inside the subject with trial number and age as explanatory variables. We included random slopes for trial number grouped by participants and items. The results of the model are reported in Table 11.7. There is no significant main effect of age, even though there is a significant main effect of habituation. Hence, the impression given by Figure 11.13 is not corroborated by the model.

Table 11.7: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
trial	0.038	0.015	3	p<.05	1.04
age	0.034	0.039	1	0.3881	1.03

11.4.5.0.3 Comparing the subject in-situ question with the object in-situ question We fit a second model to compare the in-situ questions on their own (mean

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.11: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 11.

Figure 11.12: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 11 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.13: Average acceptability ratings (z-scored by participant) for each condition of Experiment 11 depending on the participants' age.

centered with subject coded negative, object coded positive). We included trial number and age as covariates, and random slopes for the fixed effect and trial number grouped by participants and items. The results of the model are reported in Table 11.8. There is a significant effect of habituation, but no significant effect of syntactic function or age.

Table 11.8: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.177	0.176	-1	0.3162	1.19
trial	0.031	0.012	3	p<.01	1.03
age	0.025	0.041	1	0.5308	1.03

In a third model, we compared all four conditions. We fit a model crossing syntactic function and question type (mean centered with in-situ coded positive, no *wh*-word coded negative). We included trial number and age as covariates, and random slopes for all fixed effects and for trial number grouped by participants and items. The results of the model are reported in Table 11.9. There is a significant main effect of question type, such that the polar questions are rated significantly higher than the questions with a *wh*-word in-situ. There is also a significant main effect of habituation, but no significant main effect of age, and no significant interaction. This is corroborated by the AUCs: if we compare the the AUCs (green and red curves on Figure 11.11 on page 307), the difference is not significant. Figure 11.14 on page 309 illustrates the interaction effect: both lines are parallel (no interaction).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 11.9: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.200	0.134	-1	0.1343	1.22
question type	-1.596	0.322	-5	p<.001	4.93
trial	0.027	0.010	3	p<.005	1.03
age	0.028	0.026	1	0.2842	1.03
syntactic function:question type	0.032	0.115	0	0.7828	1.03

Figure 11.14: Interaction between syntactic function and extraction type in the Experiment 11.

11.4.6 Discussion

Direct interrogatives with the *wh*-word in-situ receive in general lower ratings that the polar controls (model n°3). This was expected given previous studies on in-situ questions in French.

However, there is no evidence for the interaction characteristic of "subject island" effects (model n°3). There is also no significant difference in terms of ratings between a *wh*-word inside the subject and a *wh*-word inside the object (model n°2).

The predictions of syntactic accounts that assume a covert movement even with *wh*-in-situ are therefore not met. But the results of this study are similar to the data on Chinese and Korean presented by Reinhart (1997), in which she observes no "subject island" effect in in-situ questions.

The results also do not support the predictions of the FBC constraint. From this, I see two possible conclusions to be drawn:

1. The formulation of the FBC constraint is incorrect and the existence of a gap should be introduced as a necessary condition for discourse clash. However, there is no clear a priori reason why this syntactic factor would play a role in a discourse-based constraint.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

2. The FBC constraint is correct, but the above predictions were based on the – wrong – assumption that in-situ *wh*-words denote a focalization. The main disadvantage of this argument is to be post hoc. However, it is justifiable based on the literature on in-situ questions.

There is also a possibility that the material in the experiment was not interpreted as information seeking questions. Given the lack of context that would license a reading as an echo question or mirative question, and based on our intuitive reading of the material, we have presumed a reading as an information seeking question. But since this reading was not supported by either prosodic markers or context, we may have made an incorrect assumption.

I will now pursue point 2. and outline the arguments that seem to indicate that in-situ questions do not have a similar discursive status to ex-situ questions.

11.4.6.0.1 The discursive status of in-situ questions: There is an ongoing debate in the literature about the exact pragmatic status of in-situ interrogatives in French.

Coveney (1996), Boeckx (1999), Cheng & Rooryck (2000) and Beyssade (2006) (a.o.) claim that in-situ questions are used in French whenever the proposition of the utterance is presupposed, or whenever it has been activated in the preceding discourse. However, Adli (2006) rightly underlines that in-situ questions can be used out of the blue:

(11.17) Pardon, il est quelle heure ? (Adli 2006: 184)
sorry it is which hour
'Sorry, what's the time?'

Larrivée (2016) ran several corpus searches and crosses their results with corpus studies from other scholars; he comes to the conclusion that in-situ questions in French have been restricted to ask for discourse given (activated) referents from the 15th to the middle of the 19th century. During that period, in-situ questions represent less that 0.25% of the questions in written texts. From the end of the 19th century to the 21th century, the usage of in-situ questions has increased drastically in written French, while the restriction to discourse given referents has vanished. They are still mostly used to mark orality in written texts.

We can therefore say that the debate is ongoing, and that no clear conclusion can yet be made on the pragmatic status of in-situ questions. It seems however clear that this status is not standard. Consequently, it is possible that the reading is by default not a focalization. This could explain the results (or lack of effects) in our experiment.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

11.5 Experiment 12: Acceptability Judgment study on *de qui wh*-questions with *wh*-extraction

This experiment aims to reproduce the results of Experiment 10 (interrogatives without long-distance dependency) while being a parallel experiment to Experiment 7 (*de qui* relative clauses). The material is based on Experiment 7, but turned into interrogatives.

11.5.1 Material and design

To build the material for Experiment 10, we took the material of Experiment 7 as a baseline and turned the items into interrogatives, following the same design than in Experiment 10. Interrogatives are build with *est-ce que*, with polar questions as a non-extraction controls, and questions with a missing preposition as an ungrammatical controls.

(11.18) a. **Condition subject + PP-extracted:**
[De qui]$_i$ est - ce que [l' associé $_{-i}$] aide mon cousin sans
of who is it that the associate helps my cousin without
contrepartie financière ?
counterpart financial
'Of who does the associate help my cousin without financial compensation?'

b. **Condition object + PP-extracted:**
[De qui]$_i$ est - ce que mon cousin aide [l' associé $_{-i}$] sans
of who is it that my cousin helps the associate without
contrepartie financière ?
counterpart financial
'Of who does my cousin help the associate without financial compensation?'

c. **Condition subject + noextr:**
Est - ce que l' associé de l' avocat aide mon cousin
is it that the associate of the lawyer helps my cousin
sans contrepartie financière ?
without counterpart financial
'Does the associate of the lawyer help my cousin without financial compensation?'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

d. **Condition object + noextr:**
Est - ce que mon cousin aide l' associé de l' avocat
is it that my cousin helps the associate of the lawyer
sans contrepartie financière ?
without counterpart financial
'Does my cousin help the associate of the lawyer without financial compensation?'

e. **Condition subject + ungramm:**
Qui est - ce que l' associé aide mon cousin sans
who is it that the associate helps my cousin without
contrepartie financière ?
counterpart financial
'Who does the associate help my cousin without financial compensation?'

f. **Condition object + ungramm:**
Qui est - ce que mon cousin aide l' associé sans
who is it that my cousin helps the associate without
contrepartie financière ?
counterpart financial
'Who does my cousin help the associate without financial compensation?'

We tested the same 20 items than in Experiment 7, each declined in the six conditions just described. In addition, the experiment had 36 distractors. The distractors are declaratives, and some of them are ungrammatical. Half of the experimental items and distractors were followed by a comprehension question. The item presented here as an example is followed by the comprehension question *Est-il question d'un associé ?* ('Is this about an associate?').

11.5.2 Predictions

The predictions for this experiment, and all experiments on interrogatives with an extraction, are generally the same than for Experiment 10. They are summarized in Table 11.2 on page 293.

11.5.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous acceptability judgment tasks

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good". After each sentence, participants had to answer a comprehension question.

The experiment took approximately 20 minutes to complete. We recruited the participants through FouleFactory (https://www.foulefactory.com), and the participants were paid 5 € for their participation. The payment was not contingent on the participants' responses to the questions about native language or place of birth.

11.5.4 Participants

The study was run in October 2019. 57 participants took part in the experiment. We present here the analysis made on the answers of the 48 participants who satisfied all criteria.[16] The 48 participants are 23 to 69 years old. 36 participants self-identify as women, 12 self-identify as men. One participant (2.08%) indicated having an educational background related to language.

11.5.5 Results and analysis

Figure 11.15 on page 314 gives an overview of the results of the Acceptability Judgment task. The subextraction conditions have very low rating. The extraction out of the subject (11.18a) has an average acceptability rating of 1.49, lower than extraction out of the object (11.18b) that has an average rating of 2.50. The non-extraction conditions have high ratings, as expected: the subject control condition (11.18c) has an average acceptability rating of 8.16, and the object control condition (11.18d) has an average acceptability rating of 7.59. The ungrammatical controls have very low acceptability ratings, comparable to the subextraction conditions: the subject condition (11.18e) has an average acceptability rating of 2.03, and the object condition (11.18f) 1.66.

Our conditions seem to receive either very high or very low ratings, with potential ceiling and floor effects accordingly. Figure 11.16 on page 314 corroborates this: it is very probable that we see here ceiling and floor effects.

Another representation of the results is given by the ROC and zROC curves of the results in Figure 11.17 on page 315. The ROC curves show that participants discriminate between the ungrammatical baseline and the non-extraction conditions, but hardly discriminate between the ungrammatical baseline and the

[16]To calculate accuracy, we excluded not only the answers to comprehension questions of the practice items and of the ungrammatical controls, but also of some distractors that had a low accuracy rate.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.15: Acceptability judgments for each condition of Experiment 12. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 11.16: Density of the ratings across conditions for Experiment 12

subextraction conditions. The zROC curves are convex for the object conditions: this could be due to the strong floor effect of the ungrammatical controls that serve as a baseline.

The ROC and zROC curves in Figure 11.18 on page 316 show the discrimination between the subject and object conditions. Participant hardly discriminate between the subject and the object variants, but there is a stronger discrimination in the subextraction conditions. The zROC curves are relatively straight, but the curve for the subextraction deviates from the paralell line. This could also be due to the floor effect in the extractions out of the subject: there is much less variance because all ratings are concentrated around the bottom of the scale.

11.5.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 11.19 on page 316. Subextraction and ungrammatical conditions are gathered at the bottom of the scale, but we can see an important habituation of the subextraction from object condition.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.17: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 12.

We fit a first model to see if the trial number is a good predictor for the rating of extractions out of the object. We included random slopes for the fixed factor grouped by participants and items. The results of the model are reported in Table 11.10. The results is not significant, showing that, despite the strong habituation effect seen on Figure 11.19, the trial number is not a good predictor for the rating.

Table 11.10: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
trial	0.020	0.012	2	0.0987	1.02

11.5.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a second model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for all the fixed effect and the covariate grouped by participants and items. The results of the model are reported in Table 11.11. There is a significant effect

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.18: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 12.

Figure 11.19: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 12 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

of the syntactic function, such that the object condition gets ratings significantly higher than the subject condition.

Table 11.11: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.459	0.144	3	p<.005	1.58
trial	0.016	0.010	2	0.1025	1.02

In a third model, we compared the subextraction with the non-extraction. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 11.12. There is a significant main effect of extraction type (non-extractions are rated higher), and a significant main effect of trial (habituation). There is also a significant interaction effect. Figure 11.20 on page 318 shows indeed a disadvantage for extractions out of the subjects compared to the other conditions. The difference is also significant ($p < 0.005$) if we compare the the AUCs (green and red curves on Figure 11.18 on page 316).

Table 11.12: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.088	0.133	1	0.5073	1.09
extraction type	-3.042	0.286	-11	p<.001	20.94
trial	0.016	0.007	2	p<.05	1.02
syntactic function:extraction type	0.411	0.132	3	p<.005	1.51

If we look at the ratings per participant, that are illustrated by Figure 11.21 on page 318, we see that this advantage for the extraction out of the object is brought by a few specific participants (participants 11, 29, 35 and 83). These participants have a very strong preference for extractions out of the object (rated on the top of the scale). For most participants, both conditions are rated equally low. Participants are extraordinarily consistent however in not preferring extractions out of the subject (only one participant, 27, has a relatively weak preference for it).

We see similar patterns in Experiment 10. Figure 11.22 on page 319 shows the results by participants for Experiment 10, and, like in Experiment 12, some participants have a strong discrimination against subextractions from subjects while most rate them on a relatively same level of the scale, but only two participants

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.20: Interaction between syntactic function and extraction type in the Experiment 12.

Figure 11.21: Ratings of the subextraction conditions for each participant in the Experiment 12.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(participant 46 and 48) have a preference for subextractions from subjects. The conclusion is that the significant interaction effect probably comes only from some participants, but that the disadvantage against subextraction from subjects is still robust among participants, and can by no means be considered as an artefact of some participants being outliers.

Figure 11.22: Ratings of the subextraction conditions for each participant in the Experiment 10.

11.5.5.0.3 Comparing the subextraction from subject with the ungrammatical controls We fit a fourth model to compare the extractions out of the subject and the subject ungrammatical controls on their own (mean centered with subextraction coded positive and ungrammatical coded negative). We included trial number as covariate, and random slopes for the fixed effect grouped by participants and items. The results of the model are reported in Table 11.13. The difference between both conditions is not significant.

Table 11.13: Results of the Cumulative Link Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	0.067	0.144	0	0.6403	1.07
trial	0.002	0.007	0	0.7865	1.00

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

In a fifth model, we compare the subextractions with the ungrammatical controls. We fit a model crossing syntactic function (mean centered with object coded positive, subject coded negative) and extraction type (grammaticality). We included trial number as covariate, and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 11.14. There is a significant main effect of extraction type (in favor of the extraction conditions) and of trial (habituation). There is also a significant interaction, such that extractions out of the object are rated higher than all other conditions.

Table 11.14: Results of the Cumulative Link Mixed Model (model n°5)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.107	0.105	1	0.3112	1.11
extraction type	0.397	0.165	2	p<.05	1.49
trial	0.011	0.005	2	p<.05	1.01
syntactic function:extraction type	0.333	0.115	3	p<.005	1.40

11.5.6 Discussion

We see in this experiment the expected pattern of a "subject island" effect: extractions out of the subject are rated lower than extractions out of the object (model n°2) and there is a significant interaction compared to non-extraction controls (model n°3).

The low acceptability of both subextraction conditions is however striking. Subextractions with *de quel* + N, even though degraded compared to the non-extraction conditions, were not that low. Even though there is a main effect of extraction type such than subextractions are higher than ungrammatical controls (model n°5), this main effect comes from the subextraction from objects. The subextraction from the subject's mean rating is actually lower than its ungrammatical control (model n°4) and there is no significant difference between the two. As far as model n°4 is concerned, the results are closer to the expectations of the traditional syntactic approach than of the other accounts, even though null-effects are not able to falsify the predictions of the other accounts. The significant interaction when comparing subextractions with ungrammatical controls (model n°5) is also only predicted by the syntactic account. However, the strong degradation of extracting out of objects with *de qui* is surprising under all accounts.

One possible way to look at this finding is to recall the difference in acceptability between relative clauses with *dont* and relative clauses with *de qui*. The

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

subextractions conditions seemed much degraded in the *de qui* relative clauses, regardless of the syntactic function. A similar contrast arises between *de quel* and *de qui* interrogatives. The significant interaction found in model n°5 can be explained as a product of superadditivity: if there is an inherent difficulty of extracting of a NP with *de qui*, and this processing difficulty adds up with previously mentioned difficulties (clash in discourse status follwoing the FBC constraint, processing difficulties of extraction on its own, weak specificity of the pronoun), the parser may reach a point where processing the sentence is not possible anymore (at least for some parsers). Assuming that *de qui* subextractions are difficult per se is actually consistent with the results of the corpus studies. Remember that we have seen that *de qui* is not very frequent in general, that there is a lesser proportion of subextractions from NP than for *dont* (the occurrences are in a large majority by one single author for 2000–2013) and that subextractions from NPs in general, and not subextractions from subjects alone, are almost inexistant in interrogatives. A mere frequency effect could lead to surprisal and therefore to processing difficulties. Furthermore, this infrequency could in fact be the symptom of another reason why *de qui* is inadequate for subextractions.

11.6 Experiment 13: Acceptability Judgment study on *de quel wh*-questions with long-distance dependencies

In this fourth experiment on interrogatives, we test *de quel* questions with a long distance dependency. This allows us to compare our results on one hand with our experiment on relative clauses with a long distance dependency (Experiment 4) and on the other hand with Sprouse et al.'s (2016) experiments on Italian and English.

11.6.1 Material and design

We use as a baseline the material of Experiment 10, and introduce the same long distance dependencies used in Experiment 4. Like in Experiment 10, we test extractions out of the subject and extractions out of the object with *est-ce que* questions. The embedding verbs are non-factive (e.g. *supposer* 'suppose' or *croire* 'believe') in order to avoid presupposition of the embedded clause.

(11.19) a. **Condition subject + PP-extracted:**
[De quelle innovation]$_i$ est - ce qu' on suppose [que [l'
of which innovation is it that one supposes that the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

originalité $_i$] enthousiasme mes collègues sans aucune
uniqueness excites my colleagues without any
raison] ?
reason
'Of which innovation do we suppose that the uniqueness excites my colleagues for no reason?'

b. **Condition object + PP-extracted:**
[De quelle innovation]$_i$ est - ce qu' on suppose [que mes
of which innovation is it that one supposes that my
collègues admirent [l' originalité $_i$] sans aucune raison] ?
colleagues admire the uniqueness without any reason
'Of which innovation do we suppose that my colleagues admire the uniqueness for no reason?'

Like in Experiment 10, we use polar questions (11.20) for the non-extraction conditions, also build with *est-ce que*.

(11.20) a. **Condition subject + noextr:**
Est - ce qu' on suppose que l' originalité de cette
is it that one supposes that the uniqueness of this
innovation enthousiasme mes collègues sans aucune
innovation excites my colleagues without any
raison ?
reason
'Do we suppose that the uniqueness of this innovation excites my colleagues for no reason?'

b. **Condition object + noextr:**
Est - ce qu' on suppose que mes collègues admirent l'
is it that we suppose that my colleagues admire the
originalité de cette innovation sans aucune raison ?
uniqueness of this innovation without any reason
'Do we suppose that my colleagues admire the uniqueness of this innovation for no reason?'

Like in Experiment 10, in order to build the ungrammatical controls, we use the material of the subextraction conditions and leave out the preposition of the extracted element.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(11.21) a. **Condition subject + ungramm:**
Quelle innovation est - ce qu' on suppose que l' originalité
which innovation is it that one supposes that the uniqueness
enthousiasme mes collègues sans aucune raison] ?
excites my colleagues without any reason
'Which innovation do we suppose that the uniqueness excites my colleagues for no reason?'

b. **Condition object + ungramm:**
Quelle innovation est - ce qu' on suppose que mes collègues
which innovation is it that one supposes that my colleagues
admirent l' originalité sans aucune raison ?
admire the uniqueness without any reason
'Which innovation do we suppose that my colleagues admire the uniqueness for no reason?'

We tested the same 24 items than in Experiment 4 and 10. Each item was declined in the six conditions just described. In addition, the experiment has 36 distractors. The distractors are declaratives, and some of them are ungrammatical. Half of the experimental items and distractors are followed by a comprehension question. The item presented here as an example is followed by the comprehension question *Est-ce que les collègues ont raison d'être enthousiastes ?* ('Are the colleagues right to be enthusiastic?').

11.6.2 Predictions

Predictions for long distance dependencies do not differ essentially from the predictions for interrogatives in general, as they are summarized in Table 11.2 on page 293.

Processing account expect in general to see more processing costs associated with the extraction itself, because of the increased distance between the filler and the gap.

On the contrary, for the discourse-based account following the FBC constraint, extractions may be facilitated because embedded clauses may be more backgrounded.

11.6.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous acceptability judgment tasks

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good". After some sentences, participants had to answer a comprehension question.

The experiment took approximately 20 minutes to complete. We recruited the participants through FouleFactory (https://www.foulefactory.com), and the participants were paid 5 € for their participation. The payment was not contingent on the participants' responses to the questions about native language or place of birth.

11.6.4 Participants

The study was run between October and November 2019. 65 participants took part in the experiment. We present here the analysis made on the answers of the 51 participants who satisfied all criteria.[17] The 51 participants are 21 to 78 years old. 31 participants self-identify as women, 20 self-identify as men. Two participants (3.92%) indicated having an educational background related to language.

11.6.5 Results and analysis

Figure 11.23 on page 325 gives an overview of the results of the Acceptability Judgment task. In the subextraction conditions, the extraction out of the subject (11.19a) has an average rating of 3.07, lower than extraction out of the object (11.19b) that has an average rating of 3.39. The difference between the two conditions is not as obvious as in Experiment 10 (without the long distance dependency). The non-extraction conditions are rated higher than the subextraction conditions: the subject control condition (11.20a) has an average rating of 6.25, and the object control condition (11.20b) has an average rating of 6.09. The ungrammatical controls have very lower ratings: the subject condition (11.21a) has an average rating of 1.99, and the object condition (11.21b) 2.35.

Figure 11.23 suggests potential floor effects for the ungrammatical controls. Figure 11.24 on page 325 confirms this impression: The ungrammatical controls display a floor effect, especially in the subject variant, but the other conditions seem to have a normal distribution.

Another representation of the results is given by the ROC and zROC curves of the results in Figure 11.25 on page 326. The ROC curves show that participants discriminate between ungrammatical baselines and the other conditions. Similarly to what we see on Figure 11.23, the non-extraction conditions build larger curves

[17] To calculate accuracy, we excluded not only the answers to comprehension questions of the practice items and of the ungrammatical controls, but also of the ungrammatical distractors.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.23: Acceptability judgments for each condition of Experiment 13. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 11.24: Density of the ratings across conditions for Experiment 13

than the subextraction conditions. The zROC curves are relatively straight and parallel to the baseline.

The ROC and zROC curves in Figure 11.26 on page 327 show the discrimination between the subject and object conditions. We see that participants hardly discriminate between both. The zROC curves are relatively straight and parallel to the baseline.

11.6.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 11.27 on page 327. The subextraction conditions and the ungrammatical controls have a strong habituation.

Extractions out of the subject have a stronger habituation than extractions out of the subject (but not significantly: see model n°2 below).

The ungrammatical controls are not lower at the end of the experiment than the subextraction conditions were at the beginning of the experiment. Given that the ungrammaticality relies on the lack of a preposition, it can relatively easily

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.25: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 13.

be overseen if participants are not paying enough attention. The habituation could therefore be due to "noisy channel" effects, i.e. the participant's attention lowering through the experiment.

11.6.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 11.15. There is a significant effect of habituation, but no main effect of syntactic fucntion: extractions out of the subject do not have significantly lower ratings than extractions out of the object.

Table 11.15: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.114	0.118	1	0.334	1.12
trial	0.023	0.009	2	p<.05	1.02

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.26: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 13.

Figure 11.27: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 13 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

We fit a second model to compare the extractions out of the subject and out of the object on their own, crossing syntactic function with trial number. We included participants and items as random factors. The results of the model are reported in Table 11.16. The results for the main effects are similar to model n°1, but we can see that the interaction is not significant. The stronger habituation effect on extractions out of the object that we can see in Figure 11.27 is not significant.

Table 11.16: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.165	0.240	-1	0.4918	1.18
trial	0.022	0.006	3	p<.001	1.02
syntactic function:trial	0.008	0.007	1	0.2153	1.01

In a third model, we compare the subextraction with the non-extractions. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 11.17. There is a significant main effect of extraction type (non-extractions are rated higher). There is no significant main effect of syntactic function, no significant main effect of habituation, and no significant interaction effect. We get the same result if we compare the the AUCs (green and red curves on Figure 11.26 on page 327): the difference is not significant. Figure 11.28 on page 329 illustrates this: we see a slight tendency toward an interaction effect, but with a very small amplitude.

Table 11.17: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.057	0.092	1	0.5373	1.06
extraction type	-1.221	0.160	-8	p<.001	3.39
trial	0.011	0.010	1	0.2402	1.01
syntactic function:extraction type	0.048	0.104	0	0.6406	1.05

11.6.5.0.3 Comparing the subextraction from subject with the ungrammatical controls We fit a fourth model to compare the extractions out of the subject and the subject ungrammatical controls on their own (mean centered with subextraction coded positive and ungrammatical coded negative). We included trial

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11.28: Interaction between syntactic function and extraction type in the Experiment 13.

number as covariate, and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 11.18. There is a significant effect of extraction type, such that the extraction out of the subject gets ratings significantly higher than its ungrammatical control. There is also a significant effect of trial (habituation).

Table 11.18: Results of the Cumulative Link Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	0.656	0.143	5	p<.001	1.93
trial	0.026	0.011	2	p<.05	1.03

In a fifth model, we compare the subextraction with the ungrammatical controls. We fit a model crossing syntactic function (mean centered with object coded positive, subject coded negative) and extraction type (grammaticality). We include trial number as an explanatory variable too, and random slopes for syntactic function and extraction type grouped by participants and items. The results of the model are reported in Table 11.19. There is a significant main effect of extraction type (in favor of the extraction conditions) and of trial (habituation). There is however no significant main effect of syntactic function and no significant interaction effect.

11.6.6 Discussion

In this experiment on long distance dependencies, we see no typical "island" effect when extracting out of the subject. Extractions out of the subject have a mean acceptability rating slightly under the mean acceptability ratings for objects, but the difference is not significant (model n°1) and there is no interaction when comparing with non-extraction controls (model n°3). The results are more similar to

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 11.19: Results of the Cumulative Link Mixed Model (model n°5)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.134	0.091	1	0.1405	1.14
extraction type	0.631	0.133	5	p<.001	1.88
trial	0.025	0.005	5	p<.001	1.03
syntactic function:extraction type	0.009	0.088	0	0.9142	1.01

the results on long distance dependencies in relative clauses (Experiment 4) than to the results for the other interrogatives with an extraction (Experiment 10 and 12).

As such, the results do not falsify any account. Only the fact that the extractions out of the subject get significantly higher ratings than its ungrammatical control goes against the predictions of the syntactic account.

The rating of the non-extraction conditions is relatively low compared to the other experiments. This can of course be accidental, be due to the items, or be the side effect of the choice of distractors, but it may well be due to the embedded structure itself. However, it was not the case in the relative clauses with long-distance dependencies.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

12 Experiment on *c'est*-clefts

I presented a series of experiments on relative clauses and a series of experiments on interrogatives that show a strong cross-construction difference. Usually, approaches to subject islands expect all extractions to have a similar behavior. Only the FBC constraint predicts the results we observe in the previous experiments. This chapter is about another construction: *it*-clefts sentences (*c'est*-clefts in French).

I will present the discourse status of the different elements in *it*-clefts, and show how *it*-clefts are a good way to test the predictions of the FBC constraint. I will then present an experiment:

12.0.0.0.1 Experiment 14: In this Acceptability Judgment task, we crossed extraction type (subextraction / non-subextraction) with syntactic function (subject / object) and tested *c'est*-clefts. The extraction out of the subject gets significantly lower ratings than extractions out of the object, but significantly higher than ungrammatical controls. There is no significant interaction.

12.1 Information structure of *c'est*-clefts

French *c'est*-clefts are similar to English *it*-clefts on the syntactic level, but show some subtle differences on the pragmatic level with their English counterpart. Two parts can be identified in this construction, as illustrated in (12.1): the pivot and the *that*-clause (or *que*-clause for French).

(12.1) a. [It is tomorrow$_i$]$_{pivot}$ [that we have to leave $_{-i}$]$_{that-clause}$.

b. [C' est demain$_i$]$_{pivot}$ [que nous devons partir $_{-i}$]$_{que-clause}$.
it is tomorrow that we must leave.INF

12.1.0.0.1 Information structure of the pivot *It*-clefts are a special kind of filler-gap dependency. The pivot comprises an expletive *c(e)* 'it', the copula *est* 'is' and an argument: it is a XP that I will designate in the following as the "filler" of

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the *it*-clefted structure, even though it is not strictly speaking a filler on the syntactic point of view. In an *it*-cleft construction, the filler is focused (Lambrecht 1994). The extracted element is then presupposed to be exhaustive relative to the proposition expressed by the *que*-clause.

The kind of focus involved in *it*-clefts has been discussed extensively (see Destruel et al. (2019) for an overview). Prince (1978) said that the focus in *it*-clefts was contrastive. Destruel (2012) and Destruel et al. (2019) however have shown experimentally that English *it*-clefts and French *c'est*-clefts' focus expresses what they call "contrariness": "clefts signal a commitment on the part of the interlocutor to a proposition that conflicts with the one the cleft expresses and […] express opposition to that commitment." As such, it is a corrective focus more than a contrastive focus. We can illustrate this with the example (12.2) below: the commitment *k* in question here is that Alice have told Amy about her surprise party, a commitment to which speaker B is opposed (because speaker B knows that Ken told her about it). The strength of the commitment varies in (12.2) depending on speaker A's utterance. In (12.2a), the commitment is non-existent: there is no cue for speaker B to assume that speaker A is committed to *k*. In (12.2b), the commitment is present, but weak: speaker A does not seem strongly committed to *k*. In (12.2c), the commitment is strong, stronger than in (12.2b): speaker B has every reason to assume that A has a strong commitment for *k*.

(12.2) a. Non-contradictory:
Speaker A: We were planning Amy's surprise party for weeks. I can't believe she found out about it. I guess someone from the staff told her.
Speaker B: Actually, it's Ken who told her about it.

b. Weak commitment:
Speaker A: We were planning Amy's surprise party for weeks. I can't believe she found out about it. I guess Alice must have told her.
Speaker B: Actually, it's Ken who told her about it.

c. Strong commitment:
Speaker A: We were planning Amy's surprise party for weeks. I can't believe she found out about it. Alice told her about it, you know.
Speaker B: Actually, it's Ken who told her about it.
(examples from Destruel et al. 2019: 5)

The results of an experiment run by Destruel et al. (2019) on material similar to what has been presented in (12.2) show that the strength of the commitment *k* is

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

a good predictor for the participants' acceptability of speaker B's utterance (the *it*-cleft): the stronger the commitment, the higher the acceptability. Destruel et al. (2019) conclude that the focus of *it*-clefts (at least in French and English) do not only express contradiction: both (12.2b) and (12.2c) express contradiction, and no difference of acceptability should be noticed between them if contradiction was the only factor at play. Contrariness is however the combination of contradiction and strength of the commitment.

Destruel (2012) also shows that French *c'est*-clefts can mark an information focus. This kind of focus can range over the whole sentence (broad focus) or over one element (narrow focus). Having a main stress on the beginning of an intonational phrase is strongly dispreferred in French. Therefore, it is dispreferred – though not at all infelicitous – to mark narrow information focus on the subject through intonation, and clefted subjects (i.e. fillers in the pivot corresponding to a subject gap in the *que*-clause) are a frequent and preferred way to mark narrow informational focus on the subject in French.

For the same reason, there is a preference for clefted subjects over clefted objects (as experimentally shown by Destruel (2012) and Destruel et al. (2019)), even though the latter are fully acceptable. Such a preference does not exist in English, where subjects can be in situ and receive main stress without problem.

12.1.0.0.2 Information structure of the *que*-clause Prince (1978) describes the content of the *that*-clause in English *it*-clefts as being presupposed and containing "known", but not necessarily "given" information (her terminology). Actually, in some variants of *it*-clefts "frequent in historical naratives", the speaker assumes the information to be unknown by the hearer (hence not given in discourse) but known in general terms as an indisputable (for example historical) fact. One example is given in (15.7).

(12.3) It was in this year that Yekuno Amlak, a local chieftain in the Amba-Sel area, acceded to the so-called Solomonic Throne. (Prince 1978: 900)

In the other and most common used variant of *it*-clefts, the information is presupposed as known by both speaker and hearer, such that the information of the *that*-clause does not play an important role in the development of the dialogue. In some cases, this information may even be given. For this reason, this part may easily be omitted in most of the cases, as shown in (15.8).

(12.4) Who made this mold? was it the teachers? (Prince 1978: 897)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The fact that the information contained in the *that*-clause is presupposed in *it*-clefts can be tested with a negation test: whereas the information conveyed in (15.9a) and (15.9b) do not differ, the negation in (15.9d) only concerns the one in the pivot, whereas John having lost something remains true (this is not the case in (15.9c) in which the scope of the negation is ambiguous).

(12.5) a. John lost his keys.
b. It was his keys that John lost.
c. John didn't loose his keys.
d. It wasn't his keys that John lost. (Prince 1978: 884)

12.2 Experiment 14: Acceptability judgment study on *c'est*-clefts

If *it*-clefts are a focalisation, extractions out of the subject by means of *it*-clefting should be more similar to interrogatives than to relative clauses. This is an important way to test the FBC constraint, because *it*-clefts on the other hand are syntactically closer to relative clauses than to interrogatives. That is why I close this series of experiments about subextraction from a subject NP by testing *c'est*-clefts.

12.2.1 Material and design

To build the material for Experiment 14, we used the items already tested in Experiments 4, 10, 11 and 13 and turned the items into *c'est*-clefts. We tested *c'est*-clefts with a short distance dependency. Subextractions from the subject put the *de*-complement into the pivot.

(12.6) a. **Condition subject + PP-extracted:**
[C' est [de cette innovation]$_i$ que [l' originalité _]
it is of this innovation that the uniqueness
enthousiasme mes collègues sans aucune raison.
excites my colleagues without any reason
'It is of this innovation that the uniqueness excites my colleagues for no reason.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. **Condition object + PP-extracted:**
C' est [de cette innovation]$_i$ que mes collègues admirent [l'
it is of this innovation that my colleagues admire the
originalité $__i$] sans aucune raison ?
uniqueness without any reason
'It is of this innovation that my colleagues admire the uniqueness for no reason.'

It is not possible to build a *c'est*-cleft without extraction, so we use as a felicitous control an extraction of the whole subject (12.7a) or of the whole object (12.7b).

(12.7) a. **Condition subject + noextr:**
C' est l' originalité de cette innovation qui
it is the uniqueness of this innovation that.SUBJ
enthousiasme mes collègues sans aucune raison.
excites my colleagues without any reason
'It is the uniqueness of this innovation that excites my colleagues for no reason.'

b. **Condition object + noextr:**
C' est l' originalité de cette innovation que mes collègues
it is the uniqueness of this innovation that my colleagues
admirent sans aucune raison.
admire without any reason
'It is the uniqueness of this innovation that my colleagues admire for no reason.'

For the ungrammatical controls, we use the material of the subextraction conditions, and leave out the preposition of the extracted element.

(12.8) a. **Condition subject + PP-extracted:**
[C' est cette innovation que l' originalité enthousiasme mes
it is this innovation that the uniqueness excites my
collègues sans aucune raison.
colleagues without any reason
'It is this innovation that the uniqueness excites my colleagues for no reason.'

b. **Condition object + PP-extracted:**

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

C' est cette innovation que mes collègues admirent l'
it is this innovation that my colleagues admire the
originalité sans aucune raison ?
uniqueness without any reason
'It is this innovation that my colleagues admire the uniqueness for no reason.'

We tested the same 24 items than in Experiment 4, 10, 11 and 13, each declined in the six conditions already described. In addition, the experiment had 24 distractors. The distractors were declarative sentences. Around 2/3 of the experimental items and distractors were followed by a comprehension question. The item presented here as an example was followed by the comprehension question *Est-ce que les collègues ont raison d'être enthousiastes ?* ('Are the colleagues right to be enthusiastic?').

12.2.2 Predictions

As said before, the FBC constraint is the only approach that assumes a difference between constructions. *C'est*-clefts imply the focalization of the extracted element, and for this reason, following the FBC constraint, we expect results of Experiment 14 to be similar to the results of the interrogatives (at least interrogatives with an extraction).

The predictions of the other accounts remain the same, except for the processing account based on linear-distance. The non-subextraction condition in this experiment implies an extraction. The contrast between extractions of the subject and extraction of the object are well studied (especially for relative clauses): extractions of the subject are rated higher, read faster and processed easier than extractions of the object (Gibson 1998, Pozniak & Hemforth 2015 to name just a few references on this topic).

This subject preference is compatible with processing accounts based on linear distance, and sometimes motivated these accounts in the first place. However, in our case, this implies that the interaction effect expected based on linear-distance in the previous experiments is not expected in this experiment. There is indeed one referent between the filler and the gap in the subject subextraction conditions (12.6a) and zero for the extraction of the subject (12.7a), while there are three referents between the filler and the gap in the object subextraction conditions (12.6b) and two referents for the extraction of the object (12.7b).

All predictions for *c'est*-clefts are summarized in Table 12.1 on page 337.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 12.1: Predictions of the different accounts for Experiment 14 (clefts)

	Predictions				
	"subject island" accounts			no-island accounts	
	"traditional" syntactic account	processing account with surprisal due to subject complexity	BCI account (Goldberg 2006)	account based on linear distance (DG, DLT)	FBC constraint account
extractions out of the subject vs. extractions out of the object	(a) <(b)	(a) <(b)	(a) <(b)	(a) >(b)	(a) <(b)
extractions vs. non-extractions	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of function (subj > obj) + no interaction effect	main effect of extraction + interaction effect, such that (a) <(b,c,d)
extractions out of the subject vs. ungrammatical controls	(a) ≃ (e)	(a) >(e)	(a) >(e)	(a) >(e)	(a) >(e)
extractions vs. ungrammatical controls	interaction effect, such that (b) >(a,e,f)	main effect of grammaticality	main effect of grammaticality	main effect of grammaticality	main effect of grammaticality

(a) Condition subject + PP-extracted
(b) Condition object + PP-extracted
(c) Condition subject + whole NP extracted
(d) Condition object + whole NP extracted
(e) Condition subject + ungrammatical
(f) Condition object + ungrammatical

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

12.2.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous Acceptability Judgment tasks (see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good". After some sentences, participants had to answer a comprehension question.

The experiment took approximately 20 minutes to complete. The participants received no financial reward for taking part in the experiment. We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

12.2.4 Participants

The study was run between April and May 2019. 24 participants took part in the experiment. We present here the analysis made on the answers of the 21 participants who satisfied all criteria. The 21 participants are 22 to 76 years old. 17 participants self-identify as women, 4 self-identify as men. Six participants (12.77%) indicated having an educational background related to language.

12.2.5 Results and analysis

Figure 12.1 on page 339 gives an overview of the results of the Acceptability Judgment task. The ratings for the subextraction conditions are relatively low. The extraction out of the subject (12.6a) has an average rating of 2.60, lower than the extraction out of the object (12.6b) that has an average rating of 3.75. The grammatical controls have high ratings. The subject control condition (12.7a) has an average rating of 7.93, and the object control condition (12.7b) has an average rating of 7.70. The ungrammatical controls have lower ratings than the subextraction conditions: the subject condition (12.8a) has an average rating of 2.15, and the object condition (12.8b) of 2.07.

Figure 12.1 suggests a potential ceiling effect for the grammatical controls and a potential floor effect for the ungrammatical controls. This is what Figure 12.2 on page 339 is suggesting as well, but the distribution for the subextraction conditions seems relatively normal.

Another representation of the results is given by the ROC and zROC curves of the results in Figure 12.3 on page 340. The ROC curves show that participants discriminate between the ungrammatical baselines and the other conditions, even though the subextraction from subject condition is close to the baseline. Corroborating what we see on Figure 12.1, the non-subextraction conditions build

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 12.1: Acceptability judgments for each condition of Experiment 14. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Figure 12.2: Density of the ratings across conditions for Experiment 14

larger curves than the subextraction conditions. The zROC curves are relatively straight and parallel to the baseline.

The ROC and zROC curves in Figure 12.4 on page 341 show the discrimination between the subject and object conditions. The curves for the object condition are barely discriminated from the baseline, except for the subextraction condition, where the difference between both syntactic functions seems more important. The zROC curves denote that the distribution is not completely normal, except for the subextraction condition that has a straight line parallel to the baseline.

12.2.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 12.5 on page 341. We see some habituation effect for the subject variants of the two controls, but not for their object variants. The subextraction on the other hand gets similar ratings during the whole experiment.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 12.3: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 14.

12.2.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for the fixed effect and the covariate grouped by participants and items. The results of the model are reported in Table 12.2. There is a significant effect of the syntactic function, such that the object condition gets ratings significantly higher than the subject condition. As could be observed in Figure 12.5, there is no significant effect of habituation.

Table 12.2: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.700	0.315	2	p<.05	2.01
trial	0.001	0.014	0	0.9463	1.00

In a second model, we compared the subextractions with the non-subextractions. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-subextraction coded negative). We included

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 12.4: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 14.

Figure 12.5: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 14 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 12.3. There is a significant main effect of syntactic function (in favor of the object) and a significant main effect of extraction type (non-extractions are rated higher). There is also a significant interaction effect. Figure 12.6 on page 342 illustrates this interaction effect: we see a decrease of acceptability for the extraction out of subjects. However, if we compare the AUCs (green and red curves on Figure 12.4 on page 341), the difference is not significant. The two methods lead therefore to different results as far as the interaction effect is concerned.

Table 12.3: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.289	0.145	2	p<.05	1.34
extraction type	-2.547	0.358	-7	p<.001	12.77
trial	0.019	0.011	2	0.0967	1.02
syntactic function:extraction type	0.369	0.177	2	p<.05	1.45

Figure 12.6: Interaction between syntactic function and extraction type in the Experiment 14.

12.2.5.0.3 Comparing the subextraction from subject with the ungrammatical controls We fit a third model to compare the extractions out of the subject and the subject ungrammatical controls on their own (mean centered with subextraction coded positive and ungrammatical coded negative). We included trial number as covariate, and random slopes for the fixed effect and the covariate grouped by participants and items. The results of the model are reported in Table 12.4. There is a significant effect of extraction type, such that the extraction out of the subject gets ratings significantly higher than its ungrammatical control.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 12.4: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
extraction type	0.450	0.222	2	p<.05	1.57
Trial	0.008	0.020	0	0.6682	1.01

In a fourth model, we compare the subextraction with the ungrammatical controls. We fit a model crossing syntactic function (mean centered with object coded positive, subject coded negative) and extraction type (grammaticality). We included trial number as covariate, and random slopes for all fixed effects and covariate grouped by participants and items. The results of the model are reported in Table 12.5. There is a significant main effect of extraction type (in favor of the extraction conditions) and a significant interaction, such that extractions out of the object are rated higher than all other conditions.

Table 12.5: Results of the Cumulative Link Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.455	0.238	2	0.0557	1.58
extraction type	0.802	0.223	4	p<.001	2.23
trial	-0.005	0.011	-0	0.6846	1.00
syntactic function:extraction type	0.368	0.167	2	p<.05	1.45

12.2.5.0.4 Comparing the extraction of the subject with the extraction of the object We fit a fifth model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 12.6. There is a significant effect of habituation, but no significant effect of syntactic function. Extractions of the subject (12.7a) do not get significantly higher ratings than (12.7b).

Table 12.6: Results of the Cumulative Link Mixed Model (model n°5)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	-0.003	0.174	-0	0.985011	1.00
trial	0.039	0.015	3	p<.01	1.04

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

12.2.6 Discussion

In this experiment, the extractions out of the subject get significantly lower rating than extractions out of the object (model n°1), but this does not lead to a significant interaction (comparsion of AUCs). Extractions out of the subject are nevertheless significantly higher than their ungrammatical controls (model n°3).

The fact that extractions out of the subject have lower ratings than extractions out of the object, and also that there is a significant main effect in favor of objects is in contradiction with the expectations of processing accounts based on linear distance. On the other hand, the fact that extractions out of the subject are higher than the ungrammatical controls is in contradiction with the predictions of the syntactic account.

All other accounts expect to see a significant interaction effect. The results about this are contradictory: there is a significant interaction effect with the less conservative method (model n°2), but not with the more conservative one (comparison of AUCs). A precautious approach leads us to to conclude that the null-hypothesis (i.e. that there is no interaction effect) is not falsified either, and therefore that the study is inconclusive in this respect. Accounts that predict an interaction effect are not falsified, but it is noticeable that the degradation when extracting out of the subject is less strong in these *c'est*-clefts than in the interrogatives of the previous studies. Indeed, in the corpora, we found extractions out of the subject in *c'est*-clefts (especially an undeniable focalization with example (8.8a) page 130), while we did not find any in interrogatives.

We were not able to reproduce the findings of Destruel (2012) about extractions of the subject (model n°5). It is surprising, because the subject preference has been attested many times for relative clauses. This may be an indication that our experiment is not very powerful (it may not have enough participants), or that another unidentified factor is playing a role in our material.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

13 Experiments on infinitival subjects

The results of the previous corpus and experimental studies show that extractions out of subject NP are not islands. Certainly, these extractions are constrained in certain constructions, but by general constraints, not restricted to these specific configurations. This is in contradiction with our definition of "islands".

What about infinitival and sentential subjects? Indeed, Ross's (1967) original definition of subject island only targeted extractions out of clauses, not out of NPs. Ross (1967) furthermore acknowledges that the subject island constraint may be English-specific, and that Japanese, for example, seems to allow extraction out of sentential subjects.

Sentential and infinitival subjects are hard to target by a corpus study and that's the reason why I present in this chapter two last experiments on infinitival subjects. Both are Acceptability Judgment tasks. The organization of the chapter is the following:

Experiment 15: In this Acceptability Judgment task, we cross extraction type (extraction / non-extraction) with syntactic function (subject / object) and test subextraction out of infinitivals. The subextraction consists of an extraction of the locative complement of the verb of the embedded clause with *où*. Extractions out of infinitival subjects have significantly lower mean ratings than extractions out of infinitival objects (impersonal structure), but there is no significant interaction.

Experiment 16: In this Acceptability Judgment task, we cross extraction type (extraction / non-extraction) with syntactic function (subject / object) and test subextraction out of infinitivals. The subextraction consists of an extraction of the direct object of the verb of the embedded clause with *que*. Extractions out of infinitival subjects have significantly lower mean ratings than extractions out of infinitival objects (impersonal structure), and there is a significant interaction such that extractions out of the subject have lower ratings than all other conditions.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

13.1 Experiment 15: Acceptability Judgment study on subextraction from infinitivals with *où*

We chose to test infinitival clauses, because extractions out of sentential clauses pose additional problems, as noted by Kluender (2004). Godard (1988: 63) thinks that extractions out of finite clauses may be ruled out in general. In their corpus study (see Section 8.1.2), Candito & Seddah (2012a) corroborate that extractions out of non-finite clauses are way more frequent than extractions out of finite clauses: "We noted that extraction out of finite verbal clause is totally absent from the corpora we've annotated (one case only for over 15000 sentences), but extraction out of infinitival clause accounts for one third of the occurrences of the relative pronoun *que*.".

Infinitival subjects are also somewhat more frequent, and therefore more familiar. In the French Treebank (Abeillé et al. 2019), there are only 24 sentential subjects, for 99 infinitival subjects. As a comparison, there are 26 000 nominal subjects in the same corpus.

13.1.1 Material and design

The experiment is an Acceptability Judgment task with a 2*2 design that I explain here in details.

We based our design on felicitous examples reported from English, like the following, that Chaves & Putnam (2020: 105) attribute to Grosu (1981: 72):

(13.1) a. The 'Hunan' restaurant is a place [where]$_i$ [having dinner $__i$] promises to be most enjoyable.

b. The pre-midnight hours are the time [when]$_i$ [sleeping soundly $__i$] is most beneficial to one's health.

For this reason, we used verbs that select a locative complement (e.g. *flâner* 'wander' or *habiter* 'reside') and extract this locative complement with *où* ('where'). The verb builds an infinitival subject clause for the subject condition (8.20a), and is used in an impersonal construction for the object condition (8.20b).

(13.2) a. **Condition subject + *où* extracted:**
Amsterdam est connue pour son centre-ville, où$_i$ [flâner $__i$]
Amsterdam is known for its city.center where wander.INF
est charmant lorsqu' il fait beau.
is charming when it does nice
'Amsterdam is well-known for its city center, where to wander is charming when the weather is nice.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. **Condition object + *où* extracted:**
Amsterdam est connue pour son centre-ville, où$_i$ il est
Amsterdam is known for its city.center where it is
charmant [de flâner $__i$] lorsqu' il fait beau.
charming of wander.INF when it does nice
'Amsterdam is well-known for its city center, where it is charming to wander when the weather is nice.'

We build non-extractions controls by using a coordination instead of an extraction.

(13.3) a. **Condition subject + noextr:**
Amsterdam est connue pour son centre-ville, et y
Amsterdam is known for its city.center and there
flâner est charmant lorsqu' il fait beau.
wander.INF is charming when it does nice
'Amsterdam is well-known for its city center, and to wander there is charming when the weather is nice.'

b. **Condition object + noextr:**
Amsterdam est connue pour son centre-ville, et il est charmant
Amsterdam is known for its city.center and it is charming
d' y flâner lorsqu' il fait beau.
of there wander.INF when it does nice
'Amsterdam is well-known for its city center, and it is charming to wander there when the weather is nice.'

We build 12 items, each declined in the four conditions just described. In addition, the experiment had 36 distractors. Around 1/3 of the experimental items and distractors are followed by a comprehension question. The item presented here as an example is followed by the comprehension question *Est-ce que j'aime me promener dans Amsterdam ?* ('Do I like to take a walk in Amsterdam?').

13.1.2 Predictions

The predictions for this experiment are similar to the predictions for relative clauses in general. They are summarized in Table 9.6, which is reproduced here in Table 13.1 on page 348.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 13.1: Predictions of the different accounts for Experiments 15 and 16 (relative clauses)

	Predictions				
	"subject island" accounts			no-island accounts	
	"traditional" syntactic account	processing account with surprisal due to subject complexity	BCI account (Goldberg 2006)	account based on linear distance (DG, DLT)	FBC constraint account
extractions out of the subject vs. extractions out of the object	(a) <(b)	(a) <(b)	(a) <(b)	(a) >(b)	(a) ⩾ (b)
extractions vs. non-extractions	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)	main effect of extraction + interaction effect, such that (a) <(b,c,d)	interaction effect, such that (b) <(a,c,d)	main effect of extraction + no interaction

(a) Condition subject + subextraction
(b) Condition object + subextraction
(c) Condition subject + no extraction
(d) Condition object + no extraction

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

13.1.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous Acceptability Judgment tasks (see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good".

The experiment took approximately 20 minutes to complete. The participants received no financial reward for taking part in the experiment. We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

13.1.4 Participants

The study was run between October 2018 and January 2019. 37 participants took part in the experiment. We present here the analysis made on the answers of the 27 participants who satisfied all criteria. The 27 participants are 18 to 90 years old. 15 participants self-identify as women, 11 self-identify as men. 10 participants (37.04%) indicated having an educational background related to language.

13.1.5 Results and analysis

Figure 13.1 on page 349 gives an overview of the results of the Acceptability Judgment task. All experimental conditions receive very high ratings. In the subextraction conditions, the extraction out of the subject (13.2a) has an average rating of 7.58, lower than extraction out of the object (13.2b) that has an average rating of 8.33. The subject control condition (13.3a) has an average rating of 8.12, and the object control condition (13.3b) has an average rating of 8.41.

Figure 13.1: Acceptability judgments for each condition of Experiment 15. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Unfortunately, these high ratings suggest that we may have ceiling effects in all conditions. Figure 13.2 on page 350 also suggests this, even though the ceiling effects seem more important in the object conditions.

Figure 13.2: Density of the ratings across conditions for Experiment 15

Another representation of the results is given by the ROC and zROC curves of the results in Figure 13.3 on page 351. The ROC curves show that participants hardly distriminate between the subextraction condition (grey baseline) and the non-extraction controls. The zROC curves are relatively straight, but the curve for subjects deviates from the baseline. Following Dillon & Wagers (2019), this can be a visual cue that there is more variance in one condition. This is in line with the box-and-whisker plots in Figure 13.1 that shows more variability on the ratings for the subextraction from subject condition.

The ROC and zROC curves in Figure 13.4 on page 352 show the discrimination between the subject and object conditions. We see a weak prefernce for the two object conditions (curve above the baseline). The zROC curves are relatively straight and parallel to the baseline.

13.1.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 13.5 on page 352. All conditions except the subextraction from objects show some weak habituation.

13.1.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for the fixed effect and covariate by participants and items. The results of the model are reported in Table 13.2. There is a significant main effect of the syntactic function, such that the object condition gets ratings significantly higher than the subject condition.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 13.3: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 15.

Table 13.2: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.388	0.193	2	p<.05	1.47
trial	0.016	0.015	1	0.278	1.02

In a second model, we compare the subextraction with the non-extraction. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 13.3. The results corroborate the observation of the zROC curves in Figure 13.4. There is a significant main effect of syntactic function (in favor of the object). There is however no main effect of extraction type and no significant interaction, even though Figure 13.6 on page 353 shows a weak tendency toward an interaction effect. If we compare the AUCs (green and red curves on Figure 13.4 on page 352), the difference is not significant either. Trial number also is not a significant factor, as could be seen in Figure 13.5.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 13.4: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 15.

Figure 13.5: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 15 in the course of the experiment

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 13.3: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.427	0.136	3	p<.005	1.53
extraction type	-0.015	0.163	-0	0.9291	1.01
trial	0.016	0.009	2	0.0655	1.02
syntactic function:extraction type	0.093	0.160	1	0.562	1.10

Figure 13.6: Interaction between syntactic function and extraction type in the Experiment 15.

13.1.6 Discussion

The results of this experiment on infinitival subjects show first of all that the kind of subextractions tested receives very high ratings.

These high ratings cause even a problem in the statistical analysis: there are so much ceiling effects that we cannot be sure that they do not conceal any other significant effect. The ratings for extractions out of the subject are significantly lower than the ratings for extractions out of the object, but we can't see any interaction effect. We can imagine that with more participants (the results are based on the results of only 27 participants) or adding additional difficulties to the sentences in order to have less ceiling effects could potentially make the interaction significant. This is indeed what we do in the following study.

However, the mere fact that we are confronted with ceiling effects for extractions out of infinitival subjects is in my opinion a strong evidence that the constraint, if there is any, has nothing to do with a syntactic island constraint. We did not include ungrammatical controls in this experiment, but there is no doubt that extractions out of the infinitival subject do not receive the ratings of an ungrammatical structure.[1]

[1]For example, the "ungrammatical" distractors receive a mean rating of 4.17. They are them-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

13.2 Experiment 16: Acceptability Judgment study on subextraction from infinitivals with *que*

Chaves (2013) reports a lot of felicitous examples of extractions of the direct object from an infinitival subject:

(13.4) a. The eight dancers and their caller, Laurie Schmidt, make up the Farmall Promenade of nearby Nemaha, a town$_i$ that [[to describe $__i$ as tiny] would be to overstate its size]. (Huddleston & Pullum 2002: 1094, fn. 27)

b. In his bedroom, [which]$_i$ [to describe $__i$ as small] would be a gross understatement, he has an audio studio setup. (Chaves 2013: 471)

Based on our intuition that such sentences are less felicitous than the extraction of a PP tested in Experiment 15, we tested in Experiment 16 the extraction of an object NP. According to Candito & Seddah (2012a), extractions out of a non-finite clause with *que* are very frequent. For this reason, we assumed that a potential contrast between extraction out of subjects and extractions out of objects would be stronger in this second experiment.

13.2.1 Material and design

The Experiment replicates the 2*2 design of the previous experiment, but uses verbs that select a direct object. Whenever possible, we tried to stay close to the items of Experiment 15, and describe similar situation. For this reason, many direct object also denote locations (e.g. *explorer une forêt* 'explore a forest').

Again, the subextraction takes place from a infinitival subject for the subject condition (8.20a), and from the complement of an impersonal construction for the object condition (8.20b). Non-extraction controls (8.22a) and (8.22c) are a coordination.

(13.5) a. **Condition subject + *que* extracted:**
Amsterdam est connue pour ses péniches, qu$_i$' [observer $__i$] est
Amsterdam is known for its barges that observe.INF is

selves relatively acceptable, because they all involve structures with potential agreement attraction like '*Le commandant des armées ont attaqué la Biélorussie.* 'The commander(.SG) of the troops(.PL) attacked(.PL) Belarus'.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

charmant lorsqu' il fait beau.
charming when it does nice
'Amsterdam is well-known for its barges, that to observe is charming when the weather is nice.'

b. **Condition object + *que* extracted:**
Amsterdam est connue pour ses péniches, qu$_i$' il est charmant
Amsterdam is known for its barges that it is charming
[d' observer $__i$] lorsqu' il fait beau.
of observe.INF when it does nice
'Amsterdam is well-known for its barges,that it is charming to observe when the weather is nice.'

c. **Condition subject + noextr:**
Amsterdam est connue pour ses péniches, et les
Amsterdam is known for its barges and them.ACC
observer est charmant lorsqu' il fait beau.
observe.INF is charming when it does nice
'Amsterdam is well-known for its barges, and to observe them is charming when the weather is nice.'

d. **Condition object + noextr:**
Amsterdam est connue pour ses péniches, et il est charmant de
Amsterdam is known for its barges and it is charming of
les observer lorsqu' il fait beau.
them.ACC observe.INF when it does nice
'Amsterdam is well-known for its barges, and it is charming to observe them when the weather is nice.'

We build 12 items, based on the items of Experiment 15. Each item is declined in the four conditions just described. In addition, the experiment had 36 distractors, some of which are ungrammatical. Around 40% of the experimental items and 70% of the distractors were followed by a comprehension question. The item presented here as an example was followed by the comprehension question *Il est question de Hambourg*. ('This is about Hamburg.').

13.2.2 Predictions

The predictions for this experiment are the same than the predictions for the previous experiment. They are summarized in Table 13.1 on page 348.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

13.2.3 Procedure

We conducted the experiment on the Ibex platform (Drummond 2010). The procedure was similar to the procedure of the previous Acceptability Judgment tasks (see Section 8.2.3). Participants had to rate the sentences on a Likert-scale from 0 to 10, 0 being labeled as "bad" and 10 being labeled as "good".

The experiment took approximately 20 minutes to complete. The participants received no financial reward for taking part in the experiment. We recruited the participants on the R.I.S.C. website (http://experiences.risc.cnrs.fr/) and on social media (e.g. Facebook).

13.2.4 Participants

The study was run between May and August 2019. 29 participants took part in the experiment. We present here the analysis made on the answers of the 19 participants who satisfied all criteria. The 19 participants are 19 to 76 years old. 12 participants self-identify as women, seven self-identify as men. Three participants (15.79%) indicated having an educational background related to language.

13.2.5 Results and analysis

Figure 13.7 on page 356 gives an overview of the results of the Acceptability Judgment task. In the subextraction conditions, the extraction out of the subject (13.5a) has an average rating of 4.47, lower than the extraction out of the object (13.5b) that has an average rating of 6.73. The non-extraction conditions are rated higher: the subject control condition (13.5c) has an average rating of 8.00, and the object control condition (13.5d) has an average rating of 7.96.

Figure 13.7: Acceptability judgments for each condition of Experiment 16. The grey box-and-whisker plots indicate the median and quartiles of the results. Black points are outliers. Mean and confidence intervals are indicated in white.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 13.7 suggests potential ceiling effect for the non-extraction conditions. The subextraction conditions however seem distributed along the whole scale in this experiment. This is corroborated by Figure 13.8 on page 357.

Figure 13.8: Density of the ratings across conditions for Experiment 16

Another representation of the results is given by the ROC and zROC curves of the results in Figure 13.9 on page 357. The ROC curves show that participants discriminate between the subextraction conditions and the non-extraction controls. The zROC curve for the subject condition is convex.

Figure 13.9: ROC curves (top) and zROC curves (bottom) of the non-extraction conditions compared to their respective subextraction condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 16.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The ROC and zROC curves in Figure 13.10 on page 358 show the discrimination between the subject and object conditions. We see that the discrimination is more important for the subextraction than for the non-extraction controls. The zROC curve for the subextraction is slightly convex.

Figure 13.10: ROC curves (top) and zROC curves (bottom) of the object conditions compared to their respective subject condition represented by the dotted grey baseline (Dillon & Wagers 2019's method) in Experiment 16.

13.2.5.0.1 Habituation An overview of the habituation effects in the course of the experiment is given in Figure 13.11 on page 359. The non-extraction conditions do not show an habituation effect (or very small). But the subextraction conditions show an habituation effect, especially for extractions out of the object (but there's no interaction, see below).

13.2.5.0.2 Comparing the subextraction from subject with the subextraction from object We fit a first model to compare the extractions out of the subject and out of the object on their own (mean centered with subject coded negative and object coded positive). We included trial number as covariate, and random slopes for the fixed effect and covariate grouped by participants and items. The results of the model are reported in Table 13.4. There is a significant effect of the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 13.11: Evolution of the average acceptability ratings (z-scored by participant) for each condition of Experiment 16 in the course of the experiment

syntactic function, such that the object condition gets ratings significantly higher than the subject condition. There is also a significant effect of trial (habituation).

Table 13.4: Results of the Cumulative Link Mixed Model (model n°1)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	1.328	0.488	3	p<.01	3.77
trial	0.069	0.023	3	p<.005	1.07

We fit a second model to compare the extractions out of the subject and out of the object on their own, and cross this factor with trial number in order to see if they differ in terms of habituation. We participants and items as random variables. The results of the model are reported in Table 13.5. The main effect of syntactic function which is seen in model n°1 disappears in this model. There is no significant interaction, contrary to the impression we may get based on the observation of Figure 13.11.

Table 13.5: Results of the Cumulative Link Mixed Model (model n°2)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.474	0.465	1	0.307	1.61
trial	0.034	0.014	2	p<.05	1.03
syntactic function:trial	0.014	0.015	1	0.342	1.01

In a third model, we compare the subextractions with the non-extractions. We fit a model crossing syntactic function and extraction type (mean centered with extraction coded positive, non-extraction coded negative). We included trial number as covariate, and random slopes for all fixed effects grouped by participants

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

and items. The results of the model are reported in Table 13.6. There is a significant main effect of syntactic function (in favor of the object), a significant main effect of extraction type (non-extractions are rated higher), and a significant main effect of trial (habituation). There is also a significant interaction effect. Figure 13.12 on page 360 shows indeed a strong decrease of ratings for the extractions out of subjects compared to the other conditions. The difference is also significant ($p < 0.05$) if we compare the AUCs (green and red curves on Figure 13.10 on page 358).

Table 13.6: Results of the Cumulative Link Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
syntactic function	0.704	0.285	2	p<.05	2.02
extraction type	-1.455	0.251	-6	p<.001	4.28
trial	0.043	0.012	3	p<.001	1.04
syntactic function:extraction type	0.585	0.229	3	p<.05	1.79

Figure 13.12: Interaction between syntactic function and extraction type in the Experiment 16.

13.2.6 Discussion

The contrast between extractions out of the subject and extractions out of the object is more important in this experiment than in the previous experiment. In general, the subextraction out of an infinitival complement seems more felicitous with *où* than with *que*, because we see in this experiment a main effect of extraction type (model n°3) that we did not observe in Experiment 15.

Here, a "subject island effect" arises. The extraction out of the subject receives significantly lower ratings than the extraction out of the object (model n°1), and there is a significant interaction such that extractions out of the subject have

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

lower ratings than all other conditions (model n°3). Notice however that the significant difference between extractions out of the subject and extractions out of the object disappear if we cross this factor with trial number. Nevertheless, the interaction effect seems strong, because it is also significant with the more conservative method of comparing the AUCs.

Ratings for extractions out of the infinitival subject are not very low. They get a mean rating of 4.47 on a scale from 1 to 10. As a comparison, the ungrammatical distractors (wrong subject-verb agreement) have a mean rating of 1.72. In my opinion, the traditional syntactic account cannot explain this.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

14 Conclusions on the empirical data

Contrary to an idea strongly anchored in syntax, extractions out of the subject are possible in French. The empirical data I have presented in this part of the book show that extractions out of the subject can be found in the productions of native speakers, and that the speakers do not reject them in acceptability judgment tasks.

I was not able to confirm experimentally the observation made by Chaves and his colleagues (Chaves & Dery 2014, 2019, Chaves & Putnam 2020) that extractions out of the subject undergo a strong habituation and get significantly better in the course of the experiment. But this is not very surprising, because the number of items in these experiments is below the threshold considered by these authors as sufficient for observing the habituation. In general, the habituation patterns seem to be relatively inconsistent, and this factor is rarely significant in my models.

14.1 Extractions out of the NP and extractions out of the subject

In general, what we can observe in production data is that extractions out of subjects are very frequent where extractions out of NPs are frequent. In written French, there is no fixed usage of *dont* or any other relative word for extracting the *de*-PP complement of the verb, as was observed for spoken French by Blanche-Benveniste (1990). On the contrary, extractions of the *de*-complement of the noun out of NPs are frequent in relative clauses. However, in interrogatives, we see a different pattern, such that the *wh*-word is used almost exclusively to extract the complement of the verb and there are very few extractions out of NPs. There are also no extractions out of the subject NP in interrogatives. I do not think that this is a coincidence. We see indeed something similar when we look at *avec qui* relative clauses. On one hand we observe that almost all occurrences of *avec qui* relative clauses are extractions of the complement of the verb or adjuncts, and that extractions out of NPs are very rare, while on the other hand we observe very few extractions out of subjects.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

This first observation is compatible with what Kluender (2004) says about extractions out of the subject: whenever extracting out of an NP is not a frequent option, there seems to be an additional disadvantage for extracting out of the subject compared to extracting out of the object.

This may explain a difference between the results of Experiment 12 and those of Experiments 10, 13, and 14. In Experiments 10, 13, and 14, extractions out of the subject are rated higher than the ungrammatical controls. In Experiment 12, extractions out of the subject are not rated significantly higher than the ungrammatical controls. There are several ways to interpret this result. The first is that of syntactic accounts, i.e., that this is a syntactic island, and therefore ungrammatical. But the expectations of the syntactic accounts have been falsified on many other occasions in the other experiments. The second way to interpret this result is to appeal to specificity. Indeed, many studies on English so-called "*wh*-islands" show that *which* + N interrogatives are more acceptable than *who/what* interrogatives when the structure is complex. But I propose a different interpretation: For some reason, *de qui* is not considered a suitable interrogative phrase for NP subextractions. The evidence for this is that we find almost no *de qui* interrogative with an NP extraction in corpus studies.[1] Wherever extractions out of the NP are unacceptable, extractions out of the subject are even less acceptable.

But even if we take into account the frequency/acceptability of extractions out of the NP, there is definitely a difference between the constructions. *Avec qui* relatives and *de qui* interrogatives both have few extractions outside the NP, but we find a few extractions outside the subject in the former and none in the latter. This second observation shows that Kluender's (2004) hypothesis is not sufficient to explain the data, because it does not predict a cross-construction difference. For this, we need the FBC constraint.

14.2 Cross-construction difference

The results of the experiments and of the corpus studies show a clear contrast between non-focalization constructions (the relative clauses) and the focalization constructions (interrogatives and *c'est*-clefts) as far as extractions out of a subject are concerned.[2] This contrast is expected by the FBC constraint, but not expected

[1] Of course, it remains to be explained why *de qui* is not adequate to extract out of an NP, while *dont* is. I have no answer to this question at the moment.

[2] That the results of the experiments are perfectly compatible with the results of the corpus studies confirms that both methodologies give similar results (Bosch et al. 2020).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

under any other account that I am aware of. My conclusion is that the FBC constraint predicts the results of these different experiments best, even though it cannot alone account for all results.

14.2.1 Relative clauses

Production data from the French Treebank and Frantext show that speakers produce extractions out of the subject frequently. In *dont* and *de qui* relative clauses, extracting out of the subject is the most frequent usage of the relative word. In *duquel* relative clauses, it is used more frequently than extractions out of the object, even though it is not the most frequent usage overall. In the experiments, the ratings for extractions out of the subject are significantly higher than the ratings for extractions out of the object in Experiments 1, 4, 7 and 8, with a significant interaction in Experiment 1. In all experiments that include ungrammatical controls (Experiment 4, 7 and 8), the subextraction from the subject is rated significantly higher than its ungrammatical counterpart. Also, reading patterns in Experiment 3 indicate rather a disadvantage for extractions out of the object. Overall, the empirical data corroborate what Godard (1988) said about extractions out of subjects in relative clauses in French.

The disadvantage for extractions out of the subject observed in Experiment 5 is probably an artefact of the material, that has an animacy mismatch between subject and object. Indeed, the disadvantage disappears when the animacy mismatch is removed in Experiment 7.

The significant interaction I find in Experiment 1 in favor of the subextraction from the subject should be considered with caution. As I pointed out several times in the discussions related to the experiments, these effects may be an artefact of the material (especially of the choice of coordinations with an anaphoric possessive article for the control conditions), but also due to the ceiling effects observed almost systematically for *dont* relative clauses. The advantage for extractions out of the subject are expected under accounts based on memory costs, because the filler-gap dependency is shorter in this case. It is not expected by the FBC constraint. Of course, both are not incompatible, and my conviction is that a combination of both predicts the data for relative clauses best. However, the evidence is too sparse for me to conclude based on the results of my studies that processing accounts based on memory costs are confirmed by the data.

We conducted two corpus studies on Frantext 1900–1913 to see whether there was a shift in the usage, but this was not the case: Extractions out of the subject were frequent at the beginning of the 20th century as well.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The corpus data therefore falsify accounts that predict any form of subject island effect. The experimental data are compatible with them, even though I want to underline once again that null effects can by no means either prove nor falsify any theory or prediction. As a matter of fact, what we observe in the experiments on relative clauses are mostly null effects. These results are therefore only meaningful because they contrast so undeniably with the results of the experiments on other constructions. On the other hand, the fact that we observe only null effects for the potential "subject island" effects (i.e. interactions between extraction type and extraction site) is a strong cue – even though it is not a proof – that syntactic accounts that expect extractions out of the subject to be ungrammatical and ruled out by grammar altogether, cannot be on the right track.

14.2.2 Focalizations (interrogatives and *c'est*-clefts)

The results of the interrogatives and clefts are directly opposite to those of the relative clauses. On the side of the corpus studies, we find no extractions out of subjects in interrogatives, and the extractions out of subjects in clefts may be debatable. On the side of the experiments, there is much evidence in favor of a disadvantage of extractions out of the subject. First, the ratings for the extractions out of the subject are significantly lower than the ratings for the extractions out of the object in the interrogatives with a short distance dependency (Experiment 10 and 12) and in the *c'est*-clefts (Experiment 14). Second, there is a significant interaction between extraction type and extraction site in the interrogatives with a short distance dependency. Whether there is a significant interaction in the *c'est*-clefts is not clear: the result is significant for the Cumulative Link Mixed Model, but not when comparing the AUC. The later method being more conservative than the previous one, we should be cautious and say that the results are inconclusive.

These results falsify an approach based on memory costs, which expects that extractions out of the subject should be rated better than extractions out of the object. Even though the other accounts expect a degradation when extracting out of the subject, no account except the FBC constraint can explain the contrast with relative clauses. Furthermore, the syntactic accounts are falsified, because extractions out of the subject should be ruled out by grammar and therefore be rated as low as ungrammatical controls. Yet, in Experiment 10, 13 and 14, the extractions out of the subject are rated higher than the ungrammatical controls.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

14.2.2.1 Interrogatives worse than *c'est*-clefts

Interrogatives have their own pragmatic constraints. One of these constraints is that the presuppositions of all answers must be part of the Common Ground (Simonenko 2015). We can illustrate this requirement with example (14.1).

(14.1) a. Question: Of which innovation does the uniqueness excite my colleagues for no reason?

b. One answer alternative: [The uniqueness of the digital bracelet for social distancing]$_B$ excites my colleagues for no reason.

By default, the whole subject in (14.1b) is backgrounded, and therefore presupposed. The pragmatic constraint of questions thus states that the subject of (14.1b) must be part of the Common Ground in (14.1a). Then, we are faced with a contradiction: the inquirer asks for information that is presupposed as being part of the Common Ground (a presupposition that they introduced themself). Simonenko 2015 makes a similar argument about another kind of islands. This mechanism may reinforce the FBC constraint and explain why the "island effect" is stronger in interrogatives than in *c'est*-clefts.

14.2.2.2 Exceptions

The interaction in disfavor of extractions out of the subject can only be found in interrogatives with a short distance dependency. There are therefore two exceptions: the interrogatives with the *wh*-phrase in situ (Experiment 11), and the interrogatives with a long distance dependency (Experiment 13).

In Experiment 11, except for a main effect of extraction type, no significant effect is found. We can conclude that in situ interrogatives do not behave like interrogatives with an extraction as far as the "subject island" is concerned. This is not expected by the FBC constraint, in which extraction plays no role. One possibility would be to add the extraction as a necessary factor in the FBC constraint. On the other hand, I have shown in the discussion of this experiment that the functional status of in situ questions is not clear. There is a possibility that the FBC constraint is not violated in in situ questions in French, because the structure is not a focalization by default. There is, for the time being, not enough strong evidence to conclude in favor of any of these two possibilities. Therefore, I leave this question open, and will assume the FBC constraint as defined in (4.31).

In Experiment 13, no significant difference is observed between extractions out of the subject and extractions out of the object. In this respect, there is a contrast between Experiment 10 and Experiment 13. The result of Experiment 13

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

directly contradicts syntax-based and processing-based accounts. A higher complexity and an increased length of the extraction in long distance dependencies is expected by these accounts to lead to a stronger "island effect" than in short distance dependencies. But the contrast seems also in contradiction with the FBC constraint. However, I doubt that it is the case. First, the results do not falsify the FBC constraint. We could imagine that the experiment is not strong enough to capture the effects of the discourse clash because of some factor that we forget to take into account. More importantly, I do consider it possible that the discourse clash is at least weaker, or even disappears, in a long distance dependency. We consider information structure as a relation between a constituent and a clause (see Section 15.1). In (14.2), *of who* is by default focus with respect to the matrix clause. But it is not sure that it is focus with respect to the embedded clause.

(14.2) [Of who]$_i$ do you think [that [the daughter $__i$] plays the piano]?

If *of who* is not the focus of the embedded clause, then there is no discourse clash, and the FBC constraint is not violated. If *of who* is the focus of the embedded clause, then it can be at least focus to a lesser degree, based on the common assumption that elements have the possibility to be focussed, topic, or backgrounded to a lesser or greater extent. I come back to this question in Section 15.2.

14.2.3 Extractions out of a verbal subject

In Experiments 15 and 16, we looked at extractions out of infinitive subjects. We observe an interaction effect in Experiment 16 with *que*, but not in Experiment 15 with *où*. Yet these results are not necessarily in conflict. Experiment 15 does indeed appear to have strong ceiling effects, which may mask a potential interaction.

Experiments 15 and 16 pose a problem with respect to the FBC constraint. They are relativizations, and so the FBC constraint does not expect to see any degradation in the extraction out of the subject. Thus, it seems that the FBC constraint alone cannot explain the results we observe.

We can review the other accounts. Distance-based processing accounts do not expect the pattern we observe in Experiments 15 and 16 either and can therefore be set aside. Overall, the extractions out of the subject receive high scores, which is at odds with the ungrammaticality of these extractions assumed by syntactic accounts. The latter should therefore be set aside as well. Then, it is hard to believe that BCI-like functional accounts are right about infinitive subjects when these accounts are inconsistent with the other empirical results I have presented.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The proposition of Kluender (2004) that retrieving complex topics induces higher processing costs seems a good explanation, and it can be combined with the FBC constraint. We can indeed assume that processing costs are higher when the subject is more complex. NPs including a *de*-PP do not seem to be very complex in French. NPs including another kind of PP are probably more complex. Verbal subjects are even more complex, but infinitival ones probably less than sentential ones. This gives us a hierarchy of complexity, that has as a consequence that very complex subjects are avoided whenever possible. The more complex the subject is, the less expected it is, and the less probable it is that the addressee predicts a gap inside the subject. Unexpected gaps create stronger processing costs. As long as these processing costs are below a certain threshold, they have virtually no incidence on the addressee's perception (as in our Experiments on relative clauses). In Experiment 16, in which the relative word is less specific than in Experiment 15, the threshold is met, and we observe a significant interaction, probably caused by more difficulties for extracting out of the subject.

14.3 Discourse clash

We cannot reduce the difference between the constructions to an incompatibility in information structure between the extracted element and its head. Indeed, if it seems problematic to focalize out of a topic, topicalizing out of a focus (or non-topic) is not a problem. This is attested by the extractions out of postverbal subjects that we find in the copus studies. Following Lahousse (2011), postverbal subjects are less topical than preverbal subjects. In the different corpus studies presented above, we find in total 12 extractions out of a postverbal subject.[3] This means that topicalization out of a less topical element does not lead to a discourse clash. The fact that there are many more extractions out of preverbal subject can be explained by the fact that speakers tend to minimize the distance between the filler and the gap.

[3]Lahousse (2011: 261) notices that most of the examples of postverbal subject in the literature about subject-verb inversions are restrictive. In my corpus studies, all but one extractions out of a postverbal subject are non-restrictive (and the last one reported page 275, (10.13b), even though we annotated it as restrictive, is an ambiguous case – see our guidelines for annotation in Section IV). Lahousse says that inversion is always acceptable in restrictive relative clauses, but not in non-restrictive relative clauses. In a non-restrictive relative clause, she says, there must be a clear indication that the subject is non-topical (for example: the presence of a framing topic). I cannot confirm this assertion, and find no special indication that the subject is non-topical in these 12 relative clauses. In four of them, a preverbal subject would have as a consequence that the verb would stand in the last position, and this is dispreferred in French (still following Lahousse 2011: 261).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

14.4 Verb types

14.4.1 Extractions out of the subject of transitive verbs

Chomsky (2008) and Polinsky et al. (2013), among other scholars, say that extracting of the subject of a transitive verb is degraded compared to extracting out of an "underlying object", i.e. out of the subject of a passive or unaccusative verb. In a majority of the corpus studies, there is indeed a significant difference between the extractions out of the subject on one hand and the other relative clauses on the other hand, such that there are significantly fewer transitive verbs in extractions out of the subject. This is compatible with the assumption that extractions out of the subject of transitive verbs are degraded. However, I will argue that this is not the case, for several reasons. First, the amount of transitive verbs among the extractions out of subject NPs is far from marginal. Second, we already mentioned previously that the results can be biased by the fact that, among the "other relative clauses", there are extractions out of object NPs, that have by definition only transitive verbs. But a third powerful argument should also be mentioned.

In Section 3.3.1, we mentioned several corpus studies on English, Italian and Japanese which show that speakers tend to produce fewer complex subjects when the sentence has a direct object than when the sentence has no direct object. The general rule in production data seems to be: the longer the rest of the VP, the shorter the subject. If we assume that this is true for French also, then transitive verbs have more clitic subjects than the other types of verbs. As far as it is not possible to extract out of a clitic, it is no surprise that there are fewer transitive verbs in extractions out of subjects than in other extractions. We used the corpus study on *duquel* in Frantext to reproduce on a small scale the corpus studies done on other languages. Figure 14.1 on page 371 shows the distribution of the types of subject for the different verb types: the results are given only for pied-piping structures (*duquel* is the complement of a preposition or the complement of a noun complement of a preposition). But for a few exceptions, these pied-piping structures are extractions of the complement of a verb, or are extractions of an adjunct. We can clearly see that transitive verbs have a higher proportion of clitic subjects compared to the other kinds of verbs, as expected.

14.4.2 Remark on psychological verbs

As we presented the results of our experiments in papers and conferences, a recurrent concern voiced by reviewers and participants was about our use of psychological verbs. Indeed, the subjects of some psych verbs are considered to be

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 14.1: Subject type for every verb type in *duquel* relative clauses with a pied-piping structure in Frantext 2000–2013

underlying objects in some theories. This idea, which only applies to experiencer-object psych verbs, goes back to Belletti & Rizzi (1988), and the various debates have been summarized in Landau (2010). The original claim made by Belletti & Rizzi (1988) was that these verbs were unaccusative, but Legendre (1989) and Herschensohn (1992) have brought some evidence against this claim for French, summarized as follows by Landau (2010: 38–39): "On too many points – for example, auxiliary selection, passivization, lexical operations referring to external arguments, compatibility with pure expletives (e.g. *il* vs. *cela* in French) – class II verbs do not pattern with unaccusatives, their subject (a causer rather than a theme) behaving like a normal external argument [...].".

Nevertheless, Legendre (1989), Herschensohn (1992) and Landau (2010) consider that the stimulus in such verbs is a derived subject.

14.4.2.1 Arguments in the literature

Landau (2010) mentions three core arguments in favor of this hypothesis: experiencer-object psych verbs do not reflexivize, cannot be embedded as infinitival complements of a causative verb and do not passivize. A careful study of these arguments would go beyond the scope of my work, but here are a few remarks which lead us to think that psych verbs behave like transitives.[4]

Herschensohn (1992) illustrates the impossibility for experiencer-object psych verbs to reflexivize with the following example:

[4]Many thanks to Elisabeth Verhoeven for her inputs on this topic.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(14.3) a. Les enfants se lavent les uns les autres.
the children REFL wash the ones the others
'The children wash each others.'

b. * Les enfants se préoccupent les uns les autres.
the children REFL worry the ones the others
'The children worry each (about the) others.'

But, as mentioned by Herschensohn (1992) herself, verbs of this class have pronominal variants. For example, *préoccuper* ('worry') has a ditransitive variant *se préoccuper* ('worry about') with an indirect object, so that there is a straightforward way to express (14.3b), namely (14.4):

(14.4) Les enfants se préoccupent les uns des autres.
the children REFL worry the ones of.the others
'The children worry each about the others.'

The second argument relies on causative constructions. The verb *faire* ('to do') can be used to build a causative construction in French, as illustrated by example (14.5). The referent of the causative adverbial in (14.5a) can be the subject of a *faire* + Vinf structure like (14.5b).

(14.5) a. Jean porte un appareil auditif à cause de son grand âge.
Jean wears a device hearing at reason of his old age
'Jean wears a hearing device because of his advanced age.'

b. Son grand âge fait porter à Jean un appareil auditif.
his old age makes wear.INF at Jean a device hearing
'His advances age makes Jean wear a hearing device.'

The transposition from (14.5a) to (14.5b) is not possible for experiencer object verbs:

(14.6) a. La télévision dégoûte Jean à cause de son bruit déplaisant.
the television disgusts Jean at reason of its noise annoying
'The television disgusts Jean because of its annoying noise.'

b. * Son bruit déplaisant fait dégoûter Jean à la télévision.
its noise annoying makes disgustINF Jean at the television.
(Kayne 1975: 252)
'Its annoying noise makes Jean disgusted by the television.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

According to Burzio (1986), causative constructions are a test to see whether a subject is a derived subject. Clauses with derived subjects can not be embedded as infinitival complements of causative constructions. However, I want to point out that this kind of embedding is infelicitous for any non-agentive subject of a transitive verb, as the following example shows:

(14.7) a. La grange abrite Jean grâce à son toit solide.
the barn protects Jean thanks at its roof robust
'The barns protects Jean thanks to its robust roof.'

b. * Son toit solide fait abriter Jean à la grange.
its roof robust makes protect.INF Jean at the barn
'Its robust roof makes Jean protected by the barn.'

Kayne himself notes that this restriction is lifted in agentive contexts, as reported by Landau (2010: 38). Experiencer-object psych verbs are in this respect not different from any other non-agentive verbs. Some scholars may argue that all non-agentive subjects are internal arguments, but this goes beyond the analysis of Landau (2010) that we discuss here.[5]

The last claim, made by Legendre and reported by Landau, is that the passivization of psych verbs is stative, i.e. that *choqué* in (14.8) would be an adjective and not a real passive form.

(14.8) Pierre est choqué par le film.
Pierre is shocked by the movie
'Pierre is shocked by the movie.'

Legendre's demonstration relies on two arguments : (i) the impossibility of embedding psych verbs in a causative construction with *faire* and (ii) the impossibility of applying *re*-prefixation. I just explained why argument (i) is not a good argument for French. Argument (ii) is the following: the prefix *re-* in French can be used productively to build new verbs, expressing the idea that the event have been repeated. According to Legendre, past participles of experiencer-objects verbs cannot undergo a *re*-prefixation, which shows that they are adjectives and not verbs. This is illustrated by the contrast between the "real" participle in (14.9a) and the alleged adjective in (14.9b) (the judgments on the examples are in concordance with Legendre's account):

[5]For an answer to this specific argument, see Section 14.4.2.2 below.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(14.9) a. Ce film a rechoqué Pierre.
this movie has shocked.again Pierre
'This movie shocked Pierre again.'

b. * Pierre a été rechoqué par ce film.
Pierre has been shocked.again by this movie
'Pierre has been shocked again by this movie.'

My intuition differs from Legendre's intuition in this respect. Both (14.9a) and (14.9b) are relatively weird for me, probably because of the neologism, but I do not have the impression of a strong contrast between the two constructions. Furthermore, if the passivization of psych verbs was stative, a construction with *en train de* (equivalent of V+ing in English) should be ruled out. My intuition is that (14.10) is weird, but possible:

(14.10) ? Pierre est en train d' être choqué par ce film.
Pierre is in pace of be.INF shocked by the movie
'Pierre is being shocked by the movie.'

To conclude, the arguments brought in favor of an analysis of the subjects of experiencer-object psych verbs as being underlying objects are not sufficiently grounded. I acknowledge that dedicated work should be done on this topic, but this is not the aim of the present book.

14.4.2.2 Consequence for my experiments

Even if the subjects of experiencer-object psych-verbs were not "real" subjects, this would not have had a big impact on my experiments and would account for the results that we found.

In Experiments 1, 2, 3, 4, 5, 6, 10, 11, 13 and 14, extractions are systematically made out of the stimulus. Therefore, the extractions out of subjects in these experiments are extractions out of underlying objects under this hypothesis. This could account for the results of the relative clauses (i.e., that native speakers do not reject these sentences), but not for the interaction effects that I find in focalizing constructions (i.e., that extractions out of the subject are rated worse than extraction out of the object). If we inadvertedly tested extractions out of objects in all conditions, where does the "subject island" effect come from?

In Experiments 7, 8, 9 and 11, we tested some extractions out of subjects of experiencer-object psych verbs, but they represent around 1/3 of the items. The other items are extractions out of "real" subjects following the hypothesis defended by Landau (2010). I performed an informal overview by verb types of the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

results of Experiment 9 that did not reveal any obvious contrast between the experiencer-object verbs and the other verbs.[6]

14.5 Remark on hanging topics

Another recurrent concern against our interpretation of the results from the experiments was a certain suspicion that relative clauses (or eventually some relative clauses) may not be "real" extractions. This is the argumentation presented by Giorgi & Longobardi (1991: 82–85), and developed extensively by Jurka (2010: Section 5) and Uriagereka (2012: Section 2.3). In a nutshell, their claim is that extractions of a PP-complement out of a subject NP are bad counterexamples to the subject island constraint, because such PP-complements are acceptable hanging topics (or "aboutness proleptics" in Uriagereka's (2012) terms). An example of fronted aboutness proleptics in Spanish is given in (14.11), in which the relevant elements are emphasised with bold text.

(14.11) **De los árboles frutales** me gusta el melocotón, y **de los**
of the trees fruit-growing me pleases the peach and of the
reyes de España Alfonsito de Borbón. (Uriagereka 2012: 94)
kings of Spain Alphonso de Borbón
'Concerning fruit trees, I like peaches ; and concerning the kings of Spain, I like Alphonso de Borbón'

The English translation makes the aboutness relation of these proleptics transparent. Evidence that the fronted elements are not extracted out of the NPs *el melocotón* and *Alphonso de Borbón* is that neither [*el melocotón de los árboles*] nor [*Alfonsito de Borbón de los reyes de España*] is a correct whole NP. Uriagereka and Jurka assume that all felicitous extractions out of NPs in the literature can be explained as being only misleading extractions, and actually aboutness proleptics. Hence, following their argument, acceptable extractions of pied-piped PPs in English, as in (14.12a), can be explained as misleading extractions in which the fronted element (here *of which politician*) is a proleptic, similarly to what happens in (14.12b) which is obviously not an extraction.[7]

[6] It would be possible to run additional experiments without any experiencer-object psych verbs. But there is a certain correlation between the type of psych verb (experiencer subject vs. object) and the implicit causativity of the verb. Counterbalancing this factor would then be very complicated, the list of common psych verbs being relatively short.

[7] For Uriagereka (2012), *a picture* in (14.12a) is an underlying subject. Example (14.12a) is therefore a potential English counter-example to the subject island constraint.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(14.12) a. Of which politician is there a picture on the wall?

b. I often think of politicians that there is a picture of them on every wall. (examples from Uriagereka 2012: 95)

Notice that Uriagereka's argument is not restricted to relative clauses, as example (14.12a) shows. His objection, then, does not hold for our experiments, because we used similar materials across experiments, hence with the same potential of having proleptical topics, and get nevertheless a contrast between relative clauses and interrogatives.

But the original remark of Giorgi & Longobardi concerns exclusively relative clauses, and topicalizing constructions like relativizations seem indeed more prone to be associated with cases of aboutness proleptics or hanging topics. If so, it could explain the cross-construction difference that we observed in our experiments.

The possibility of analysing relativizations out of an NP as non-extractions have been discussed by Haegeman et al. (2014: 87–88). They argue that the relative phrases are not hanging topics based on several pieces of evidence: (i) the head noun constrains the preposition of the relative phrase and (ii) they are sensitive to island constraints.

In this respect, we agree with Haegeman et al. Hanging topics in relatives are possible in French, though restricted to colloquial French. But they involve a gapless relative clause and are restricted to *que* relatives, hence to NPs.

(14.13) Vous avez une figure que vous devez avoir de la température.
you have a face that you must have.INF of the temperature
(Abeillé & Godard 2007: 42; attributed to Françoise Gadet)
'You have a face that you must have fever.'

The complementizer *dont* cannot be used in such an aboutness relation. It can introduce gapless relative clauses, but must be coindexed with a resumptive pronoun.

(14.14) a. un argument dont$_i$ on pense que personne ne l$_i$' a
an argument of.which one thinks that noone NEG it has
utilisé (Godard 1985: 21)
used
'an argument that we think that noone has used it'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. * un argument dont on pense que personne n' a utilisé
an argument of.which one thinks that noone NEG has used
(Godard 1985: 22)
'an argument that we think that noone has used it'

This condition is not met in our material, in which there is no element that can serve as a resumptive pronoun in the relative. And yet, replacing *dont* by *que* in our relatives decreases the acceptability: It is the way we built our ungrammatical controls in the experiments on *dont* relative clauses. Even though, as just explained, it is only colloquial and not ruled out, these controls have a very low acceptability.[8]

The relative phrase *de qui* cannot introduce gapless relatives. Also, the preposition *de* is required by the head noun of the subject/object of the relative clause. Omitting the preposition or replacing it with another preposition would be ungrammatical. We built our grammatical controls in the experiments on *de qui* relative clauses by omitting the preposition, and these conditions received very low ratings.

I conclude that the relative clauses tested in our experiments (Experiment 1 to 9) are "real" instances of filler-gap dependencies. The relative phrases do not express loose relations, but are constrained by syntactic rules (e.g. argument selection).

14.6 A cross-linguistic perspective

As mentioned previously, the results of our experiments on French are compatible with the experiments of Sprouse et al. (2016) in Italian, even though they do not reproduce them exactly.

In Abeillé et al. (2020), we reproduced their results on English when testing extractions with preposition stranding as they did. But we also tested extractions with the *of* preposition pied-piped, in a configuration therefore more similar to what happens in French or Italian. In this case, a cross-construction difference

[8]English seem less strict as far as the subextraction out of an NP is concerned, according to the following examples:

(i) * This is the city that I've always wanted to go.

(ii) This is the city that I've always wanted to visit the capital. (examples from Chaves & Putnam 2020: 59)

A contrast like the one between (i) and (ii) does not exist in French.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

arises, such that English does not behave differently than Italian or French. This is not surprising, because the cognitive principles responsible for the FBC constraint should be cross-linguistically valid.

The obvious question that arises is: Where does the interaction in the preposition stranding position come from? I am at the time being not able to give a satisfactory answer, and I have to leave this question to future research. Many questions remain open about preposition stranding in English: its distribution in corpora, its diachronic use, its relation to register[9], and why it is a cross-linguistically rare phenomenon. All these questions may help us to understand the findings of this experiment.

In a corpus study on preposition stranding, Gries & Samiian (2002) identify several factors that can satisfactorily predict the choice for a pied-piping construction instead of a preposition stranding construction. They notice that transitive verbs show a preference for pied-piping compared to other verb types. Since we used transitive verbs, this remark is interesting, but does not explain the contrast between subject and object. Gries & Samiian think that this factor is actually correlated with another one, also significant to predict the choice of the structure: the syllabic length of the material between the filler and the gap. They observe that the longer the distance, the more often the sentences show a pied-piping construction. This observation is completely in contradiction with our results, because the distance between the filler and the gap is shorter in extractions out of the subject than in extractions out of the object. This indicates that the factor that causes the interaction effect in our results and Sprouse et al.'s (2016) results must be strong enough to bypass the attested preference for shorter distances. However, Gries & Samiian (2002) do not look at the extraction type in their study. They also say that "P[reposition] S[tranding] in interrogatives is prescriptively considered ungrammatical" (Gries & Samiian 2002: 230), but on the other hand find no occurrence of pied-piping constructions in spoken data (Gries & Samiian 2002: 232).[10] They regret that work on the phenomenon of preposition stranding in English is rarely based on empirical evidence. I have to agree with this assessment.

[9]Haegeman et al. (2014: 88) claim that pied-piping constructions are "unnatural" in colloquial English.

[10]In written data, the distribution is almost perfectly equal (49% pied-piping, 51% preposition stranding).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Part III

Formal analysis

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

15 General discussion

The main finding of the corpus studies and experiments that I presented in this book is that there is a cross-construction difference as far as extracting out of the subject is concerned, and that the constraints on locality called since the foundational work of Ross (1967) "subject island" depends on discourse functions. The empirical data also show that extraction out of the subject depends on the type of subjects: sentential or infinitival subjects are not like NP subjects, and embedded subjects are not like subjects of the matrix clause. That's why I proposed the Focus-Background Conflict constraint in order to account for this cross-construction difference. As I just argued, other processing factors are also useful to understanding the data, but the FBC constraint relies on information structure, at the interface between semantics and pragmatics, and is therefore part of the grammar. In this section, I will discuss the FBC constraint in more detail, leaving aside the other processing factors at play for extractions (e.g. surprisal caused by infrequent and complex structures). In the following sections, I will propose a formalisation of the FBC constraint in the framework of HPSG.

The FBC constraint in (4.31), reproduced here in (15.1) for convenience, states the following:

(15.1) **Focus-background conflict (FBC) constraint:**
A focused element should not be part of a backgrounded constituent.

15.1 Clarifications about the FBC constraint

Intuitively, it seems reasonable to assume that something cannot be at the same time backgrounded and in the foreground, presupposed and unknown, highlighted and able to be elided. Focus and background come in a complementary distribution, and an element is either focused or belongs to the background.

The novelty of the FBC constraint is to state that a constituent cannot be partly focused if it is backgrounded on the other hand. Some assumptions are necessary in order to make the FBC constraint work. First, the FBC does not specify what kind of focus is not allowed as part of a backgrounded constituent. So far, my main interest has been an informational focus, because interrogatives and clefts

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

involve an informational focus. However, because focus and background come in complementary distribution, I will assume that all kinds of focus are concerned.

Second, we assume that the constituent is backgrounded if its head is backgrounded. Otherwise relativizing out of an object NP (or any NP) that is part of the focus domain would violate the FBC constraint. In (15.2), the relative clause is restrictive and backgrounded, and in this respect the NP object of the matrix clause is partly backgrounded and partly focused, but we assume that the constituent (the direct object) is focused, because its head is focused. Hence, (15.2) does not violate the FBC constraint.

(15.2) I can't see [the man [you mentioned yesterday]$_{\text{Bg}}$]$_{\text{F}}$.

Third, I assume with other scholars (a.o. Lahousse 2011, Song 2017) that embedded clauses have an internal information structure, independent of the information structure the clause itself may have with respect to the matrix clause meaning. In the formalism that I adopt in the following sections, information structure is expressed as a binary relation between a constituent and a clause meaning. For example, a restrictive relative clause is generally considered as backgrounded with respect to the meaning of the clause that embeds it, but this does not mean that its antecedent does not play the role of a topic with respect to the relative clause itself. In example (15.3), I use a graphical representation of information structure in which the binary relation is represented by an arrow starting from the constituent that bears the information structure and pointing to the clause (represented by its main verb) with respect to which the relation holds.

(15.3)

A possible context for (15.3) is that of an experiment in which one group of mice are fed with glucose, and the other ones are fed with glucose and fat. Given this context, *mouse* is at the same time the default topic of the matrix clause (its subject)[1] and the default topic of the relative clause (its antecedent). The relative clause is interpreted as a restrictive relative, and is therefore backgrounded with respect to the matrix clause meaning. However, the presence of the focus particle *only* attests that *glucose* bears a focus. The focused element [*only glucose*]

[1]In this particular context, it is probably best interpreted as a contrastive topic.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

is hence "part of" the backgrounded relative clause, but this does not violate the FBC constraint, because the former is focused with respect to the embedded clause meaning and the latter is backgrounded with respect to the matrix clause meaning. On the contrary, (15.4) does violate the FBC constraint, because [*which car*] is focus with respect to the matrix clause meaning, and [*the driver of (the car)*] is topic with respect to the same clause meaning. The former is therefore at the same time topic and focus of the clause meaning.

(15.4)

Fourth, an S or a VP are considered constituents only with respect to their embedding clause.[2] The FBC constraint does not apply internally to them. In example (15.5b), the V is backgrounded, but this does not mean that the NP object cannot be focus.This means that the VP is not backgrounded, even though its head is.

(15.5) a. A: What did David read?
b. B: [David read]$_{Bg}$ [this book]$_{F}$.

Similarly, a subject or an adverb can be focus of the clause meaning even when the verb is backgrounded. On the other hand, if the meaning of the embedded clause is backgrounded with respect to the matrix clause meaning, as in (15.3), all elements in the embedded clause are backgrounded with respect to the matrix clause meaning.[3]

[2] I am distinguishing here and in the following between an S (or CP) like [*David read the book*] and a VP like [*read the book*].

[3] Relative clauses belong to the syntactic island defined by Ross (1967) as "Complex NP Constraint".

(i) *The man [who$_i$ I read a statement [which$_j$ $___j$ was about $___i$]] is sick. (Ross 1967: 119)

Goldberg (2013) argues that extracting out of relative clauses is ruled out because relative clauses are backgrounded (according to the BCI constraint, see section 4.2.3). The FBC constraint predicts that a focalization out of a relative clause should lead to a discourse clash, but it does not constrain relativizations (topicalization) out of a relative clause.

This seems at odds with examples like (i), but works on the extraction out of relative clauses

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Finally, an important aspect of the FBC constraint is that it assumes a gradience of discourse status: "the more focused an element, the less acceptable it is as part of an unfocused/backgrounded constituent, and the more backgrounded a constituent is, the less it accepts a focused element" (Abeillé et al. 2020: 21). The gradient aspect of information structure is assumed by many scholars. Kuno (1987) defines Focus as the "highly unpredictable" information in the sentence; since information can be more or less predictable, it follows that focalization is graded. Webelhuth (2007: 310–311) defines a "more thematic than" relation that holds between different arguments, such that some are topics (themes) to a greater or lesser degree than the others. Ambridge & Goldberg (2008: 369) assume that a constituent can be more or less backgrounded, and that it is the factor that explains the gradient acceptability of extractions out of backgrounded constituents.

15.2 The FBC in long distance dependencies

In Section 14.2, I discussed the results of focalizations out of backgrounded constructions in long distance dependencies. In (15.6), the extraction gives rise to a focalization of the *wh*-phrase. More precisely: The *wh*-phrase is a Focus with respect to the matrix clause meaning.

---

show that the acceptability increases drastically if the words in the matrix clause are semantically weakly defined, i.e. with indefinite antecedents (Kluender 1998) and main verbs almost devoid of meaning (Chaves & Putnam 2020: 91–92). Furthermore, Erteschik-Shir & Lappin (1979) have shown that extractions out of presentational relative clauses are acceptable. Notice that most of the time, the examples given in this literature are relativizations out of a relative clause.

Furthermore, there are languages that allow some extractions out of the relative clause (with or without resumptive pronouns, see Crysmann (2012) for a discussion and analysis). Example (ii) is an extraction out of a relative clause in Hausa, again a relativization.

(ii) ?gà̀ mà̀tar [dà$_i$ ka bā nì littāfin [dà$_j$ mà̀lāmai sukà san
here.is woman REL 2SG.MAS.CPL give me book REL teachers 3.PL.CPL know
mùtumìn [dā$_k$ $__i$ ta rubùtā wā $__k$ $__j$]]]. (Tuller 1986: 84 cited by Crysmann
man REL 3.SG.FEM.CPL write for
2012: 55)

'Here is the woman that you gave me the book that the teachers know the man (she) wrote (it) for (him).'

This evidence challenges the idea that extractions out of relative clauses are altogether unacceptable. Therefore, the fact that the FBC constraint is not violated when relativizing out of a relative clause is a good thing. It still remains to be demonstrated that there is a cross-construction difference between relativizations and interrogatives, which has never been done so far.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(15.6)

Two questions arise in this configuration: What is the status of the *wh*-phrase with respect to the embedded clause meaning? And: Is the subject of the embedded clause also a default topic?[4] Both questions are entangled for our research question: If we assume that the subject is the default Topic of the embedded clause meaning, and if we assume that the interrogation makes the *wh*-phrase focus of the embedded clause(s) meaning(s), then (15.6) faces a violation of the FBC constraint. The question is therefore: can we observe pieces of evidence that a discourse clash takes place in embedded structures?

The results of Experiment 13 on *wh*-questions with a long distance dependency were not conclusive. Extractions out of the subject were not rated significantly lower than extractions out of the object, and there was no significant interaction.

Even though Experiment 13 shows null results, evidence from other researchers could show significant interaction effects. Indeed, similar material has been tested before by Sprouse (2007a), Sprouse et al. (2012) and Sprouse et al. (2016) in English, and Sprouse et al. (2016) in Italian. In these experiments, they found significant interaction effects.[5]

The problem is that all these experiments used as a baseline subject relative clauses and object relative clauses. Subject and object relative clauses are inappropriate as a baseline for such an experiment, because it is well-known that there is a strong cross-linguistic preference for subject relative clauses. Figure 15.1 on page 386 illustrates the interaction effects found for English relative clauses and

[4]Portner & Yabushita (1998) claim that Topics have a wide scope over the whole utterance. For them, this follows logically from the definition of Topics: if the Topic is "the thing which the sentence is about" (Portner & Yabushita 1998: 127), then the whole utterance can have only one focus. This would, however, mean that the assumption I made in the previous section that antecedents are the Topic of (restrictive) relative clauses cannot hold.

[5]I leave aside Sprouse et al. (2011), as they do not cross extraction site and extraction type. Sprouse et al. (2016) found only a marginally significant interaction ($p < .062$) in English. However, reanalyzing their data, I found that the interaction became significant ($p < .05$) using cumulative link mixed models instead of the authors' original linear mixed effects models. Thus, according to the criteria adopted in this book, the interaction for wh-question in English in Sprouse et al. (2016) would be significant. I think we can safely assume the interaction is robust with their material. However, the effect may not be very large.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

wh-questions in Sprouse et al. (2016). Even a purely visual inspection of the interaction plot clearly shows that the non-island baseline for the experiment (green line) has a subject preference. Re-analysis of their data show a significant difference (p<.005 and p<.05 respectively) between extraction out of the subject and extraction out of the object (i.e. the slope of the red line is significantly different from 0). However, this does not tell whether or not the interaction effect is artificially produced by the subject relative clause preference, and whether or not it would be significant with another grammatical baseline.

Figure 15.1: Interaction plot of Sprouse et al.'s (2016) experiments on subject island in English

I conclude that the evidence is too sparse where long distance dependencies are concerned to affirm that the focused element is focus also with respect to the meaning of the embedded clauses. There is certainly a persistent tendency for *wh*-questions with long distance dependency in this direction. This tendency is also supported by the intuitions of many scholars. But further research is needed.

15.3 The puzzle of *it*-clefts

In this section, I talk about *it*-clefts (or *c'est*-clefts for French) with a narrow focus, i.e. in which the pivot bears the focus. As explained in Section **??**, all-focus *c'est*-clefts are possible and common in French (Lambrecht 1994, Doetjes et al. 2004), but they differ in prosody (Doetjes et al. 2004: 541–549) and therefore should be analysed differently.

15.3.1 The information structure of the that-clause

The information structure of the pivot was discussed previously in Section **??**, but not the information structure of the *that*-clause (or *que*-clause in French). The

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

approach that seems to predominate in the literature is Prince's (1978). Prince describes the content of the *that*-clause in English *it*-clefts as being presupposed and containing "known", but not necessarily "given" information (her terminology). Actually, in some variants of *it*-clefts "frequent in historical naratives", the speaker assumes the information to be unknown by the hearer (hence not given in discourse) but known in general terms as an indisputable (for example historical) fact. One example is given in (15.7).

(15.7) It was in this year that Yekuno Amlak, a local chieftain in the Amba-Sel area, acceded to the so-called Solomonic Throne. (Prince 1978: 900)

In the other and most common used variant of *it*-clefts, the information is presupposed as known by both speaker and hearer, such that the information of the *that*-clause does not play an important role in the development of the dialogue. In some cases, this information may even be given. For this reason, this part may easily be omitted in most of the cases, as shown in (15.8).

(15.8) Who made this mold? was it the teachers? (Prince 1978: 897)

That the *that*-clause is presupposed (and therefore backgrounded) can be tested with a negation test: whereas the information conveyed in (15.9a) and (15.9b) do not differ, the negation in (15.9d) only concerns the one in the pivot, whereas John having lost something remains true (this is not the case in (15.9c) in which the scope of the negation is ambiguous).

(15.9) a. John lost his keys.
b. It was his keys that John lost.
c. John didn't loose his keys.
d. It wasn't his keys that John lost. (Prince 1978: 884)

The proposition expressed by the *that*-clause in (15.9b), namely that *John lost x*, is still true in (15.9d). What is negated is the identitity of x with the entity *his keys*. This seems to indicate that the content of the *that*-clause is backgrounded.

There are, however, alternative views. According to Gussenhoven (2007: 96), the *that*-clause in *it*-clefts can contain reactivated information, i.e. old information that bears a focus. This fact would be incompatible with the idea that everything in the *that*-clause is backgrounded. Song (2017) concludes that there is not enough evidence that *that*-clauses in *it*-clefts are backgrounded and decides not to constrain their information structure in his own analysis.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

15.3.2 A problem for the FBC constraint?

If, as assumed by Prince (1978), the whole *that*-clause is backgrounded, then *it*-clefts are a counter-example to the FBC. By definition, *it*-clefts would be indeed focalization (by mean of extraction) of a backgrounded element.[6] Typically, subextractions out of the NP object like (15.10) should violate the FBC constraint. And yet, the empirical evidence in **??** show that they are acceptable.

(15.10) It is [of my car]$_F$ [that you hate [the color _]]$_{B?}$.

One solution is offered by Bresnan & Mchombo (1987). They think that *it*-clefts are semantically biclausal and assume the information structure in (15.11). According to this analysis, the pivot is the focus of the main clause, and topic of the embedded clause.

(15.11) Information structure of *it*-clefts according to Bresnan & Mchombo (1987):

(adapted from Bresnan & Mchombo 1987: 758)

If we indeed have two clauses, elements of the *that*-clause are backgrounded with respect to the embedded clause meaning (e2), while the pivot is focus with respect to the main clause meaning (e1). This solves the contradiction with the FBC constraint, since the same element is not focus and backgrounded with respect to the same clause.

But the analysis in (15.11) seems problematic to me. There is no meaningful event e1 associated with the copula. What does it mean therefore for the focussed element to be focus with respect to e1? Rather, the set of alternatives opened by the focalization in (15.11) can be something like: {*You don't want my house.*, *You don't want Christine's dog.*, ...}. For this reason, I will in the following advocate for an analysis of *it*-clefts as semantically monoclausal structures.

(15.12) Information structure of *it*-clefts in this work:

[6] I thank Daniel Büring who drew my attention to this contradiction.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

15.3.3 Other extractions out of the that-clause

We may add that *wh*-questions with extractions out of the *que*-clause in French seem relatively acceptable:

(15.13) [De qui]$_i$ est - ce que [c' est toi$_j$ qui $_{-j}$ dois tenir [la main $_{-i}$]]?
of who is it that it is you who must hold the hand
'Of whom are you the one who must hold the hand?'

In example (15.13), the object complement *de qui* is necessarily a focus, since it is the *wh*-element of the *wh*-question. It is also part of the *que*-clause of the embedded *c'est*-cleft, and therefore backgrounded according to Prince (1978).

Yet, it would be necessary to confirm this intuition with empirical data, because it has been claimed that such examples are ungrammatical. For example, Godard (1988) says that extractions out of the *que*-clause in general – e.g. (15.14) – are only possible with a resumptive pronoun.

(15.14) * Les enfants, [qu$_i$' il était convenu que [c' était le père de Paul
the children that it was agreed that it was the father of Paul
qui$_j$ $_{-j}$ devait raccompagner $_{-i}$]], ont décidé de rentrer
who must.PAST take.back have decided of come.back
seuls. (Godard 1988: 44)
alone
'The children, that it was agreed that it was Paul's father who was supposed to bring (them) back, have decided to come back on their own.

If Godard's intuition for the unacceptability of (15.14) was true, then this case would challenge the FBC constraint, because relativization should be acceptable regardless of the discourse status of the *que*-clause. But examples with a similar structure and an unquestionable focalization of the pivot like example (15.15) can be found online.[7] Some more work is hence needed in order to resolve this issue.

(15.15) des périodes de crise prolongées[,] [[d]ont$_i$ [c' est toujours l'
DET times of crisis protracted of.which it is always the
économie et le social qui$_j$ $_{-j}$ pâtissent $_{-i}$]]
economy and the social who suffer
'times of long-term crisis, from which it's always the economy and

[7]Example (15.15) from https://www.lorientlejour.com/article/699098/Un_systeme_tampon,_en_attendant_un_nouveau_pacte_constitutionnel.html, last access 19/06/2023

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the social affairs that suffer' (i.e. the economy and the social affairs suffer from times of long-term crisis)

Examples like (15.13) and (15.15) seem to indicate either that the FBC constraint is incorrect, or that we have to abandon the assumption that the *que*-clause is backgrounded in French.

15.3.4 Assumptions of this book

In an experiment to be published elsewhere (Winckel et al. in preparation), we have tested sentences like (15.9d), on which the assumption that the content of the *that*-clause is presupposed is built. The empirical evidence suggests that the elements in the *that*-clause are not backgrounded to the same degree. I will therefore follow Song (2017) and will assume in my analysis that the elements in the *que*-clause may have any possible discourse status. This allows me also to not take into account the distinction between all-focus and narrow-focus *it*-clefts or *c'est*-clefts. However, an empirically grounded investigation of the information structure of *it*-clefts would be very beneficial to our understanding of focalization.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

16 A French HPSG fragment

I adopt in this work the HPSG framework, based mostly on the general principles explained in Pollard & Sag (1994), and updated more recently in Müller, Abeillé, Borsley & Koenig (2020). This framework allows for a precise formal representation of all aspects of linguistic utterances (morphology, syntax, semantics and information structure) and provides a construction-based approach to extraction constructions (Sag 1997, 2010, Ginzburg & Sag 2000). There is a lot of work already done on French in HPSG, which allowed me to build on a large body of detailed analyses for French syntax and semantics.[1] Abeillé (2007) gives an overview of an HPSG grammar for French which I partially adopt here, though with a binary branching approach.[2] The formalism that I adopt for semantics is the Minimal Recursion Semantics (MRS, Copestake et al. 2005) and the formalism for the information structure is based on Song's (2017) proposal.

[1] i.e. Miller & Sag (1997) and Abeillé & Godard (2002) on clitics and auxiliaries, Abeillé et al. (2004) and Abeillé, Bonami, et al. (2006) on *de* and *à* prepositions, Sag & Godard (1994) and Godard & Sag (1996) on dependents of nouns, Abeillé & Godard (2003) and Abeillé, Borsley & Espinal (2006) for extractions out of specifiers (respectively with degree adverbs and comparative correlatives), Abeillé & Godard (1997) and Kim & Sag (2002) on negation, as well as Abeillé et al. (2008) and Marandin (2011) on information structure in French.

[2] HPSG implementations, such as the CoreGram Project (Müller 2015) and the DELPH-IN (DEep Linguistic Processing with HPSG) consortium (http://www.delph-in.net) have binary branching. However, many HPSG work do not, including many I base my analysis on here (a.o. Sag 1997, Ginzburg & Sag 2000). Traditionally, researchers working French in HPSG assume a flat structure (a.o. Abeillé & Godard 2002 for tense auxiliaries), but this recently faced some criticism by Aguila-Multner & Crysmann 2020 who argue in favor of a binary analysis of VPs in French in order to better account for modification and coordination. I consider that the debate about the appropriate branching in French is still an open one, and choose a binary branching as a default choice that would allow straightforward implementation (e.g. the French fragment of the CoreGram project). On the other hand, this choice has, to my knowledge, no major implication for my analysis, especially because I only talk about headed structures. A conversion of my analysis into flat structures is possible: The rules, instead of applying to the object in the non-head daughters, would merely have to apply to every objects in the list of non-head daughters.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

16.1 General principles of an HPSG grammar

In HPSG, linguistic entities are modeled by feature structures that are described by feature descriptions (or attribute-value matrices, AVMs). Feature structures are of a certain type, and this type defines which features the sign has and what type of values its features have. Types are ordered in a type hierarchy and every type inherits the properties of its supertype. Values are themselves of a certain type, which is also contained in the type hierarchy of the grammar. A value is either a feature-value description if it is complex or an atomic value.

A simplified hierarchy of French signs is represented in Figure 16.1, from Ginzburg & Sag (2000: 19). For example, the subtype *word* inherits the characteristics from the type *lexical-sign* (e.g. having a feature ARG-ST, see below).

Figure 16.1: Type hierarchy of *sign*

The lexicon of a given language consists of lexical items. Lexical entries are signs of type *lexeme*. Words are derived from these lexemes through lexical rules (unitary branching structures). Phrases are derived through schemata. Not only lexical entries, but also constraints and lexical rules are formalized using AVMs. Constraints define the characteristics of the different types and the conditions the linguistic objects have to satisfy in order to be valid in the given language. Lexical rules define how a lexical item licences another lexical item.

A sign has at least two main features: PHONOLOGY (PHON) and SYNTAX-SEMANTICS (SYNSEM). The value of PHON is a list of phonemes.[3] The value of SYNSEM is a feature structure of type *synsem*.

[3]For the sake of simplicity, and as it is common practice in HPSG works, I give in this work as value of the feature PHON the orthographic representation of the sign, and not its phonetic transcription. Some scholars encode more information under PHON than its mere phonetic transcription. PHON, for example, contains information about accents and prosody (Engdahl & Vallduví 1996: 11, De Kuthy 2002: 166, Bonami & Delais-Roussarie 2006, Bildhauer 2008:

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.1) **Definition of *sign*:**

$$\begin{bmatrix} \textit{sign} & \\ \textsc{phon} & \textit{list of phonemes} \\ \textsc{synsem} & \textit{synsem} \end{bmatrix}$$

From the syntactic point of view, I will mostly talk in the present work about headed structures, i.e. structures in which the mother node structure-shares its *pos* value with one of its daughters. An example of a non-headed structure is coordination (at least in most of the recent HPSG analyses, see Abeillé & Chaves 2020). Signs of the type *headed-structure* have as additional features HEAD-DAUGHTER (HEAD-DTR) and NON-HEAD-DAUGHTERS (NHEAD-DTRS).[4] The feature HEAD-DTR contains the AVM of type *sign* of the head. The feature NHEAD-DTRS contains a list of feature structures of the type *sign*. For example, in a headed structure, and assuming a binary analysis, this list constrains only one element, i.e. the non-head element (specifier, complement, modifier or filler).

(16.2) **Head Feature Principle** from Pollard & Sag (1994: 34):

$$\textit{headed-structure} \Rightarrow \begin{bmatrix} \textsc{synsem|loc|cat|head} & \boxed{1} \\ \textsc{head-dtr} & \begin{bmatrix} \textsc{synsem|loc|cat|head} & \boxed{1} \end{bmatrix} \end{bmatrix}$$

Under the feature SYNSEM, every piece of information concerning syntax and semantics is encoded. Features that concern local dependencies are encoded under the feature LOCAL (LOC), in an AVM of type *loc*. Features that concern nonlocal dependencies are encoded under NONLOCAL (NONLOC), in an AVM of type *nonloc*. I describe the feature NONLOC in Section 16.2 in which I go into the details of an HPSG analysis of extractions. Under LOC, the features related to semantics (but also pragmatics, as we will see) are encoded under the feature CONTENT (CONT). The feature CATEGORY (CAT) contains the features related to (local) syntax.[5]

(16.3) **Definition of *synsem* and *loc*:**

chapter 3). Even though prosody plays an important role in information structure, I have little to say about prosody with respect to the topic of this work. For this reason, I assume a minimal structure for PHON.

[4] I adopt the terminology from Sag (1997). Other HPSG works may use another terminology (e.g., DAUGHTERS in Ginzburg & Sag 2000: Section 2.5).

[5] Most HPSG versions assume a third local feature CONTEXT (a.o. Pollard & Sag 1994: 16–21), where information related to the pragmatics of the sign is encoded. The features of *context* objects are for example C-INDICES (e.g. who is the addressor, who is the addressee) and BACKGROUND (related to what is usually defined as Common Ground, see Section 4). In my fragment of French, pragmatics is part of CONTENT, as assumed by Song (2016, 2017).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

$$\begin{bmatrix} \textit{synsem} & \\ \textsc{loc} & \begin{bmatrix} \textit{loc} & \\ \textsc{cat} & \textit{cat} \\ \textsc{cont} & \textit{cont} \end{bmatrix} \\ \textsc{nonloc} & \textit{nonloc} \end{bmatrix}$$

I will define now how syntax and semantics work on the local level. This includes the encoding of information structure, which is part of CONTENT in my formalization. In Section 16.2, I will then talk about non-local dependencies.

16.1.1 Syntax

The value of CAT is an AVM of the type *cat*. It contains a feature HEAD, whose value is an AVM of the type *part-of-speech* (*pos*). The fragment developed in this paper uses seven parts of speech: *noun*, *verb*, *determiner* (*det*), *adjectives* (*adj*), *adverb* (*adv*), *preposition* (*prep*) and *complementizer* (*comp*). The hierarchy of *pos* is given in Figure 16.2. The structure of HEAD varies depending on the part of speech. For example, verbs have a verb form (VFORM), while other parts of speech do not.

Figure 16.2: Type hierarchy of *pos*

Arguments can be realized or non-realized (e.g. *I cooked.* / *I cooked lasagne.*). In French, realized arguments or adjuncts can be realized as XPs (e.g. NPs, PPs) or as clitics. Following Miller & Sag (1997), Abeillé & Godard (2002) and Aguila-Multner & Crysmann (2020), I assume that pronominal clitics in a non-subject function are affixes that attach to the verb. Lastly, arguments and adjuncts may be realized non-locally: this is what I have called "extraction" throughout this dissertation. All these possibilities give rise to different subtypes of *synsem*, i.e.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

canonical, *pro* (non-realized), *affix* (realized as clitic) and *gap* (non-locally realized). I adopt the hierarchy in Figure 16.3, adapted from Abeillé et al. (1998) and already presented in Winckel & Abeillé (2020: 104).

Figure 16.3: Type hierarchy of *synsem*

16.1.1.1 Valence

Signs of the type *word* have a main feature ARG-ST that has as value a list of *synsem*. This list is traditionally the list of the different arguments dependent on the lexeme. In addition, the word selects its canonically realized complements ([SYNSEM *canonical*]) via the feature COMPS, its subject via the feature SUBJ and its specifier via the feature SPR. This principle is called the Argument Realization Principle (16.5). Non-realized arguments ([SYNSEM *pro*]) are present in ARG-ST, and can for example serve as semantic arguments, while no syntactic information is needed about them on the phrasal level. Arguments realized as clitics ([SYNSEM *aff*]) are realized morphologically through lexical rules, as just said. Gaps ([SYNSEM *gap*]) are realized through lexical rules and non-local dependencies, as I will explain in Section 16.2.

The value of COMPS is a list of *synsem* objects (only canonical ones), which is a sublist of the ARG-ST list. The value of SPR is a list of *canonical* objects as well, but this list contains at most one element. Subjects need to be in SUBJ even if they are extracted, in order to account for the so-called *que-qui* rule in French, see below. The value of SUBJ is a list of *synsem* objects with one or no element.

(16.4) **Definition of *cat*:**

$$\begin{bmatrix} \textit{cat} & \\ \text{HEAD} & \textit{pos} \\ \text{SUBJ} & \textit{list of one or less synsem} \\ \text{SPR} & \textit{list of one or less canonical} \\ \text{COMPS} & \textit{list of canonical} \end{bmatrix}$$

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.5) **Argument Realization Principle** adapted from Ginzburg & Sag (2000: 171)

$$\textit{word} \Rightarrow \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{SUBJ} & \boxed{1} \\ \text{SPR} & \boxed{2} \\ \text{COMPS} & \boxed{3} \end{bmatrix} \\ \text{ARG-ST} & \boxed{1} \oplus \boxed{2} \oplus \boxed{3} \circ \textit{list of non-canonical} \end{bmatrix}$$

Example (16.7) illustrates with the transitive verb *enthousiasme* ('inspires') from example (16.6), in which both subject and direct object are realized canonically, how verbs state their arguments.

(16.6) L' originalité de l' innovation enthousiasme mes collègues.
the uniqueness of the innovation excites my colleagues
'The uniqueness of the innovation excites my colleagues.'

(16.7) *enthousiasme* ('inspires') in (16.6)

$$\begin{bmatrix} \textit{word} & \\ \text{PHON} & \langle \textit{enthousiasme} \rangle \\ \text{SYNSEM|LOC|CAT} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{SUBJ} & \langle \boxed{1} \begin{bmatrix} \text{LOC|CAT|HEAD} & \textit{noun} \end{bmatrix} \rangle \\ \text{SPR} & \langle \rangle \\ \text{COMPS} & \langle \boxed{2} \begin{bmatrix} \text{LOC|CAT|HEAD} & \textit{noun} \end{bmatrix} \rangle \end{bmatrix} \\ \text{ARG-ST} & \langle \boxed{1}, \boxed{2} \rangle \end{bmatrix}$$

16.1.1.2 Syntactic composition

After the selection mechanism, I present the mechanism in charge of the syntactic composition. For this, I assume the type hierarchy for *headed-structure* presented in Figure 16.4, which enhances Figure 16.1.

Figure 16.4: Type hierarchy of *headed-structure* (incomplete)

Ginzburg & Sag (2000: 33) a.o. define a Generalized Head Feature Principle (GHFP): by default, a headed-phrase's SYNSEM features are the SYNSEM features

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

of its head-daughter.[6] This alternative analysis accounts, for example, for the fact that valence features remain by default unchanged from head-daughter to mother.

(16.8) **Generalized Head Feature Principle (GHFP)** adapted from Ginzburg & Sag (2000: 33)

$$\textit{headed-structure} \Rightarrow \begin{bmatrix} \textsc{synsem} & /\boxed{1} \\ \textsc{head-dtr} & \begin{bmatrix} \textsc{synsem} & /\boxed{1} \end{bmatrix} \end{bmatrix}$$

We define a default value (represented with the sign /) as follows: the default value (as well as all values that are subsumed by it) can only be overwritten by more specific subtypes (Lascarides & Copestake 1999: 85). For the GHFP in (16.8), this means that the values of all SYNSEM features are by default the values of the SYNSEM features of the head daughter, except if they are overwritten by some definition of subtypes of *headed-structure*. This is the case for the definitions of *head-comps-structure*, *head-subj-structure*, *head-spr-structure* and *head-mod-structure*. I will now define each of these subtypes.

In structures that are not a combination of a head with one of its complements, the GHFP (16.8) makes sure that the value of the feature COMPS remains constant from daughter to mother. In structures that combine a head with one of its complements (i.e. *head-comps-structure*), the value of the complement is "substracted" from the COMPS list of the daughter.[7] Because French complements appear in free order, the "substracted" element can be situated anywhere in the list (hence the shuffle ○ symbol). The AVM in (16.10) illustrates the case when *enthousiasme* combines with the NP *mes collègues* in (16.6).

(16.9) $$\textit{head-comps-structure} \Rightarrow \begin{bmatrix} \textsc{comps} & \boxed{1} \\ \textsc{head-dtr} & \begin{bmatrix} \textsc{comps} & \boxed{1} \circ \langle \boxed{2} \rangle \end{bmatrix} \\ \textsc{nhead-dtrs} & \langle \begin{bmatrix} \textsc{synsem} & \boxed{2} \end{bmatrix} \rangle \end{bmatrix}$$

[6] It has already been defined with the Head Feature Principle in (16.2) that a headed phrase's HEAD features are the HEAD features of its head-daughter. Contrary to the GHFP however, the Head Feature Principle is not a default principle.

[7] Analyses not assuming binary branching do not need to use *head-comps-structure* recursively until the COMPS list is empty, since all complements can be listed in NHEAD-DTRS. As mentioned above, a non-binary analysis would work similarly regarding the main point of my analysis.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.10)
$$\begin{bmatrix} \textit{head-comps-structure} & \\ \textsc{phon} & \langle \textit{enthousiasme mes collègues} \rangle \\ \textsc{head} & \boxed{1} \\ \textsc{subj} & \boxed{2} \\ \textsc{comps} & \boxed{3} \\ \textsc{head-dtr} & \begin{bmatrix} \textit{word} & \\ \textsc{phon} & \langle \textit{enthousiasme} \rangle \\ \textsc{head} & \boxed{1}\ \textit{verb} \\ \textsc{subj} & \boxed{2}\ \langle \text{NP} \rangle \\ \textsc{comps} & \langle \boxed{4}\ \text{NP} \rangle \oplus \boxed{3}\ \langle\rangle \\ \textsc{arg-st} & \langle \boxed{2}, \boxed{4} \rangle \end{bmatrix} \\ \textsc{nhead-dtrs} & \left\langle \begin{bmatrix} \textit{head-spr-structure} & \\ \textsc{phon} & \langle \textit{mes collègues} \rangle \\ \textsc{synsem} & \boxed{4} \end{bmatrix} \right\rangle \end{bmatrix}$$

Notice that in (16.9) and in (16.10) I am using shortcuts in my nomenclature: e.g. HEAD stands for SYNSEM|LOC|CAT|HEAD, NP stands for a linguistics object with all the characteristics of an NP (HEAD value is *noun*, empty COMPS and SPR lists). I use this kind of shortcut throughout Part III.

The mechanism is the same when the head and its subject combine. The sign is then of the type *head-subj-structure* and the value of the subject is "subtracted" from the SUBJ list of the head, leaving an empty SUBJ list for the mother. For all other headed structures the value of SUBJ remains constant from head-daughter to mother, as defined by the GHFP (16.8). An illustration can be seen in (16.12) where the verb of (16.6) combines with its subject.

(16.11) $$\textit{head-subj-structure} \Rightarrow \begin{bmatrix} \textsc{subj} & \langle\rangle \\ \textsc{head-dtr} & \left[\textsc{subj}\ \langle \boxed{1} \rangle\right] \\ \textsc{nhead-dtrs} & \left\langle \left[\textsc{synsem}\ \boxed{1}\right] \right\rangle \end{bmatrix}$$

(16.12)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

$$\begin{bmatrix} \textit{head-subj-structure} & \\ \textsc{phon} & \langle \textit{l'originalité de l'innovation enthousiasme mes collègues} \rangle \\ \textsc{head} & \boxed{1} \\ \textsc{subj} & \langle\rangle \\ \textsc{comps} & \boxed{2} \\ \textsc{head-dtr} & \begin{bmatrix} \textit{head-comps-structure} & \\ \textsc{phon} & \langle \textit{enthousiasme mes collègues} \rangle \\ \textsc{head} & \boxed{1}\ \textit{verb} \\ \textsc{subj} & \langle \boxed{3}\ \textit{NP} \rangle \\ \textsc{comps} & \boxed{2}\ \langle\rangle \end{bmatrix} \\ \textsc{nhead-dtrs} & \left\langle \begin{bmatrix} \textit{head-spr-structure} & \\ \textsc{phon} & \langle \textit{l'originalité de l'innovation} \rangle \\ \textsc{synsem} & \boxed{3} \end{bmatrix} \right\rangle \end{bmatrix}$$

A combination of the head with its specifier (i.e. *head-spr-structure*) follows the same mechanism, while the definition of the GHFP (16.8) states that the value of SPR is identical from head daughters to mother for the other headed structures.

(16.13) $$\textit{head-spr-structure} \Rightarrow \begin{bmatrix} \textsc{spr} & \langle\rangle \\ \textsc{head-dtr} & \begin{bmatrix} \textsc{spr} & \langle \boxed{1} \rangle \end{bmatrix} \\ \textsc{nhead-dtrs} & \left\langle \begin{bmatrix} \textsc{synsem} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

A complete syntactic analysis for (16.6) can be seen in Figure 16.5 on page 400.

Adjuncts select the element they modify through a head feature MOD defined for adjectives, adverbs, and verbs. The value of MOD is an AVM of type *none-or-synsem*, a supertype of *synsem* (see Figure 16.3) and of *none* (whenever the linguistic object is not an adjunct). The head and its adjunct combine through the *head-mod-structure*. The element selected by the modifier can have an empty COMPS list or a non-empty COMPS list (it is underspecified in this respect). Consequently, modifiers may appear either after (empty COMPS) or before (non-empty COMPS list) the complements of the element they modify. This is illustrated by (16.14) for adjectives and (16.15) for adverbs.

(16.14) a. un livre sur les indiens intéressant
a book on the Indians interesting
'a book about Indians interesting'

b. un livre intéressant sur les indiens
a book interesting on the Indians
'an interesting book about Indians'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.5: Syntactic representation for "L'originalité de l'innovation enthousiasme mes collègues." ('The uniqueness of the innovation excites my colleagues.')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.15) a. Ils sont enthousiastes souvent.
they are thrilled often
'They are often thrilled.'

b. Ils sont souvent enthousiastes.
they are often thrilled
'They are often thrilled.'

Example (16.16) illustrates how an adjective and a noun combine.

(16.16) a. [l' [innovation formidable]$_{N'}$]$_{NP}$
the innovation amazing
'the amazing innovation'

b. $$N' \begin{bmatrix} \textit{head-mod-structure} & \\ \textsc{phon} & \langle \textit{innovation formidable} \rangle \\ \textsc{head} & \boxed{1} \\ \textsc{head-dtr} & \begin{bmatrix} \textit{word} & \\ \textsc{phon} & \langle \textit{innovation} \rangle \\ \textsc{synsem} & \boxed{2}\begin{bmatrix} \textsc{head} & \boxed{1}\ \textit{noun} \end{bmatrix} \end{bmatrix} \\ \textsc{nhead-dtrs} & \left\langle \begin{bmatrix} \textit{word} & \\ \textsc{phon} & \langle \textit{formidable} \rangle \\ \textsc{head} & \begin{bmatrix} \textit{adjective} \\ \textsc{mod} & \boxed{2} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

16.1.1.3 Word order

In French, specifiers precede the head and complements follow it. A linearization rule states that in *head-comps-structure* objects the head element must precede the non-head element (the complement). Another linearization rule states that in *head-spr-structure* objects the non-head element (the specifier) must precede the head element.

Subject-verb inversion in French is a very complex phenomenon, and a proper explanation would require a long discussion. A complete HPSG analysis of subject-verb inversion can be found in Bonami et al. (1998) and Bonami & Godard (2001). For the time being, I assume that the linearization for *head-subj-structure* is underspecified. Verbs bear a feature INV with a boolean value (+/−). In *head-subj-structure*, the head precedes the non-head if it has the value [INV +] and follows it if it has the value [INV −].

Modifiers can also precede or follow the modified element. I will illustrate this with adjectives: adjectives in French can be prenominal or postnominal, with

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

some adjectives constrained to one position or the other. Example (16.16) illustrates a postnominal adjective. I adopt the analysis of Abeillé & Godard (1999a,b): a feature WEIGHT with a value of type *weight* (subtypes: *lite* and *nonlite*) accounts for the syntactic position of adjectives. Abeillé & Godard's analysis can be roughly summarized as follows: *lite* adjectives are prenominal and *nonlite* adjectives are postnominal. Modification and complementation of the adjective may cause a *lite* adjective to become *nonlite*. Coordination of two or more *lite* adjectives may also turn the coordination into a *nonlite* modifier. I refer the reader for more details to Machicao y Priemer & Winckel (2015), in which we proposed an analysis of the position of adjectives in French and Spanish based on semantic factors. The analysis of adverbs follows roughly the same principles. Relative clauses are always [WEIGHT *nonlite*], i.e. postnominal (Abeillé & Godard 1999a: 343). I come back to the analysis of relative clauses in Section 16.2.

The different linearization rules are summarized in (16.17).

(16.17) **Linearizations rules:**

a. *head-spr-structure* ⇒ NHEAD-DTR < HEAD-DTR

b. *head-comps-structure* ⇒ HEAD-DTR < NHEAD-DTR

c. *head-subj-structure* ⇒ HEAD-DTR [INV +] < NHEAD-DTRS

d. *head-subj-structure* ⇒ NHEAD-DTR < HEAD-DTR [INV −]

e. *head-mod-structure* ⇒ NHEAD-DTR [WEIGHT *lite*] < HEAD-DTR

f. *head-mod-structure* ⇒ HEAD-DTR < NHEAD-DTR [WEIGHT *nonlite*]

16.1.2 Semantics

I adopt the Minimal Recursion Semantics (MRS) semantic representation as developed by Copestake et al. (2005). This representation is often used in HPSG implementations, e.g. the CoreGram Project (Müller 2015). Semantics is represented in an AVM of type *mrs*. Copestake et al. (2005) define three features for the *mrs* objects: HOOK, RELATIONS (RELS) and HANDLE-CONSTRAINTS (HCONS).[8] Song (2017) adds an additional feature to encode the information about the discourse status of the different parts in an utterance: ICONS.

[8]Copestake et al. (2005) define the value of RELS and HCONS not as a list, but as a "bag", though they represent them as lists.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.18) Definition of *mrs*:

$$\begin{bmatrix} \textit{mrs} & \\ \text{HOOK} & \begin{bmatrix} \textit{hook} & \\ \text{GTOP} & \textit{handle} \\ \text{LTOP} & \textit{handle} \\ \text{CLAUSE-KEY} & \textit{event} \\ \text{ICONS-KEY} & \textit{info-str} \\ \text{INDEX} & \textit{index} \end{bmatrix} \\ \text{RELS} & \textit{list of relations} \\ \text{HCONS} & \textit{list of qeq constraints} \\ \text{ICONS} & \textit{list of icons} \end{bmatrix}$$

In this section, I will present how MRS works, leaving the ICONS features aside. In a later section dedicated to information structure in HPSG, I will come back to ICONS and how information structure is encoded in my fragment of French.

The reference marking feature INDEX, embedded under CONT|HOOK in MRS, can be found also in other semantic representations in HPSG, (see Pollard & Sag 1994: 24–26). The value of INDEX is an AVM of type *index*, that has different subtypes in accordance with the type of referent concerned (individual or event).

Figure 16.6: Type hierarchy of *index*

Each lexeme with a semantic content introduces an "Elementary Predication" (EP) in the discourse. In the MRS representation, this is reflected by the fact that every lexeme has (at least) one object of type *relation* in its RELS list. Conventionally, the nomenclature for the different types of relations is *lexeme_rel*. For example, the lexical entry for *collègue* ('colleague') contains in its RELS list an object of type *collegue_rel*. The handle is the label of the EP. It is encoded under a feature LBL with a value of type *handle* (conventionally labeled *h1*, *h2*, *h3*, etc.). The first argument of an EP is a variable (conventionally labeled *i*, *j*, *k*, etc. for individuals and *e1*, *e2*, *e3*, etc. for events), and is encoded under a feature ARG0 with a value of type *index*. On the level of the lexeme, the value of ARG0 is coindexed with the value of INDEX. The other arguments, if there are any, are handles, which are encoded under features ARG1, ARG2, etc. with values of type *index*.[9] Copestake et al.

[9]The order of the arguments follows the obliqueness of the arguments (Keenan & Comrie 1977): less obliges < more oblique (Copestake et al. 2005: 287).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(2005) also define other possible features (e.g. RESTR, BODY) for scopal relations, that we do not need in this fragment.

The (simplified) semantic representation for *collègue* ('colleague') is given in (16.19). Being a noun, *collègue* has an INDEX of type *individual*. Because *collègue* is a relational noun, *collegue_rel* has a feature ARG1. In ARG-ST, the value of ARG1 is identified with the index of the complement.

(16.19) Lexical entry for *collègue* ('colleague') – semantics:

$$\begin{bmatrix} \text{PHON} & \langle \textit{collègue} \rangle \\ \text{CONT} & \begin{bmatrix} \textit{mrs} & \\ \text{HOOK} & \begin{bmatrix} \text{LTOP} & \boxed{\text{h1}} \\ \text{INDEX} & \boxed{\text{i}}\ \textit{individual} \end{bmatrix} \\ \text{RELS} & \left\langle \begin{bmatrix} \textit{collegue_rel} & \\ \text{LBL} & \boxed{\text{h1}} \\ \text{ARG0} & \boxed{\text{i}} \\ \text{ARG1} & \boxed{\text{j}} \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{ARG-ST} & \langle [\text{INDEX}\ \boxed{\text{j}}] \rangle \end{bmatrix}$$

The value of the feature HANDLE-CONSTRAINTS (HCONS) is a list of AVMs of the type *equality modulo quantifiers (qeq)*. They link the arguments with each other, especially for scope resolution. It is not absolutely necessary to take it into account for my analysis, and that is why I will ignore the feature HCONS in this work.

The feature HOOK has a value of type *hook* that contains five features: GTOP, LTOP, CLAUSE-KEY, ICONS-KEY and INDEX. CLAUSE-KEY is related to information structure and I will describe it in the next section. GTOP states the global top handle: this is the EP in the sentence whose ARG0 value is not bound by any other EP. LTOP states the local top handle, i.e. the EP of the head in headed structures. On the level of the lexeme, the value of LTOP is identified with the value of the LBL, see example (16.19).

In headed structures, the value of the GTOP is the same for the mother and its daughters. The mother inherits the value of the whole HOOK of the head daughter.

The value of the RELS list of the mother is a concatenation of the lists of the daughters in structures with a simple semantic composition. In some structures however, the semantic contribution of the structure is more than the sum of the contributions of the daughters. Therefore, phrases have an additional *loc* feature C-CONT in which the contribution of the structure can be encoded. Like CONT, C-CONT takes as value a *mrs* object. The value of the CONT|RELS (and HCONS) list of the mother is an amalgamation of the lists of both daughters and of its own

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

C-CONT|RELS (and HCONS) list in structures with a simple semantic composition. Headed structures are thus defined as follows:

(16.20) **Semantic composition**

headed-structure ⇒

$$\begin{bmatrix} \text{SYNSEM|LOC} & \begin{bmatrix} \text{CONT} & \begin{bmatrix} \text{HOOK} & \boxed{1}\begin{bmatrix}\text{GTOP} & \boxed{2}\end{bmatrix} \\ \text{RELS} & \boxed{3} \oplus \boxed{4} \oplus \boxed{5} \\ \text{HCONS} & \boxed{6} \oplus \boxed{7} \oplus \boxed{8} \end{bmatrix} \\ \text{C-CONT} & \begin{bmatrix} \text{RELS} & \boxed{5} \\ \text{HCONS} & \boxed{8} \end{bmatrix} \end{bmatrix} \\ \text{HEAD-DTR} & \begin{bmatrix} \text{SYNSEM|LOC|CONT} & \begin{bmatrix} \text{HOOK} & \boxed{1} \\ \text{RELS} & \boxed{3} \\ \text{HCONS} & \boxed{6} \end{bmatrix} \end{bmatrix} \\ \text{NHEAD-DTRS} & \left\langle \begin{bmatrix} \text{SYNSEM|LOC|CONT} & \begin{bmatrix} \text{HOOK} & \begin{bmatrix}\text{GTOP} & \boxed{2}\end{bmatrix} \\ \text{RELS} & \boxed{4} \\ \text{HCONS} & \boxed{7} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

A sentence is well-formed if all *index* variables are bound, except for one. For the sake of simplicity, I assume that the *handle* corresponding to this unbound variable is then unified with the value of GTOP. At the sentence level, the value of GTOP must be equal to the value of LTOP.

CLAUSE-KEY is a feature introduced by Song (2017). Its value is structure-shared with the INDEX value of the semantic head of the clause (usually the main verb). Only finite clauses are considered as "clauses" for CLAUSE-KEY. For example, in (16.21), the value of CLAUSE-KEY is *e2* for *Sherry wants Minnie to bring her dog* and all its subtrees, because *bring* is non-finite.

(16.21) [Maria wonders$_{e1}$ [why Sherry wants$_{e2}$ Minnie to bring$_{e3}$ her dog], [whereas Erica is$_{e4}$ allergic to them]].

The lexical entry for verbs constrains the NPs and non-finite VPs in its ARG-ST list to structure-share the value of their feature CLAUSE-KEY with the value of its own CLAUSE-KEY. This ensures that all elements in a clause share the same CLAUSE-KEY value – except the finite sentential arguments, as I will explain in Section 16.2.5.[10] On the clausal level, a constraint ensures that the CLAUSE-KEY value of the clause is structure-shared with the INDEX value of the semantic head

[10]The mechanism is somewhat more sophisticated in Song (2017), but this should not not change the analysis.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

of the clause. I will describe the different types of clauses and how the constraint is formalized below.

Figure 16.7 on page 407 gives a concrete example of how MRS's representation of semantics works for a whole sentence. I do not elaborate on the semantics of quantifiers, developed at length by Copestake et al. (2005), since they are not of significant interest to the topic of this book. Suffice it to say that I assume the distinction between definite articles (with a relation *def_rel*), indefinite articles (with a relation *indef_rel*) and possessives (with a relation *poss_rel*).

16.1.3 Information structure

The question of how to represent information structure in HPSG has not been settled yet, and before I present the representation I adopted in this work, I briefly discuss the other proposals in the literature. Song (2017) seems best suited for my aims, and I decided to stand by his proposal despite some imperfections and open questions that I leave for future work to resolve.

16.1.3.1 Different representations of information structure in HPSG

There is for now no broad consensus on how to represent and implement information structure in HPSG. The different proposals make different choices relative to: (i) how many and which discourse status they assume, (ii) on which level they encode information structure (e.g. main feature of *sign*, CONTENT feature), (iii) which type of object is taken as value by the feature expressing discourse status (e.g. *sign*, *mrs*) and (iv) whether or not they allow for embedded clauses to have their own internal information structure. See Bildhauer (2008: 113–122) and De Kuthy (2020) for an overview of the HPSG literature on information structure.

The first solid attempt to develop an information structure representation has been made by Engdahl & Vallduví (1996), based on Vallduví's (1992) theory on information structure. Instead of the double binary distinction Topic/Comment and Focus/Background that is presented in Section 4.1, Vallduví's (1992) analysis relies on a binary distinction Focus / Background, in which the latter entails a binary distinction Link / Tail. The concept of Link is roughly equivalent to what I defined as Topic, and the concept of Tail applies to the elements in the utterance that are neither Link (Topic) nor Focus. Engdahl & Vallduví (1996) represent information structure under CONTEXT. They propose a CONTEXT feature INFO-STRUC that has as value an AVM with three features: LINK, FOCUS and TAIL (Engdahl & Vallduví 1996: 11). They all take as a value an object of type *sign* even though Engdahl assumes a value of type *content* in her later accounts (Engdahl 1999). On

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.7: Semantic representation for "L'originalité de l'innovation enthousiasme mes collègues." ('The uniqueness of the innovation excites my colleagues.')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

top of that, Engdahl & Vallduví account for the interface between prosody and information structure, but I leave this aspect of their analysis aside.

(16.22) **Encoding of information structure in Engdahl & Vallduví (1996: 11)** (adapted to a modern representation)

$$\begin{bmatrix} \textit{sign} & \\ \text{SYNSEM|LOC|CONTEXT} & \begin{bmatrix} \text{C-INDICES} & \textit{cindices} \\ \text{BACKGROUND} & \textit{set} \\ \text{INFO-STRUCT} & \begin{bmatrix} \text{FOCUS} & \textit{sign} \\ \text{GROUND} & \begin{bmatrix} \text{LINK} & \textit{sign} \\ \text{TAIL} & \textit{sign} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

De Kuthy (2002) makes a different proposal: she encodes information structure under a main feature of *sign* INFO-STRUC, that takes as value a feature structure of type *info-struc* with only two features: FOCUS and TOPIC (De Kuthy 2002: 161–165). Each of these features has as value a list of *meaningful expression* objects (a semantic representation proposed by Richter (2000) that is closer to Montague Semantics (Dowty et al. 1981) than MRS). There is therefore no encoding of backgroundedness, even though it would be relatively easy to introduce it in her model if needed. Having a list as value enables her analysis to distinguish utterances with multiple foci or topics from sentences with one focus or topic. De Kuthy accounts for the interface between prosody and information structure along the same lines as Engdahl & Vallduví (1996).

(16.23) **Encoding of information structure in De Kuthy (2002: 161–165)** (summed up)

$$\begin{bmatrix} \textit{sign} & \\ \text{PHON} & \textit{list} \\ \text{SYNSEM} & \textit{synsem} \\ \text{INFO-STRUC} & \begin{bmatrix} \textit{info-struc} & \\ \text{FOCUS} & \textit{list of meaningful expressions} \\ \text{TOPIC} & \textit{list of meaningful expressions} \end{bmatrix} \end{bmatrix}$$

Bildhauer's (2008) proposal is relatively similar to De Kuthy (2002). Information structure is encoded under the feature IS, a main feature of *sign* that takes as value an AVM object with the two features FOCUS and TOPIC. The value of these two features is a list of lists of EPs (i.e. of object of the type *relation* as defined in MRS, see above). Here again, there is no explicit encoding of backgroundedness, but it remains relatively easy to identify.[11] Having as value a list of lists enables

[11]As pointed out by Bildhauer, "it will correspond to those EPs that are present on the RELS list,

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the analysis to identify multiple foci or topics, similarly to De Kuthy. Bildhauer also develops a very elaborate representation of accents and tonality that can be mapped onto the information structure.

(16.24) **Encoding of information structure in Bildhauer (2008: 147)**

$$\begin{bmatrix} \textit{sign} & \\ \textsc{phon} & \textit{list} \\ \textsc{synsem} & \textit{synsem} \\ \textsc{is} & \begin{bmatrix} \textsc{foc} & \textit{list} \\ \textsc{topic} & \textit{list} \end{bmatrix} \end{bmatrix}$$

Bildhauer & Cook (2010) and Müller, Bildhauer & Cook (2020) are using a sightly different variant of Bildhauer's (2008) proposal. The feature IS is a feature in *synsem*, the rest of the analysis remains unchanged.

(16.25) **Encoding of information structure in Bildhauer & Cook (2010: 74)**

$$\begin{bmatrix} \textit{sign} & \\ \textsc{synsem} & \begin{bmatrix} \textsc{loc} & \textit{local} \\ \textsc{nonloc} & \textit{nonloc} \\ \textsc{is} & \begin{bmatrix} \textit{is} & \\ \textsc{topic} & \textit{list} \\ \textsc{focus} & \textit{list} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Webelhuth's (2007) proposal differs on many points from other proposals in the literature. He represents information structure under CONTENT. The value of CONTENT is an AVM of type *content* with two features, BACKGROUND (BG) and FOCUS (FOC). The value of FOCUS is a list of *meaningful expression* objects (Richter 2000). The value of BG is an AVM with two features: FOCUS VARIABLES (FVARS) which takes a list of variables (based on Krifka (1992) in order to account for multiple foci or topics); and CORE, which takes an object of the type *meaningful expression* and encodes the meaning of the sign. Furthermore, Webelhuth (2007: 310) makes a distinction between Focus / Topic / Background, which are mapped to prosody; and Theme, which is mapped to syntax. His concept of Theme is similar to what I defined as "aboutness topic", with an important aspect of gradience (one constituent being more or less thematic than another one). Thematicity is encoded in a meaningful expression.

but absent from the FOC and TOPIC list" (Bildhauer 2008: 147). My definition of background would rather correspond to the EPs that are present on the RELS list, but absent from the FOC list.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.26) **Encoding of information structure in Webelhuth (2007: 312)**

$$\begin{bmatrix} \textit{sign} & \\ \textsc{synsem|loc|cont} & \begin{bmatrix} \textit{cont} & \\ \textsc{bg} & \begin{bmatrix} \textit{bg} & \\ \textsc{fvars} & \textit{list of variables} \\ \textsc{core} & \textit{meaningful expression} \end{bmatrix} \\ \textsc{foc} & \textit{list of meaningful expressions} \end{bmatrix} \end{bmatrix}$$

Song (2017) encodes information structure inside *mrs* objects, thus under CONTENT, with a feature called ICONS. The mechanism of ICONS mimics the mechanism of RELS. The value is a list of objects of type *info-struc*, and each word that introduces an EP also introduces such an object. The type hierarchy of *info-struc* is fine-grained and contains subtypes like *focus*, *topic* and *bg* (background). *info-struc* objects have two features, TARGET and CLAUSE, that make it possible to map the semantic variable bearing the discourse function to the clause with respect to which it has this discourse function. Embedded clauses can then have their own internal information structure independently of the main clause (e.g. a relative clause may be backgrounded with respect to the meaning of the main clause, but have its own topic or focus domain). I present Song's (2017) proposal in more detail below.

(16.27) **Encoding of information structure in Song (2017: 116) (simplified)**

$$\begin{bmatrix} \textit{sign} & \\ \textsc{synsem|loc|cont} & \begin{bmatrix} \textit{mrs} & \\ \textsc{hook} & \textit{hook} \\ \textsc{rels} & \textit{list of relations} \\ \textsc{hcons} & \textit{list of qeq constraints} \\ \textsc{icons} & \textit{list}\left(\begin{bmatrix} \textit{info-str} & \\ \textsc{clause} & \textit{individual} \\ \textsc{target} & \textit{individual} \end{bmatrix}\right) \circ \textit{list of icons} \end{bmatrix} \end{bmatrix}$$

16.1.3.2 Desiderata for a representation of information structure

As shown by the variety of the proposals, scholars disagree on many points, but especially on where the features for information structure should be embedded. Even though some define the information structure feature at the level of the *sign* (De Kuthy 2002, Bildhauer 2008), Müller, Bildhauer & Cook (2020: 145) point out that it is necessary that the discourse status is accessible in *synsem* objects – because some elements are sensitive to information structure, like focus particles (e.g. *only*) and should have the ability to select via the valence features an element

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

with the appropriate information structure. De Kuthy (2002: 160–161) argues that INFO-STRUC should not be part of a *local* object, otherwise this has unfortunate consequences for focus projection in her analysis. Focus projection is a property of the interface between prosody and information structure, such that the word(s) bearing the main stress in the sentence may project this focus status to domains wider than where the stress falls. Focus projection is therefore the reason why the German sentence in (16.28) can have an all-focus reading (e.g. as an answer to the question *What happened?*), while the main stress is on *Auto*.

(16.28) Hans hat ein AUTO gewonnen. [all-focus reading] (De Kuthy 2002: 160)
Hans has a car won
'Hans won a car.'

If the word that receives the main stress appears in the prefield (before the finite verb), focus projection is blocked: (16.29) cannot have an all-focus reading.

(16.29) # Ein AUTO hat Hans *t* gewonnen. [all-focus reading] (De Kuthy 2002: 160)
a car has Hans won
'Hans won a car.'

But De Kuthy analyses the prefield position as a filler-gap dependency with a trace (*t*) at the canonical position in the middlefield, and traces as empty categories that structure-share their *loc* value with their filler. This is the reason why De Kuthy argues against having encoding of information structure in *loc* objects: otherwise, the information structure of (16.28) is indistinguishable from the information structure of (16.29), and this fails to account for the difference in available readings between the two sentences.

On the contrary, it is crucial for the formalization of the FBC constraint that the focus interpretation received by the extracted element is structure-shared with the noun that subcategorizes for this element. That is why, contra De Kuthy (2002), I argue that information structure has to be encoded in *loc* objects. I avoid the problem pointed out by De Kuthy (2002) because I adopt a traceless account of extraction in the line of Bouma et al. (2001).[12] I refer to Sag & Fodor (1994, 1996) for a defense of traceless analyses which argues among other things that

[12]De Kuthy (2002) refers to it as a possible way to avoid focus projection in (16.29), but says that it is otherwise incompatible with her own analysis of German.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

it is more compatible with an incremental processing model (Pickering & Barry 1991, Tanenhaus et al. 2000).[13]

The different accounts use different terminologies with respect to information structure, and this is especially true for "background", which may or may not include the topic, depending on the model. For Engdahl & Vallduví (1996), (BACK)GROUND includes the LINK (Topic), whereas for De Kuthy (2002), Bildhauer (2008) and Song (2017), Background, Topic and Focus are in complementary distribution (Background is what is neither Topic nor Focus, and vice versa). The FBC constraint in (15.1) presupposes direct access to a list of the focused elements on one hand, and to the "backgrounded" (in the sense non-focus) on the other hand. This is possible in all representations that I mentioned before, though more straightforwardly so in Engdahl & Vallduví's (1996) model and Song's (2017) model (which defines a supertype *non-focus* for *background* and *topic*).

However, Song's (2017) proposal is the only one that offers the possibility to model different layers of information structure for each clause in an utterance, thanks to the pair of features CLAUSE/TARGET. This means that any element in an embedded clause can be presupposed with respect to the main clause (e.g. if the whole clause is backgrounded, as in restrictive relative clauses) and still be the topic with respect to the embedded clause (e.g. the extracted element in a relative clause[14]). This advantage is fundamental for my purposes, and that's why I adopt his model in this work.

For reasons of coherence, I adopt Song's (2017) representation and stay as consequent as possible with his analysis, even though it has some weaknesses. For example, this model does not make a distinction between a clause with multiple foci or topics and a clause with a single focus or topic (an aspect addressed by De Kuthy (2002), Webelhuth (2007), Bildhauer (2008), and Müller, Bildhauer & Cook (2020)). It is beyond the scope of this work to define a new and more optimal representation of information structure in HPSG that takes into account all aspects of information structure. In general, I am also confident that my analysis is compatible with any well thought-out representation of information structure with small adaptations.

[13] On the other hand, traceless analyses may also have some drawbacks: as explained by Müller (2016: 570–574), more rules have to be added to the grammar, and especially the German V2 position seem to be hard to analyse without the use of a trace.

[14] "On the basis of the pervasive parallelism between topicalization and relativization, I proposed that in Japanese what is relativized is the theme of the relative clause." (Kuno 1987: 15)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

16.1.3.3 The representation of information structure adopted in this work

In this work, information structure is encoded under the *mrs* feature INDIVIDUAL CONSTRAINTS (ICONS). The definition of *mrs* presented in (16.18) is reproduced in (16.30):

(16.30) Definition of *mrs*:

$$\begin{bmatrix} \textit{mrs} & \\ \text{HOOK} & \begin{bmatrix} \textit{hook} & \\ \text{GTOP} & \textit{handle} \\ \text{LTOP} & \textit{handle} \\ \text{CLAUSE-KEY} & \textit{event} \\ \text{ICONS-KEY} & \textit{info-str-or-none} \\ \text{INDEX} & \textit{index} \end{bmatrix} \\ \text{RELS} & \textit{list of relations} \\ \text{HCONS} & \textit{list of qeq constraints} \\ \text{ICONS} & \textit{list of icons} \end{bmatrix}$$

The feature ICONS "incorporate[s] discourse-related phenomena into semantic representations of sentences" (Song 2016: 31).[15] The feature CONT thus encodes not only the semantics but also the pragmatics of the sign. That's the reason why Song (2016, 2017) does not define any CONTEXT feature for *local* objects.

The value of ICONS is a list of *icons* objects. All ICONS objects express a binary relation between *index* variables. They express for example anaphora resolutions, either as an identity relation ("eq") or a non-identity relation ("neq") between two variables.

(16.31) a. John$_i$ likes himself$_j$. [i eq j]
b. John$_i$ likes him$_j$. [i neq j] (examples from Song 2016: 31)

Honorific relations are also encoded by means of *icons* objects – namely *rank* objects, as a binary relation between the addressor and the addressee. Information structure is encoded in *info-str* objects, in accordance with the hierarchy of *icons* objects in Figure 16.8 on page 414, adapted from Song (2016: 36) and Song (2017: 114).

Objects of the type *info-str* express a binary relation between a clause (an *event* variable) and some element in the sentence (through its *index* variable). Accordingly, they have two features, CLAUSE and TARGET. Every word that introduces an

[15] Song & Bender (2012) attribute the first idea of the ICONS feature to Dan Flickinger and Ann Copestake.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.8: Type hierarchy of *icons*

EP in the semantic representation also introduces an *info-str* object.[16] The value of TARGET is structure-shared with the value of the INDEX of the word. The value of CLAUSE is structure-shared with the value of CLAUSE-KEY, which is itself the current clause's event variable.

(16.32) Definition of *info-str*:

$$\begin{bmatrix} \textit{info-str} & \\ \text{CLAUSE} & \textit{event} \\ \text{TARGET} & \textit{index} \end{bmatrix}$$

Example (16.33) illustrates how words in the lexicon introduce an underspecified object of type *info-str*. Example (16.34b), on the other hand, is the AVM for *collègues* ('colleagues') in (16.34a) in which the direct object would bear the informational focus of the utterance.

(16.33) Lexical entry for *collègue* ('colleague') – information structure:

[16]The corollary of this rule is that semantically empty words like expletives or copulas do not introduce any *info-str* object. Song (2017: 112) also assumes that syncategorematic items, e.g. relative pronouns, are "informatively empty" and do not introduce any *info-str* objects. He does not explain in detail how such words are analyzed in his model, and especially what the value of ICONS-KEY is. I add the possibility of a value *i-empty* to his hierarchy of *icons*, and assume that semantically and informatively empty words are $\begin{bmatrix}\text{ICONS-KEY} & \textit{i-empty}\end{bmatrix}$. This is not very elegant because all *icons* objects are supposed to introduce a binary relation. Furthermore, an unfortunate consequence is that the ICONS list of a sign may contain *i-empty* elements. This could probably be avoided, but I leave the task of resolving this challenge for future works.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

$$\begin{bmatrix} \text{PHON} & \langle \textit{collègue} \rangle \\ \text{CONT|HOOK} & \begin{bmatrix} \text{INDEX} & \boxed{\text{i}}\ \textit{individual} \\ \text{CLAUSE-KEY} & \boxed{\text{e}}\ \textit{event} \\ \text{ICONS-KEY} & \begin{bmatrix} \textit{info-str} \\ \text{CLAUSE} & \boxed{\text{e}} \\ \text{TARGET} & \boxed{\text{i}} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(16.34) a. [L' originalité de l' innovation]$_T$ enthousiasme [mes collègues]$_F$.
the uniqueness of the innovation excites my colleagues
'The uniqueness of the innovation excites my colleagues.'

b. $$\begin{bmatrix} \text{PHON} & \langle \textit{collègues} \rangle \\ \text{CONT|HOOK} & \begin{bmatrix} \text{INDEX} & \boxed{\text{i}}\ \textit{individual} \\ \text{CLAUSE-KEY} & \boxed{\text{e}}\ \textit{event} \\ \text{ICONS-KEY} & \begin{bmatrix} \textit{semantic-focus} \\ \text{CLAUSE} & \boxed{\text{e}} \\ \text{TARGET} & \boxed{\text{i}} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The feature ICONS-KEY encodes the "main" information structure of the head. The other *icons* objects (the information structure for the rest of the phrase, or other pragmatic relations) are part of the ICONS list. There can be only one object for each TARGET-CLAUSE pair in the ICONS list, i.e. an element may have different discourse statuses for different clauses but not different discourse statuses for one single clause.

(16.35) **Discourse-clash Avoidance Principle**:
The ICONS list can contain only one *info-str* element for each TARGET-CLAUSE pair.

As long as the word remains the head of the structure, the values of ICONS-KEY and CLAUSE-KEY remain the same, as they are part of HOOK. In a headed structure, the ICONS-KEY of the non-head daughter is incorporated into the ICONS list of the mother node. The mother node also inherits the ICONS lists of its daughters and its own C-CONT.[17]

[17] Song (2017) uses some mechanisms of the LKB grammars to formulate his constraint (e.g. difference lists). I am using a more traditional approach and thus translate Song's idea into the constraint in (16.36).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.36) **ICONS Accumulation**

headed-structure →

$$\begin{bmatrix} \text{CONT}|\text{ICONS} & \boxed{1} \oplus \langle \boxed{2} \rangle \oplus \boxed{3} \oplus \boxed{4} \\ \text{C-CONT} & \begin{bmatrix} \text{ICONS} & \boxed{4} \end{bmatrix} \\ \text{HEAD-DTR} & \begin{bmatrix} \text{CONT}|\text{ICONS} & \boxed{1} \end{bmatrix} \\ \text{NHEAD-DTRS} & \left\langle \begin{bmatrix} \text{CONT} & \begin{bmatrix} \text{HOOK}|\text{ICONS-KEY} & \boxed{2} \\ \text{ICONS} & \boxed{3} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

16.2 Extraction in HPSG

The *synsem* feature NONLOC encodes features that are used for non-local dependencies. I take as a baseline the definition of NONLOC adopted in Borsley & Crysmann (2020). They follow a lexicalist approach to extractions and long distance dependencies – strongly inspired by Bouma et al. (2001) and Ginzburg & Sag (2000) – in which (i) no empty categories are needed; and (ii) constructions involving non-local dependencies receive different analyses via different non-local features. Indeed, Sag (2010) provides a detailed overview of the different extractions in English and show that they are heterogeneous. With that in mind, I propose a way to account for the different extraction constructions discussed in this work: relative clauses (based on the analysis of Abeillé & Godard (2007)), interrogatives and *c'est*-clefts (based on the analysis of Winckel & Abeillé (2020)). My goal is to show how syntax and information structure interact in these constructions.

16.2.1 A traceless analysis

Objects of the type *nonloc* have three features, SLASH, REL and QUE. They all take as value a set: a set of *loc* objects for SLASH, a set of *index* objects for REL and a set of *relations* (EPs) objects for QUE. A non-empty SLASH set denotes the presence of a "missing" element, i.e. an object of type *gap*. HPSG analyses generally assume a set value for the SLASH feature (instead of a list), because this allows two gaps to combine into a single gap (Pollard & Moshier 1990). This property accounts for cases like (16.37), where two gaps are linked to the same filler.[18]

[18] Chaves & Putnam (2020) propose that the value of SLASH (GAP in their terminology) is a list. Instead of the SLASH Amalgamation Principle (16.40) below, they assume a function of list joining (Chaves & Putnam 2020: 248). Their proposal has the advantage of licensing not only cases like (16.37), but also cases in which two gaps combine into a single gap while keeping distinct indices, as in (i). Indeed, if in (16.37) the document signed is the same as the document read, in (i) what is eaten can hardly be the same as what is drunk.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.37) [Which document]$_i$ did you sign $__i$ [without reading $__i$]?

Cases like (16.37) are challenging under a movement-based approach, and that is the reason why these accounts treat one of the gaps as "parasitic" (see Section 2.4.2 for a presentation of parasitic gaps and arguments against them).

(16.38) **Definition of *nonloc*:**

$$\begin{bmatrix} \textit{nonloc} & \\ \textsc{slash} & \textit{set of loc} \\ \textsc{rel} & \textit{set of index} \\ \textsc{que} & \textit{set of relations} \end{bmatrix}$$

I presented in Section 16.1.1 how arguments in the ARG-ST list can be selected for canonical or non-canonical realization, based on the type hierarchy of *synsem* in Figure 16.3. Dependents of the type *gap* are defined as follows:[19]

(16.39) **Definition of *gap*:**

$$\begin{bmatrix} \textit{gap} & \\ \textsc{loc} & \boxed{1} \\ \textsc{nonloc}|\textsc{slash} & \{\boxed{1}\} \end{bmatrix}$$

A word "gathers" the elements of its arguments' SLASH set into its own SLASH set. Because *gap* objects have a non-empty SLASH set, their LOC value is also stored in the SLASH set of the word that subcategorized for them. If the NP argument of a verb is realized canonically but has an element in its SLASH set, as is the case for subextractions from subjects or objects, this gap element recursively ends up in the SLASH set of the verb.

(16.40) **SLASH Amalgamation Principle** adapted from Ginzburg & Sag (2000: 169)

$$\textit{word} \rightarrow \begin{bmatrix} \textsc{slash} & /\boxed{1} \cup \ldots \cup \boxed{n} \\ \textsc{arg-st} & \langle [\textsc{slash} \ /\boxed{1}] \ldots [\textsc{slash} \ /\boxed{n}] \rangle \end{bmatrix}$$

This SLASH Amalgamation Principle is a default constraint. Some kinds of words, like the copula in *c'est*-clefts (see below) or adjectives that allow so-called

(i) What$_{i+j}$ do you think [Ed ate $__i$ and drank $__j$ at the party]? (Chaves & Putnam 2020: 246)

For the sake of simplicity, I adopt the analysis of extractions described in Borsley & Crysmann (2020) because I do not need a more sophisticated analysis in order to formalize the FBC constraint. But my analysis is also compatible with Chaves & Putnam's proposal.

[19]The original definition is in Pollard & Sag (1994: 160).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

"*tough* constructions" (Pollard & Sag 1994, Ginzburg & Sag 2000), select a complement with a non-empty SLASH set and do not contain the slashed element in their own SLASH list.

The same mechanism applies to the other NONLOC features REL and QUE. The SLASH Amalgamation Principle (16.40) can therefore have as a corollary a (default) QUE Amalgamation Principle and a (default) REL Amalgamation Principle. Or we may adopt the general NONLOC Amalgamation Principle in (16.41).

(16.41) **NONLOC Amalgamation Principle**

For every NONLOC feature F:

$$\textit{word} \rightarrow \begin{bmatrix} \text{F} & /\boxed{1} \cup \ldots \cup \boxed{n} \\ \text{ARG-ST} & \left\langle \left[\text{F} \ /\boxed{1}\right], \ldots, \left[\text{F} \ /\boxed{n}\right] \right\rangle \end{bmatrix}$$

The Argument Realization Principle (16.5) and the NONLOC Amalgamation Principle (16.41) are sufficient to account for non-local dependencies in this work, that deals only with the extraction of arguments in headed structures. Specific requirements would be necessary to account for extractions of adjuncts, out of adjuncts and out of non-headed structures.[20] I leave this question open.

Let us depict in a bottom-up fashion the argument realization for a prototypical sentence: The COMPS list of the verb is first worked off as the verb combines with its complement(s) through *head-comps-structure*; then the SUBJ list is worked off as the verb combines with its subject through *head-subj-structure*; and finally, the SLASH set of the verb is worked off as the verb combines with the filler(s) through *head-filler-structure*.

Figure 16.9 on page 419 completes, therefore, Figure 16.4 with *head-filler-structure*. Linguistic objects of the type *head-filler-structure* take a non-head daughter with a LOC value that is structure-shared with one element of the head daughter's SLASH set. This same element is then missing from the mother node's SLASH set. The type *head-filler-structure* is used to account for interrogatives and relative clauses with a relative pronoun, but *c'est*-clefts and relative clauses with a complementizer are analyzed differently, as I will show in what follows.

[20]For adjuncts, some HPSG works assume a supplementary valence feature in CAT which appends the elements of ARG-ST and the modifiers (e.g. the feature DEPS in Bouma et al. 2001). Other works assume that extracted modifiers are also part of the ARG-ST list (similar to the proposal in Abeillé & Godard 1997: 17), and extractions of or out of adjuncts are treated with the same rules as extractions of and out of arguments. Some other scholars like Przepiórkowski (2016) cast doubt on the relevance of the argument/adjunct distinction and see "argumenthood" as a continuum.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.9: Type hierarchy of *headed-structure*

(16.42) *head-filler-structure* →

$$\begin{bmatrix} \textsc{slash} & \boxed{1} \\ \textsc{head-dtr} & \begin{bmatrix} \textit{phrase} \\ \textsc{slash} & \{\boxed{2}\} \cup \boxed{1} \end{bmatrix} \\ \textsc{nhead-dtrs} & \langle [\textsc{local}\ \boxed{2}] \rangle \end{bmatrix}$$

The GHFP (16.8) makes sure that the mother inherits the SLASH-set from the head daughter in the other headed structures. All heads along an extraction path have therefore the property [SLASH *non-empty set*]. Extraction path effects are indeed attested cross-linguistically: there are phonological or morpho-syntactic alternations depending on this factor, one version outside the extraction path, and one version along the extraction path (Zaenen 1983, Hukari & Levine 1995; Bouma et al. 2001: Section 3.2).

Figure 16.10 on page 420 illustrates how a simple extraction works with the *wh*-question (16.43), in which the direct object is extracted.

(16.43) Qui l' innovation enthousiasme-t-elle?
who the innovation[F] excites-0-3SG.F.SBJ
'Who does the innovation excite?'

Ginzburg & Sag (2000: 7) define a variety of different constructions to account for interrogatives and relative clauses in English. For example, *wh-int-cl* (*wh*-questions with extraction), *polar-int-cl* (polar questions) and *in-situ-int-cl* (question without extraction) all have certain semantic properties in common (they denote a question) and are therefore all subtypes of *inter-cl*. But only *wh-int-cl* is also a subtype of *head-filler-structure*[21].

I adopt a similar analysis, but with the type hierarchy of *clause* from Winckel & Abeillé (2020), adapted from Abeillé & Godard (2007: 48). The hierarchy is given in Figure 16.11 on page 421. This hierarchy differs from Ginzburg & Sag (2000: 7), because relative clauses are in their proposal all headed by a filler, and hence a subtype of *head-filler-structure*.[22] I have argued above that *que*, *qui* and *dont* in

[21] *hd-fill-ph* in their terminology

[22] This is the case for *that* relative clauses, even though many scholars consider that *that* is not a filler.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.10: Simple extraction

French are complementizers, and not fillers (Section 2.3.1). As a consequence, only some relative clauses are a subtype of *head-filler-structure*. Furthermore, some scholars propose to analyse clefts as a special type of clause or construction (a.o. Kim 2012), but in my analysis *c'est*-clefts result from a special lexical entry of *être* ('be').

16.2.2 *Wh*-questions

I first present the interrogatives before turning to the other extractions. I only present *wh*-questions (with a *wh*-word), but refer an interested reader to Ginzburg & Sag (2000: 218–222) for an analysis of polar questions.

There are different question types in French, and some of them have special pragmatic properties (see a corpus study in Abeillé et al. 2012). Three of them involve an extraction of the *wh*-word: SVO-questions (16.44a), questions with suffixed subjects (16.44b), and *est-ce que* questions (16.44c).[23] There is a fourth type of question: in-situ question, with no extraction of the *wh*-word (16.44d).

[23] Another interrogative form is possible, but it involves *c'est*-clefting and will be addressed in Section 16.2.4.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.11: Cross-classification of *clauses* and *phrase*

(16.44) a. Qui$_i$ l' innovation enthousiasme $_{-i}$?
who the innovation excites
'Who does the innovation excite?'

b. Qui$_i$ (l' innovation) enthousiasme-t-elle $_{-i}$?
who the innovation[F] excites-0-3SG.F.SBJ
'Who does it excite?'

c. Qui$_i$ est - ce que l' innovation enthousiasme $_{-i}$?
who is it that the innovation excites
'Who does the innovation excite?'

d. L' innovation enthousiasme qui?
the innovation excites who
'The innovation excites who?'

Embedded questions must involve an extraction, and cannot involve a suffixed subject.

(16.45) a. Je me demande qui$_i$ l' innovation enthousiasme $_{-i}$.
I REFL ask who the innovation excites
'I wonder who the innovation excites.'

b. ?? Je me demande qui$_i$ (l' innovation) enthousiasme-t-elle $_{-i}$.
I REFL ask who the innovation[F] excites-0-3SG.F.SBJ
'I wonder who the innovation excites.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

c. Je me demande qui$_i$ est - ce que l' innovation
I REFL ask who is it that the innovation
enthousiasme $_{-i}$.
excites
'I wonder who the innovation excites.'

d. * Je me demande l' innovation enthousiasme qui.
I REFL ask the innovation excites who
'I wonder who the innovation excites.'

The feature MAIN CLAUSE (MC) is a head feature of verbs, and has a value of type *bool* (+/−), positive for the main clause and negative for embedded clauses. Direct questions are [MC +] and embedded questions [MC −].[24]

To account for the different question types, I assume that subjects can be realized as clitics if the verb subcategorizes for an extracted interrogative phrase. Clitic doubling is also allowed. This means that the subject may be realized as a clitic and as an NP like in (16.44b). But subject suffixes are restricted to [MC +].

To my knowledge, there is no complete HPSG analysis of *est-ce que* questions in French. Abeillé et al. (2012: 70) treat *est-ce que* as a complementizer and assume a special subtype of interrogatives, *est-ce-que-cl*. If this is true, the type *est-ce-que-cl* should have two subtypes, one inheriting from polar questions (*polar-int-cl*) and one inheriting from *wh*-questions with an extraction (*wh-inter-cl*). In polar *est-ce que* questions, the complementizer selects an S without subject-verb inversion and gives the interrogative interpretation to the sentence. In a *wh*-question with *est-ce que*, the head daughter is [HEAD *comp*] and has a non-empty SLASH set. I leave a more detailed analysis of *est-ce que* questions for future work and, for the sake of simplicity, I do not add *est-ce-que-cl* and its subtypes in my hierarchy of clauses (Figure 16.11).

All interrogatives are instances of *inter-cl*. Ginzburg & Sag (2000: 42) assume that objects of the type *inter-cl* have some common semantic properties. They may also have some common pragmatic properties. In my fragment, the semantic content of questions is brought by the *wh*-word on a lexical level with an appropriate EP. For example, the interrogative *qui* can either have an empty QUE set when it is in-situ or a non-empty QUE set when it is extracted. This is illustrated by the lexical entry in (16.46), adapted from Ginzburg & Sag (2000: 185),

[24]The topic of subject-verb inversion in French is not completely orthogonal to our main concern, given that sentence-final subjects seem to bear focus (Lahousse 2011). In this respect, the FBC constraint certainly makes some prediction for subject-verb inversion, but there are still no empirical data to confirm these predictions and so I leave it for future work.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

with a simplified semantic representation like the one adopted in the LinGO English Resource Grammar for *wh*-words.

(16.46) Lexical entry for interrogative *qui* ('who'):

$$\begin{bmatrix} \text{PHON} & \langle \textit{qui} \rangle \\ \text{LOC} & \begin{bmatrix} \text{CAT}|\text{HEAD} & \textit{noun} \\ \text{CONT}|\text{RELS} & \left\langle \begin{bmatrix} \textit{person} \\ \text{ARG0} \ \boxed{i} \end{bmatrix}, \boxed{1} \begin{bmatrix} \textit{which_q} \\ \text{ARG0} \ \boxed{i} \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{NONLOC} & \begin{bmatrix} \text{QUE} & \{\boxed{1}\} \vee \{\} \\ \text{REL} & \{\} \end{bmatrix} \\ \text{ARG-ST} & \langle\rangle \end{bmatrix}$$

As far as information structure is concerned, I also have argued in Section 11.4 that in-situ questions possibly do not always involve a focalization. Therefore, I do not propose any constrain on the type *inter-cl*, but acknowledge that other semantic or pragmatic aspects may be involved.

16.2.2.1 Extracted *wh*-phrase

Objects of the type *wh-inter-cl* inherit the properties of *head-filler-structure*. The filler in *wh-inter-cl* must have a non-empty QUE value (see the Filler Inclusion Constraint in Ginzburg & Sag 2000: 228). As a consequence, in-situ interrogative words are never used in *wh-inter-cl* structures. The element in the QUE set is saturated when the filler combines with the S on the clausal level. This is reflected by the definition of *wh-inter-cl* in (16.47).

(16.47) *wh-inter-cl* ⇒

$$\begin{bmatrix} \text{QUE} & \boxed{1} \\ \text{HEAD-DTR} & \begin{bmatrix} \text{QUE} & \{\boxed{2}\} \cup \boxed{1} \end{bmatrix} \\ \text{NHEAD-DTRS} & \left\langle \begin{bmatrix} \text{QUE} & \{\boxed{2}\} \end{bmatrix} \right\rangle \end{bmatrix}$$

Figure 16.12 on page 424 is an illustration of the analysis of the *wh*-question in (16.44a). Through the NONLOC Amalgamation Principle (16.41), the value of QUE is structure-shared with the whole filler phrase. That's why pied-piping structures like the one in (16.48) are accounted for as well, as illustrated by Figure 16.13 on page 425.

(16.48) [De l' anniversaire de qui]$_i$ tu parles $_{-i}$?
of the birthday of who you talk
'Whose birthday are you talking about?'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.12: Simplified tree for "Qui$_i$ l'innovation enthousiasme $__i$?" ('Who does the innovation excite?')

Furthermore, I assume cross-classifications of *clauses* and *speech-act*. The type hierarchy of *speech-act* is given in Figure 16.14 on page 426. Speech acts refer to the act performed when expressing an utterance. Typically, we think of interrogatives as requests for information, and in our analysis this speech act is defined as *standard-question*. Interrogatives can, however, be non-standard, as is the case in rhetorical questions. All *wh*-questions are indeed not necessarily focalizations. I presented in Section 11.2 some counterexamples with felicitous extractions out of the subject, like example (11.9) reproduced in (16.49). I argued that (16.49) is probably best analyzed as a rhetorical question, in which the filler is a continuation topic in the context of the utterance. This explains the felicity of extracting out of the subject. A rhetorical question is a "biased question whose answer is Common Ground and whose dialogue impact requires the activation of such a content" (Marandin 2008: 441).

(16.49) [De quel pays]$_i$ [la dépense militaire $__i$] dépasse annuellement
of which country the budget military exceeds yearly

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.13: Simplified tree for [*De l’anniversaire de qui*]$_i$ *tu parles* $_{}_i$*?* (‘Whose birthday are you talking about?’)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.14: Type hierarchy of *speech-act*

mille milliards de dollars [...] ?
thousand billion of dollars
'Of which country does the military budget exceed yearly 1000 Bn. dollars?'

I assume that all subtypes of *inter-cl* can inherit from either *standard-question* or *non-standard-question*. A linguistic object can therefore be *wh-inter-cl* and *standard-question*: these objects are *standard-wh-inter-cl*. A linguistic object can also be *wh-inter-cl* and *non-standard-question*: these objects are *non-standard-wh-inter-cl*.

I propose the following constraint on information structure for standard *wh*-questions, borrowed from Winckel & Abeillé (2020: 117)[25]:

(16.50) *standard-wh-inter-cl* →

$$\begin{bmatrix} \textsc{head-dtr} & \begin{bmatrix} \textsc{index} & \boxed{1} \end{bmatrix} \\ \textsc{nhead-dtrs} & \left\langle \begin{bmatrix} \textsc{index} & \boxed{2} \\ \textsc{icons-key} & \begin{bmatrix} \textit{semantic-focus} \\ \textsc{target} & \boxed{2} \\ \textsc{clause} & \boxed{1} \end{bmatrix} \end{bmatrix} \right\rangle \end{bmatrix}$$

The exact information structure for non-standard questions would need further investigation. I assume for the time being that non-standard *wh*-questions imply a *non-focus* object in the ICONS list, though this is most probably an oversimplification.

[25]The major difference is that Winckel & Abeillé define this constraint on *wh-inter-cl*. The FBC constraint then excludes extraction of the complement of topic subjects, allowing only extractions out of non-topic subjects. I doubt that it is what is at play in example (16.49) and therefore think that it is necessary to make a distinction between the speech acts at play.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.51) *non-standard-wh-inter-cl* →

$$\begin{bmatrix} \text{HEAD-DTR} & \begin{bmatrix}\text{INDEX } \boxed{1}\end{bmatrix} \\ \text{FILLER-DTR} & \begin{bmatrix} \text{INDEX } \boxed{2} \\ \text{ICONS-KEY} & \begin{bmatrix} \textit{non-focus} \\ \text{TARGET } \boxed{2} \\ \text{CLAUSE } \boxed{1} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

16.2.2.2 *Wh*-phrase in situ

As said previously, in situ *wh*-words have an empty QUE set. The type *in-situ-int-cl* is constrained to be $\begin{bmatrix}\text{MC } +\end{bmatrix}$, so that it cannot apply to embedded questions (Ginzburg & Sag 2000: 271). However, if there are several *wh*-words in an embedded question, as long as one is extracted, the other one(s) can remain in situ. Additional rules must be added to account for superiority effects in questions (Ginzburg & Sag 2000: 247–254).

The discussion around the pragmatic status of in situ questions has been exposed in Section 12.2.6. There is not enough evidence for the time being of the real status of the *wh*-word in situ, but it would be possible for example to constrain *in-situ-int-cl* to be backgrounded or to be discourse given.

16.2.3 Relative clauses

Exactly like extracted interrogative words have a non-empty QUE set, relative words have a non-empty REL set. A *wh*-word like *où* ('where') can be used as interrogative word or as relative word. Hence, it has the lexical entry described in (16.52).[26]

(16.52) Lexical entry for the *wh*-word *où* ('where')

$$\begin{bmatrix} \text{PHON} & \langle \textit{où} \rangle \\ \text{LOC} & \begin{bmatrix} \text{CAT}|\text{HEAD} & \textit{prep} \\ \text{CONT}|\text{RELS} & \left\langle \begin{bmatrix} \textit{place} \\ \text{ARG0 } \boxed{i} \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{NONLOC} & \begin{bmatrix} \text{QUE } \{\} \\ \text{REL } \{\boxed{i}\} \end{bmatrix} \\ \text{ARG-ST} & \langle\rangle \end{bmatrix}_{\vee}$$

[26]French *où* can also have a temporal interpretation, but I disregard this detail as it is unrelated to my analysis.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

$$\begin{bmatrix} \textsc{phon} & \langle \textit{où} \rangle \\ \textsc{loc} & \begin{bmatrix} \textsc{cat}|\textsc{head} & \textit{prep} \\ \textsc{cont}|\textsc{rels} & \left\langle \begin{bmatrix} \textit{place} \\ \textsc{arg0} \ \boxed{i} \end{bmatrix}, \boxed{1} \begin{bmatrix} \textit{which_q} \\ \textsc{arg0} \ \boxed{i} \end{bmatrix} \right\rangle \end{bmatrix} \\ \textsc{nonloc} & \begin{bmatrix} \textsc{que} & \{\boxed{1}\} \\ \textsc{rel} & \{\} \end{bmatrix} \\ \textsc{arg-st} & \langle \rangle \end{bmatrix}$$

Following Godard (1988), relative words in French are either relative pronouns (e.g. *où* 'where', *lequel* 'which') or complementizers (e.g. *dont* 'of which').[27] Details about her arguments are presented in Section 2.3.1. I adopt Abeillé & Godard's (2007) cross-classification of relative clauses. I assume with them that only relative pronouns, or PP comprising relative pronouns, can serve as fillers, and that complementizers are heads (see also Borsley & Crysmann 2020). Following the type hierarchy of *clause* already presented in Figure 16.11, relative clauses (*rel-cl*) either inherit from *head-comps-structure* and are *comp-rel-cl*; or inherit from *head-filler-structure* and are *wh-rel-cl*.

Relative clauses are headed by a verbal category – i.e. either a *verb* or a *comp*(*lementizer*), see Figure 16.2.[28] Relative clauses have an empty SLASH set, because extractions out of relative clauses are not allowed in French; and an empty REL set for the same reason.

(16.53) $$\textit{rel-cl} \rightarrow \begin{bmatrix} \textsc{head} & \begin{bmatrix} \textit{verbal} \\ \textsc{mod} & \begin{bmatrix} \textsc{head} & \textit{noun} \\ \textsc{spr} & \langle \rangle \end{bmatrix} \end{bmatrix} \\ \textsc{slash} & \{\} \\ \textsc{rel} & \{\} \end{bmatrix}$$

Relative clauses modify an NP.[29] We also follow Kuno's (1976) claim that the extractions in relative clauses are a topicalization. Relative pronouns and complementizers do not have an information structure status in Song's (2017) model. The

[27] Contrary to Sag (1997), who analyses the relativizer *that* as a relative pronoun, homonymous with the complementizer *that*.

[28] I do not discuss here gapless and verbless relatives in French. See Bîlbîie & Laurens (2010) for a presentation and discussion of verbless relative clauses and Abeillé & Godard (2007) for a presentation and HPSG analysis of gapless relative clauses.

[29] Jackendoff (1977) proposes that restrictive relative clauses attach to N′ while non-restrictive relative clauses attach to NP. My analysis is compatible with this proposal, if the value of SPR is left unconstrained in (16.53). However, it would then be necessary to explain how restrictive relative clauses can attach to coordinated nouns (Kiss 2005: 293):

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

relative phrase is therefore not the topic of the relative clause (contra Bresnan & Mchombo 1987 a.o.). Furthermore, not all languages have relative phrases to introduce relative clauses and endorse the topic function. Rather, the antecedent is the Topic of the relative clause. That the antecedent is a topic with respect to the relative clause is a semantic contribution of the relative clause (via C-CONT). The following constraint can then be added to the French fragment:[30]

(16.54) *rel-cl* →
$$\begin{bmatrix} \text{HEAD}|\text{MOD}|\text{INDEX} & \boxed{i} \\ \text{CONT}|\text{CLAUSE-KEY} & \boxed{e} \\ \text{C-CONT}|\text{ICONS} & \left\langle \begin{bmatrix} \textit{topic} & \\ \text{TARGET} & \boxed{i} \\ \text{CLAUSE} & \boxed{e} \end{bmatrix} \right\rangle \end{bmatrix}$$

16.2.3.1 *comp-rel-cl*

Qui ('who') relative clauses are extractions of the subject (regardless of animacy); *que* ('that') relative clauses are extractions of the object; and both *qui* and *que* are complementizers. Complementizers select an S complement. The complementizer *qui* is a variant of the complementizer *que* used whenever the S complement has a gapped subject. It follows that, in long distance dependencies, *qui* is used immediately before the S containing the missing subject, and not as the head of the relative clause, see example (16.55). This alternation is known as the *que-qui* rule (see a.o. Pesetsky 1982, Koopman & Sportiche 2014).

(16.55) a. Je veux [que Daniel vienne]$_{\text{comp}}$.
I want that$_{que}$ Daniel comes
'I want Daniel to come.'

(i) la femme et l' enfant [dont Nicole a parlé hier _]
the woman and the child of.which Nicole has talked yesterday
'the woman and the child that Nicole talked about yesterday'

[30]The constraint in (16.54) differs from a similar constraint proposed by Song (2017: 182) because he assumes that all relatives are *filler-head-str*. In (16.54), the antecedent, and not the filler, is the topic of the relative clause. (16.54) is also more compatible with the analysis of relative clauses without a gap in non-standard French, in which the antecedent is the topic (Abeillé & Godard 2007):

(i) Vous avez des feux [qu' il faut appeler les pompiers tout de suite]. (Deulofeu 1981; cited by Abeillé & Godard 2007: 38)
you have some fires that it must call.INF the firemen all at now
'There are some fires that one needs to call the firemen immediately.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

b. l' homme [que je veux [qui _ vienne]$_{comp}$]$_{RC}$ (Melis 1988: 194)
the man that$_{que}$ I want that$_{qui}$ comes
'the man who I want to come' (i.e., I want that man to come)

The two lexical entries for *que* and complementizer *qui* are directly borrowed from Abeillé & Godard (2007: 50). The complement S must be finite (see Section 2.3.1).

(16.56) a. Lexical entry for *que*:

$$\begin{bmatrix} \text{PHON} & \langle \textit{que} \rangle \\ \text{SYNSEM|LOC|CAT} & \begin{bmatrix} \text{HEAD} & \textit{comp} \\ \text{MARKING} & \textit{que} \\ \text{COMPS} & \left\langle \begin{bmatrix} \text{VFORM} & \textit{finite} \\ \text{SUBJ} & \langle\rangle \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

b. Lexical entry for complementizer *qui*:

$$\begin{bmatrix} \text{PHON} & \langle \textit{qui} \rangle \\ \text{SYNSEM|LOC|CAT} & \begin{bmatrix} \text{HEAD} & \textit{comp} \\ \text{MARKING} & \textit{que} \\ \text{COMPS} & \left\langle \begin{bmatrix} \text{VFORM} & \textit{finite} \\ \text{SUBJ} & \langle [\textit{gap}] \rangle \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

Notice the presence of a syntactic feature MARKING, defined for complementizers, and prepositions (also possibly nouns, see a.o. Sportiche 1998: 159; I come back to this issue in Section 17.1). The value of MARKING is an object of type *marking*, whose hierarchy is given in Figure 16.15. Complementizers may have a MARKING *que* or *dont*. Prepositions have a MARKING value matching their form (e.g. *de*, *sur*).

The MARKING for PPs ensures that the right preposition is selected if the PP is a complement; ensures the use of the right clitic for *à*-PP (*lui* for dative, *y* for locative); and also ensures that *dont* is used to relativize exclusively a *de*-PP. Hence, the lexical entry for *dont* is (16.57).

(16.57) Lexical entry for *dont*:

$$\begin{bmatrix} \text{PHON} & \langle \textit{dont} \rangle \\ \text{SYNSEM|LOC|CAT} & \begin{bmatrix} \text{HEAD} & \textit{comp} \\ \text{MARKING} & \textit{dont} \\ \text{COMPS} & \left\langle \text{S} \begin{bmatrix} \text{SLASH} & \left\{ \begin{bmatrix} \text{MARKING} & \textit{de} \\ \text{SUBJ} & \langle\rangle \end{bmatrix} \right\} \end{bmatrix} \right\rangle \end{bmatrix} \end{bmatrix}$$

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.15: Type hierarchy of *marking*

In the standard relative clauses mentioned so far, the complementizers take as complement an S with a non-empty SLASH set.[31] The gap is coindexed with the antecedent of the relative clause. The whole relative clause is monoclausal, the main event being the event of the main verb (hence of the non-head daughter). This leads to the definition of *comp-rel-cl* in (16.58). Notice that this constraint overwrites the default SLASH Amalgamation Principle (16.40), because the mother node does not inherit from the SLASH values of its daughters, even though *comp-rel-cl* is an instance of *head-comps-str*.[32] Furthermore, because *rel-cl* is constrained from having an empty SLASH set in French, the constraint means that

[31]But notice that the lexical entries for *que/qui* in (16.56) can take complements with empty SLASH sets. This is necessary for two reasons: (i) they can introduce a gapless clause as complement of a verb (e.g. *dire* 'say'); and (ii) in non-standard French, *que/qui* relative clauses can be gapless (see fn. 30). Furthermore, in non-standard French, the gap in the *que/qui* relative clause may not be an NP:

(i) J' ai besoin du livre.
I have need of.the book
'I need the book.'

(ii) le livre dont j' ai besoin (standard French)
the book of.which I have need
'the book I need'

(iii) le livre que j' ai besoin (non-standard French)
the book that I have need
'the book I need'

[32]Other kinds of *head-comps-str* are *noncomp-comps-structure* or *sent-comps*. The type *noncomp-comps-structure* is defined as [HEAD *non-comp*]. The type *sent-comps*, for sentential complements introduced by a complementizer, is defined as [MOD *none*].

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the S complement of the complementizer has necessarily only one element in its SLASH set in French.[33]

(16.58) *comp-rel-cl* →
$$\begin{bmatrix} \text{CLAUSE-KEY} & \boxed{e} \\ \text{SLASH} & \boxed{1} \\ \text{HEAD-DTR} & \begin{bmatrix} \text{HEAD} & \begin{bmatrix} \textit{comp} \\ \text{MOD} & \begin{bmatrix} \text{INDEX} & \boxed{i} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{NHEAD-DTRS} & \left\langle \begin{bmatrix} \text{LOC}|\text{CLAUSE-KEY} & \boxed{e} \\ \text{NON-LOC}|\text{SLASH} & \left\{ \begin{bmatrix} \text{INDEX} & \boxed{i} \end{bmatrix} \right\} \cup \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

Figure 16.16 on page 433 is an illustration of the relative clause introduced by a complementizer in (16.59).

(16.59) mes collègues$_i$ [que l' innovation enthousiasme $_{-i}$]
my colleagues that the innovation excites
'my colleagues that the innovation excites'

16.2.3.2 *wh-rel-cl*

I will assume that fillers in relative clauses must be PPs: subjects and objects are extracted with a complementizer, and pied-piping of an NP is not allowed in French, as illustrated in (16.60).[34]

(16.60) a. the people who live in Purus, [the majority of whom] are poor[35]
b. ?? les habitants de Purús, [la majorité desquels] sont
the inhabitants of Purus the majority of.the.which are
pauvres
poor

The non-local feature REL of the filler is coindexed with the antecedent of the relative clause. The relative clause is then headed by the verb.

[33] Abeillé & Godard (2007) assume that *dont* in standard French takes a finite complement, and that *comp-rel-cl* hence always imply a finite complement. But infinite *dont*-CPs seem at least marginally acceptable (see Section 2.3.1), so I see no need to rule them out.

The rule in (16.58) implies that the non-head daughter has a non-empty SLASH set. To account for non-standard relative clauses, a disjunction is probably necessary: either the non-head daughter has an empty SLASH set and has then [MARKING *que*] (not compatible with *dont*), or (16.58) applies.

[34] But see a discussion of some exceptions in Section 11.1.

[35] https://www.theguardian.com/environment/andes-to-the-amazon/2013/may/24/peru-amazon-rainforest, last access 25/07/2020

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.16: Simplified tree for *mes collègues* [*que*$_i$ *l'innovation enthousiasme* $_{}_i$] ('my colleagues that the innovation excites')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.61) *wh-rel-cl* →
$$\begin{bmatrix} \textsc{head-dtr} & \begin{bmatrix} \textsc{head} & \begin{bmatrix} \textit{verb} & \\ \textsc{mod} & [\textsc{index}\ \boxed{i}] \end{bmatrix} \end{bmatrix} \\ \textsc{filler-dtr} & \begin{bmatrix} \textsc{head} & \textit{prep} \\ \textsc{rel} & \{\boxed{i}\} \end{bmatrix} \end{bmatrix}$$

Figure 16.17 on page 435 is an illustration of the relative clauses introduced by a filler in (16.48). Notice that *qui* ('who') is in this case not the complementizer, but a relative pronoun that is used only as a complement of prepositions.[36] In accordance with the NONLOC Amalgamation Principle (16.41), the value of REL of the relative pronoun is percolated to the maximal projection of the filler.

(16.62) Gaetan, [[de l' anniversaire de qui]$_i$ tu parles $_{-i}$]
Gaetan of the birthday of who you talk
'Gaetan, whose birthday you are talking about'

16.2.4 *C'est*-clefts

In my analysis, I will consider separately two kinds of *c'est*-clefts, which both involve a focalization of the pivot. I leave aside presentationals introduced by *c'est* or *il y a* (see Karssenberg & Lahousse 2018). The first kind of *c'est*-cleft is the one usually considered in the French literature (Doetjes et al. 2004). It has a *que*-clause, similar to the *that*-clause in English *it*-clefts. An analysis of these *c'est*-clefts has already been published in Winckel & Abeillé (2020).

I assume the entry for *être* in (16.63), that takes (expletive) *ce* as a subject and two complements: the pivot, which can be of any category; and the *que*-clause with a gap coindexed with the pivot.[37] The pivot receives a focus interpretation, and the whole *c'est*-cleft is referred to as one single semantic clause (the main event is the event denoted by the finite verb of the *que*-clause).

[36] There are hence four versions of *qui* ('who'): the interrogative *qui* extracted, the interrogative *qui* in situ (16.46), the complementizer *qui* and the relative pronoun *qui*.

[37] It follows from (16.63) that colloquial French should accept *que*-clauses in *c'est*-clefts like (ii) in which the gap does not correspond to an NP (see fn. 31 on page 431):

(i) C' est ce livre dont j' ai besoin. (standard French)
it is the book of.which I have need
'It's the book that I need.'

(ii) C' est ce livre que j' ai besoin. (non-standard French)
it is the book that I have need
'It's the book that I need.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.17: Simplified tree for *Gaetan,* [[*de l'anniversaire de qui*]$_i$ *tu parles* $_{}_i$] ('Gaetan, whose birthday you are talking about')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.63) *être*[1] in *c'est*-cleft:

$$\begin{bmatrix} \text{LOC|CLAUSE-KEY} & \boxed{1} \\ \text{NONLOC|SLASH} & \boxed{2} \cup \boxed{3} \\ \text{ARG-ST} & \left\langle \text{NP}[ce], \begin{bmatrix} \text{LOC} & \boxed{4} \begin{bmatrix} \text{INDEX} & \boxed{5} \\ \text{ICONS-KEY} & \begin{bmatrix} \textit{focus} & \\ \text{TARGET} & \boxed{5} \\ \text{CLAUSE} & \boxed{1} \end{bmatrix} \end{bmatrix} \\ \text{SLASH} & \boxed{2} \end{bmatrix}, \text{S} \begin{bmatrix} \text{MARKING} & \textit{que} \\ \text{CLAUSE-KEY} & \boxed{1} \\ \text{SLASH} & \{\boxed{4}\} \cup \boxed{3} \end{bmatrix} \right\rangle \end{bmatrix}$$

The lexical entry in (16.63) discards the default Slash Amalgamation Principle (16.40): the verb inherits the SLASH information of the pivot and the SLASH information of the *que*-clause that is not coindexed with the pivot. This enables extraction out of the *que*-clause (see discussion in Section 15.3, and (15.15) for an attested example). Extraction out of the pivot is allowed as well:[38]

(16.64) a. un élève [dont$_i$ [c' est toujours [le père $__i$]$_j$ que je vois $__j$
a pupil of.which it is always the father that I see
aux réunions]] (Winckel & Abeillé 2020)
at.the meetings
'a pupil of which it is always the father that I see at the meetings'

b. les enfants [dont$_i$ [c' est [les parents $__i$]$_j$ qui $__j$ vous
the children of.which it is the parents who you.ACC
ont repérée]]
have spotted
'the children of whom it is the parents who spotted you' (i.e. the parents of this child spotted you)

Notice that the *que*-clause can be elided. Furthermore, at least in colloquial French, the whole pivot can be extracted, like in (16.65a). Bresnan & Mchombo (1987) also give example (16.65b) for English that they judge acceptable.

(16.65) a. Où$_i$ [c' est $__i$ qu' j' ai mis mon flingue $__i$]? (title of a song
where it is that I have put my gun
by Renaud, 1980)
'Where did I leave my gun?'

b. Who$_i$ [it was $__i$ that Marilyn suspected $__i$]? (Bresnan & Mchombo 1987: 759)

[38]Example (16.64b) from http://mysticlolly.eklablog.com/la-maitresse-a-une-vie-a45200461, last access 03/08/2020

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The extractions in (16.65) are possible because the pivot and the interrogative filler are both focus. There is therefore no discourse clash. However, a relativization is not possible in this configuration. This contrast with interrogatives is noted by Bresnan & Mchombo (1987: 759) for English also.

(16.66) a. * the person who$_i$ [it was $__i$ that Marilyn suspected $__i$] (Bresnan & Mchombo 1987: 759)

b. * Marine, dont [c' est $__i$ que je me méfiais]
Marine of.which it was that I REFL distrusted
'Marine, who it was that I did not trust' (i.e. Marine, it was her that I did not trust)

The contrast can be straightforwardly accounted for by the analysis of relative clauses and *c'est*-clefts sketched above. The clefted pivot should be focus (constrained by the element in the SLASH list) with respect to the semantic head, or CLAUSE-KEY, of the clause (*suspected/méfiait*), but the antecedent of the relative clause is constrained to be *topic* with respect to the semantic head of the relative (which is again *suspected/méfiait*). This results in a discourse clash and the sentence is unacceptable.[39]

The *que*-clause in (16.63) is not a relative clause, but a sentential complement with a gap. Indeed, relative clauses have an empty SLASH set and therefore cannot match the description of the selected complement. The fact that the *que*-clause is a sentential complement could explain why extraction out of the *que*-clause is allowed, contrary to extraction out of relative clauses. Cross-linguistically, the sentential complement in *it*-clefts does not always have the same syntactic properties as relative clauses. For example, in Martinique Creole, relative clauses have an optional post-clausal article *a*, while sentential complements in *it*-clefts do not (Stéphane Térosier, p.c.):

(16.67) a. jardinié a man wè (a)
gardner DET 1SG see DET
'the gardner that I saw'

b. Sé jardinié a man wè (*a) (examples from Stéphane Térosier, p.c.)
FOC gardner DET 1SG see DET
'It is the gardner that I saw.'

[39]This case is a further argument in favor of encoding information structure inside LOC, see Section 16.1.3.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The pivot in (16.63) can be of any category, for example a PP as in (16.68a). It may also be an interrogative phrase, at least in colloquial French, like in (16.68b). Figure 16.18 illustrates the structure of (16.68a).

(16.68) a. C' est de Gaetan que je parle.
it is of Gaetan that I talk
'It's Gaetan that I'm talking about.'

b. C' est [avec qui]$_i$ que tu parles $_{-i}$?
it is with who that you talk
'Who are you talking with?'

Figure 16.18: Simplified tree for *C'est de Gaetan que je parle.* ('It's Gaetan that I'm talking about.')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The second kind of *c'est*-cleft always has an NP pivot and the second complement looks a lot like a relative clause. Compare (16.69) with (16.68a).

(16.69) C' est Gaetan de qui je parle.
it is Gaetan of who I talk
'It's Gaetan that I'm talking about.'

These *c'est*-clefts are not really well studied, and for this reason I have to make several assumptions that rely on only very sparse evidence (mostly analysis-internal coherence). Undoubtedly, more work needs to be done on this kind of *c'est*-clefts. First, I will assume that the second complement of such clefts are indeed relatives.

In the corpus studies presented in this work, the only occurrence of an extraction out of a subject in a cleft that is not a presentational was example (8.8a), reproduced in (16.70).

(16.70) C' était lui maintenant, dont [les yeux _] évitaient les yeux de
it was him now of.which the eyes avoided the eyes of
l' autre. (Jean-Christophe : Le Buisson ardent, Romain Rolland,
the other
1911)
'Now it was him whose eyes avoided the other's eyes.'

The pivot in this sentence seems to be contrastive.[40] For this reason, I assume that the pivot is a contrastive topic. Because *contrast-topic* is a subtype of *topic*, this analysis is compatible with the information structure of relative clauses. And because contrastive topics are non-focus, the subextraction in (16.70) does not violate the FBC constraint.

Consequently, I assume the second entry for *être* in (16.71), that takes (expletive) *ce* as a subject and two complements: an NP pivot and a relative clause that modifies an NP coindexed with the pivot. The pivot receives a contrastive topic interpretation, and the whole *c'est*-cleft is referred to as one single clause, as in (16.63).

[40] In the book, this scene, in which Jean-Christophe avoids Ana's glance, is echoing a previous scene, in which Ana was avoiding Jean-Christophe's eyes.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(16.71) *être*[2] in *c'est*-cleft:

$$\begin{bmatrix} \text{LOC}|\text{CLAUSE-KEY} & \boxed{1} \\ \text{NONLOC}|\text{SLASH} & \boxed{2} \\ \text{ARG-ST} & \left\langle \text{NP}[ce], \text{NP}\ \boxed{3}\begin{bmatrix} \text{ICONS-KEY} & \begin{bmatrix} \textit{contrast-topic} \\ \text{TARGET} & \boxed{3} \\ \text{CLAUSE} & \boxed{1} \end{bmatrix} \\ \text{SLASH} & \boxed{2} \end{bmatrix}, \text{S}\begin{bmatrix} \textit{rel-cl} \\ \text{CLAUSE-KEY} & \boxed{1} \\ \text{MOD} & \boxed{3} \end{bmatrix} \right\rangle \end{bmatrix}$$

The lexical entry in (16.71) predicts that extraction out of the pivot is allowed, while extraction out of the relative clause is ruled out (the SLASH set of relative clauses is empty). These predictions need to be corroborated with empirical evidence, but I leave this for future work. Figure 16.19 illustrates the structure of (16.69).

Notice that the *c'est*-cleft in (16.72) can be an instance of both kinds of clefts, and the *que*-clause can be either a sentential complement or a relative clause. This should not be a problem, because each possibility leads in this analysis to a different information structure for the pivot.

(16.72) C' est mes collègues que l' innovation enthousiasme.
it is my colleagues that the innovation excites
'It's my colleagues that the innovation excites.'

16.2.5 Long distance dependencies

On the clausal level, the head's CLAUSE-KEY is identified with its INDEX (Song 2017: 120). This ensures that the whole clause then shares the same CLAUSE-KEY down the tree.

(16.73) *clause* →

$$\begin{bmatrix} \text{HEAD-DTR} & \begin{bmatrix} \text{HOOK} & \begin{bmatrix} \text{INDEX} & \boxed{e} \\ \text{CLAUSE-KEY} & \boxed{e} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

To simplify, I will assume that sentential and infinitival complements and subjects are licensed for some verbs, and that this is part of their lexical entry.[41]

For example, the lexical entry for bridge verbs like *suppose* ('to suppose') subcategorizes for a sentential complement, and the lexical entry for experiencer object verbs like *agacer* ('annoy') subcategorizes for a sentential subject.

(16.74) a. I suppose [that you agree with me].

[41]This is subject to further restrictions that are not relevant to my analysis, see Pollard & Sag (1994: 151–156) and Webelhuth (2012) a.o. for more details.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 16.19: Simplified tree for *C'est Gaetan de qui je parle.* ('It's Gaetan that I'm talking about.')

b. Je suppose [que tu es d' accord avec moi].
I suppose that you are of agreement with me
'I suppose that you agree with me.'

(16.75) a. [That Kim was late] annoyed Lee.

b. [Que Kim soit en retard] agaçait terriblement Lee.
that Kim be.SUBJ in late annoyed awfully Lee
'That Kim was late annoyed Lee awfully.'

When sentential complements and sentential subjects are finite, the lexical entry furthermore specifies the discourse relation between the embedded clause

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

and the embedding clause through an *info-str* object in ICONS. The information structure may be underspecified. The CLAUSE-KEY of the embedded clause and the CLAUSE-KEY of the embedding verb are not structure-shared: this results in two different clauses.[42]

See as an example the lexical entry for *supposer* ('to suppose') in (16.76), that licenses (16.74b). From now on, I use the shortcut *lnis* for *list of non-is* (cf. Figure 16.8).

(16.76) Lexical entry for *supposer* ('to suppose'):

$$\begin{bmatrix} \text{PHON} & \langle \textit{suppos-} \rangle \\ \text{CONT} & \begin{bmatrix} \text{HOOK} & \begin{bmatrix} \text{CLAUSE-KEY} & \boxed{e1} \\ \text{ICONS-KEY} & \begin{bmatrix} \textit{info-str} & \\ \text{TARGET} & \boxed{e2} \\ \text{CLAUSE} & \boxed{e1} \end{bmatrix} \\ \text{INDEX} & \boxed{e2} \end{bmatrix} \\ \text{ICONS} & \left\langle \begin{bmatrix} \textit{info-str} & \\ \text{TARGET} & \boxed{e3} \\ \text{CLAUSE} & \boxed{e2} \end{bmatrix} \right\rangle \oplus \textit{lnis} \end{bmatrix} \\ \text{ARG-ST} & \left\langle \text{NP}\left[\text{CLAUSE-KEY } \boxed{e1}\right], \text{S}\begin{bmatrix} \text{MARKING} & \textit{que} \\ \text{MOD} & \textit{none} \\ \text{INDEX} & \boxed{e3} \end{bmatrix} \right\rangle \end{bmatrix}$$

Notice that the verb in (16.76) selects for a *que*-clause (therefore finite) that is not a modifier (and can thus not be a relative clause).

In general, any NP, PP, infinitival complement or infinitival subject is defined by the lexical entry of the verb that selects for it as sharing its CLAUSE-KEY value with its own.

Extractions out of sentential and infinitival complements are handled straightforwardly by the same mechanisms that account for extraction in general. The content of the SLASH set of the sentential or infinitival complement is inherited through ARG-ST by the embedding verb. It can then lead to interrogatives, relative clauses or *it*-clefts.

[42]Except for raising and control verbs, which co-index their CLAUSE-KEY with the INDEX (or CLAUSE-KEY) of the embedded clause, see Song (2017: 141). The *être* in *c'est*-clefts do the same, as explained previously.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

17 Extractions out of subject NPs

17.1 Noun dependents in French

So far, we considered all *de*-dependents as *de*-PPs, but there is a long tradition in French linguistics of making a distinction between a preposition *de* that builds *de*-PPs and a weak head *de* that builds genitive *de*-NPs. This distinction mostly originates in the distinction between extractable *de*-dependents and non-extractable *de*-dependents of nouns. Sportiche (1981) shows that *de*-PPs that denote a local origin cannot be extracted out of an NP, see (17.1a). Furthermore, the presence of a second *de*-dependent may block the extraction of a *de*-dependent that is otherwise acceptable, see (17.1b).

(17.1) a. * la prison, de laquelle le transfert s' effectua avec
the jail of which the transportation REFL performed with
du retard (adapted from Sportiche 1981: 225)
some delay
'the jail, from which the transportation has been performed with some delay'

b. La jeune femme dont le portrait (*de Corot) est à la
the young woman of.which the portrait of Corot is at the
fondation Barnes est inconnue. (Godard & Sag 1996: 63)
foundation Barnes is unknown
'The young woman whose portrait (by Corot) is at the Barnes foundation is unknown.'

This latter problem with multiple *de*-dependents has been analysed either in terms of a hierarchy of semantic roles (Sag & Godard 1994, Godard & Sag 1996), or as a contrast between individual and property denoting interpretations (Kolliakou 1999, Mensching et al. 2018). It has also been explained syntactically as a distinction between extractable arguments *de*-NPs and non-extractable adjuncts *de*-PPs (Kolliakou 1999). I have previously argued that the problem of multiple *de*-dependents of nouns can be better analyzed in semantic terms than in syntactic terms (Machicao y Priemer & Winckel 2015).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Consequently, I continue to consider all *de* as prepositions and all *de*-dependents of nouns as PPs with [MARKING *de*], as also suggested by Milner (1978: 246–251) and Abeillé, Bonami, et al. (2006). I also assume that these *de*-dependents are all complements (or at least elements of the ARG-ST list of nouns), even though the distinction between arguments and adjuncts is even more blurry for dependents of nouns than for dependents of verbs.

Prepositions in French (and all Romance languages) cannot be stranded, see (17.2a). Extractions out of the *de*-PP are possible, see (17.2b), but extractions out of other PPs seem very marginal (but see example (17.2c)). The NP complement of some prepositions can be left out (17.2d). The NP complement of other prepositions cannot: this is the case for *de*, as illustrated by (17.2e).

(17.2) a. * Qui$_i$ as - tu parlé avec / de $_{-i}$?
who have you spoken with of
'Who did you speak with / about?'

b. cette déclaration, dont$_i$ je me suis assuré [de la
this statement of.which I REFL have ensured of the
vérité $_{-i}$] (Chateaubriand, Mémoires d'outre-tombe, 1ère partie,
truth
livre 4, 1848)
'this statement, whose truth I verified'

c. ? l' eau d' irrigation dont$_i$ il plaide [pour la
the water of irrigation of.which he argues for the
rationalisation [de l' usage $_{-i}$]][1]
rationalization of the use
'the irrigation water, whose usage he argues for the
rationalization of'

d. L' ampli de guitare fait des grésillements quand je joue
the amp of guitar makes some crackles when I play
avec.
with
'The guitar amp crackles when I play with (it).'

e. * J' éteinds la musique quand j' ai pas envie de.
I switch.off the music when I have not desire of
'I switch off the music when I don't fancy (it).'

[1]source: https://www.djazairess.com/fr/lesoirdalgerie/208772, last access 05/08/2020

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Therefore, the ARG-ST list of prepositions is constrained to only contain objects of type *non-gap* (see Figure 16.3). But *de* itself has only *canonical* objects in its ARG-ST and its SLASH set is not constrained (it may be non-empty). The other prepositions are defined as having an empty SLASH set.[2]

To account for the semantics of prepositions, we distinguish meaningful prepositions like (17.3a) from meaningless prepositions like (17.3b), and assume that many prepositions can be either meaningful or meaningless and have then two different lexical entries (or equivalently, have a lexical entry with a disjunction).

(17.3) a. Susanne travaille sur son balcon.
Susanne works on her balcony
'Susanne is working on her balcony.'

b. Susanne travaille sur un nouveau projet.
Susanne works on a new project
'Susanne is working on a new project.'

The lexical entry of meaningful prepositions has a non-empty RELS list, while the lexical entry of meaningless prepositions do not introduce any EP in the RELS list.

Meaningful prepositions have their own INDEX value (probably an event) and their own ICONS-KEY, like any word that introduces an EP.

Meaningless prepositions structure-share their INDEX value with the INDEX value of the NP they subcategorize for. I also assume that all meaningless prepositions that take a complement structure-share their ICONS-KEY value with the ICONS-KEY value of their complement. This latter point is somewhat contradictory with the underlying idea that semantically empty elements do not introduce an object of type *info-str* into the ICONS list of the utterance. But, because prepositions have the same INDEX value as their complement, and by virtue of the Discourse-clash Avoidance Principle (16.35) on page 415, they must have the same ICONS-KEY value. Consequently, the prepositions do not really introduce a new element into the ICONS list of the utterance, but merely treat the NP as the semantic head of the PP.

I assume that *de* is a meaningless preposition.[3] It has the lexical entry in (17.4).

[2]In order for the grammar to account for marginal cases like (17.2c), the SLASH set of all prepositions could be left unconstrained.

[3]It could be useful to assume a separate lexical entry for *de* expressing possessive or origin, and consider it as meaningful. But this has no impact on the formalization of the FBC constraint I propose. For the sake of simplicity, I assume only one lexical entry for *de*.

Furthermore, Abeillé, Bonami, et al. (2006) define two usages of the preposition *de*, one in

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(17.4) Lexical entry for *de* ('of'):

$$\begin{bmatrix} \text{PHON} & \langle de \rangle \\ \text{CAT} & \begin{bmatrix} \text{HEAD} & prep \\ \text{MARKING} & de \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{INDEX} & \boxed{i} \\ \text{ICONS-KEY} & \boxed{1} \\ \text{RELS} & \langle\rangle \end{bmatrix} \\ \text{ARG-ST} & \left\langle \begin{bmatrix} canonical & \\ \text{INDEX} & \boxed{i} \\ \text{ICONS-KEY} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

For a preposition like *sur* ('on') that can be used either as a meaningful preposition like in (17.3a) or as a meaningless preposition like in (17.3b), we can define the lexical entries in (17.5) and (17.6), which summarizes the assumptions made so far.

(17.5) Lexical entry for meaningful *sur* ('on')

$$\begin{bmatrix} \text{PHON} & \langle sur \rangle \\ \text{CAT} & \begin{bmatrix} \text{HEAD} & prep \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{HOOK} & \begin{bmatrix} \text{INDEX} & index \\ \text{ICONS-KEY} & info\text{-}str \end{bmatrix} \\ \text{RELS} & \left\langle \begin{bmatrix} ON_REL & \\ \text{ARG0} & \boxed{i} \end{bmatrix} \right\rangle \end{bmatrix} \\ \text{SLASH} & \{\} \\ \text{ARG-ST} & \left\langle \begin{bmatrix} non\text{-}gap & \\ \text{INDEX} & \boxed{i} \\ \text{ICONS-KEY} & info\text{-}str \end{bmatrix} \right\rangle \end{bmatrix}$$

which it is the head, and one in which it is a marker (i.e. in *beaucoup de*, 'many'). I consider here only the use as a head of a PP that is the one I investigated in the empirical parts.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(17.6) Lexical entry for meaningless *sur* ('on')

$$\begin{bmatrix} \text{PHON} & \langle \textit{sur} \rangle \\ \text{CAT} & \begin{bmatrix} \text{HEAD} & \textit{prep} \end{bmatrix} \\ \text{CONT} & \begin{bmatrix} \text{HOOK} & \begin{bmatrix} \text{INDEX} & \boxed{i} \\ \text{ICONS-KEY} & \boxed{1} \end{bmatrix} \\ \text{RELS} & \langle\rangle \end{bmatrix} \\ \text{SLASH} & \{\} \\ \text{ARG-ST} & \left\langle \begin{bmatrix} \textit{non-gap} \\ \text{INDEX} & \boxed{i} \\ \text{ICONS-KEY} & \boxed{1} \end{bmatrix} \right\rangle \end{bmatrix}$$

The extraction of the PP-dependent of a noun out of NPs happens in a straightforward manner through the mechanisms of extraction explained earlier. Through the NONLOC Amalgamation Principle (16.41), the verb that selects an NP with a SLASH element inherits this element. There is no difference between extraction of a PP-dependent of a verb and subextraction of a PP-dependent of a noun out of an NP.

17.2 The subject as Designated Topic

One of the main claims of this book is that the phenomenon usually called "subject island" is actually the result of a discourse clash: Prototypically, the subject is the Topic of the clause, and focalizing part of the subject leads to the contradiction that the subject NP is on the same time stated as part of the Common Ground and treated as the main information of the sentence (contra Grice's maxim that a sentence should be informative) or even as unknown information (internal contradiction).

There have been several HPSG proposals in order to account for the fact that the subject is the preferred Topic of the clause. Webelhuth (2007) has a function "more thematic than" that ensures a hierarchy of thematicity (subject > direct object > oblique object). I adopt here Bildhauer & Cook's (2010) notion "Designated Topic", which is based on the verb's preference for a certain argument to be the Topic (see also Müller, Bildhauer & Cook 2020: chapter 5.3.3.2). For example, German *herrschen* ('to reign') in its existential meaning preferably has the locative as its Topic.

(17.7) Weiterhin Hochbetrieb herrscht am Innsbrucker Eisoval.
further high.traffic reigns at.the Innsbruck icerink

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(Bildhauer & Cook 2010: 72)
'It's still all go at the Innsbruck icerink.'

In Bildhauer & Cook's proposal, D(ESIGNATED)T(OPIC) is a head feature of verbs with a list as value, either empty or containing at most one *synsem* object. This object is structure-shared with one element of the ARG-ST list. For verbs with the subject as default Topic, the lexical entry is then the following:

(17.8) Lexical entry for a verb with a subject default Topic:

$$\begin{bmatrix} \text{SYNSEM|LOC|CAT} & \begin{bmatrix} \text{HEAD|DT} & \langle \boxed{1} \rangle \\ \text{SUBJ} & \langle \boxed{1} \rangle \end{bmatrix} \\ \text{ARG-ST} & \langle \boxed{1} \rangle \oplus \textit{list} \end{bmatrix}$$

The Designated Topic is realized as Topic in sentences that "involv[e] a Topic-Comment structure plus an assessment of the extent to which the Comment holds of the Topic" (Bildhauer & Cook 2010: 73). In their model, these sentences are labeled as *a(ssessment)-topic-comment*, which is itself a subtype of *topic-comment*. Song's (2017) model also provides a hierarchy of the information structure form of sentences. Its supertype is called *sform* (*sentential form*) and the hierarchy is reproduced in Figure 17.1. Phrases inherit from both the appropriate *headed-structure* and the appropriate *sform*.[4]

Figure 17.1: Type hierarchy of *sform* (Song 2017: 125)

I assume that Bildhauer & Cook's (2010) *a-topic-comment* can be directly translated into Song's (2017) *non-frame-setting*, and propose the following constraint:

[4]Separate features ensure that the whole clause keeps the same *sform*. These features are not relevant for my analysis, but see Song (2017: Section 7) for a detailed explanation.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(17.9)
$$\begin{bmatrix} \textit{non-frame-setting} & \\ \text{CAT|HEAD|DT} & \langle [\text{INDEX } \boxed{i}] \rangle \\ \text{CONT|HOOK} & [\text{CLAUSE-KEY } \boxed{e}] \end{bmatrix} \Rightarrow \begin{bmatrix} \text{C-CONT|ICONS} & \left\langle \begin{bmatrix} \textit{aboutness-topic} & \\ \text{TARGET} & \boxed{i} \\ \text{CLAUSE} & \boxed{e} \end{bmatrix} \right\rangle \end{bmatrix}$$

The implication in (17.9) is that if an AVM has the type *non-frame-setting*, then the Designated Topic is the Topic of the clause (i.e. an appropriate TARGET-CLAUSE pair with the status *aboutness-topic* is introduced in the construction).[5]

17.3 Formalization of the Focus-Background Conflict constraint in HPSG

Notice that in Song's terminology, "Background" applies to the elements in the utterance that are neither Topic nor Focus (Figure 16.8). In my terminology so far, and in the formulation of the FBC constraint in particular, I assumed that the Topic belongs to the Background (Section 4.1). In order to match Song's terminology, the constraint (15.1) can be reformulated as: "A focused element should not be part of a non-focus constituent."

An other way to formulate this is to say that all dependents of a non-focus word should be non-focus as well, which is exactly the meaning of the following (simplified) formalization:

(17.10) **Focus Background Conflict constraint (simplified)**

$$\begin{bmatrix} \textit{word} & \\ \text{SYNSEM|LOC} & \begin{bmatrix} \text{CAT|HEAD} & \textit{non-verbal} \\ \text{CONT|HOOK} & \begin{bmatrix} \text{ICONS-KEY} & \textit{non-focus} \\ \text{CLAUSE-KEY} & \boxed{e} \end{bmatrix} \end{bmatrix} \end{bmatrix} \Rightarrow \begin{bmatrix} \text{ARG-STR} & \left\langle \ldots \begin{bmatrix} \textit{non-focus} & \\ \text{CLAUSE KEY} & \boxed{e} \end{bmatrix} \ldots \right\rangle \end{bmatrix}$$

The implication in (17.10) should be understood as: all non-verbal word that has a non-focus status with respect to a certain clause can only subcategorize for elements that are also non-focus with respect to this same clause.

This applies to all parts of speech except *verbal*: As explained in Section 15, a verbal element can have a non-focus status without constraining its arguments to have a non-focus status as well. Complementizers, on the other hand, are semantically empty, and are therefore not affected by the FBC constraint.

[5]Recall that the Discourse-clash Avoidance Principle (16.35) ensures that an element can have only one discourse status with respect to a clause. The *info-str* element introduced by the designated topic must by consequence match the one introduced by the construction *non-frame-setting*, except if the element has a discourse status with respect to two or more different clauses.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

A non-focus noun, for example a topic subject NP as in (17.11), can only have non-focus complements, otherwise it would violate (17.10). This is illustrated by Figure 17.2.

(17.11) # [l' originalité [de cette innovation]$_F$]$_T$
the uniqueness of this innovation
'the uniqueness of this innovation'

Figure 17.2: Simplified tree for the infelicitous NP "l' originalité [de cette innovation]$_F$]$_T$" ('the uniqueness of this innovation')

17.3.1 Implementing the FBC constraint

Now, the formalization in (17.10) is sufficient for my demonstration, but would be insufficient for a direct implementation. Technically, it is indeed necessary to make sure that the ARG-STR list only contains *info-str* elements that are non-focus with respect to the clause e, but allowing any other *icons* element that is not of the type *info-str*, and also potentially allowing *info-str* elements that are non-focus with respect to an other clause. This point is crudely represented by the use of suspension points in (17.10).

For the reader interested in the technical details of an implementation of the constraint, here is a method in two steps. First, we can define a function `non-focus()` that takes as arguments an event and a list of objects of the type *info-str*:

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(17.12) `non-focus(`$\boxed{1}$`,`$\boxed{2}\begin{bmatrix} \textit{info-str} & \\ \textsc{clause} & \boxed{3} \end{bmatrix}$`|Rest):-`
if $\boxed{1}$ == $\boxed{3}$, then $\boxed{2}\begin{bmatrix}\textit{non-focus}\end{bmatrix}$ and `non-focus(`$\boxed{1}$`,Rest).`
`non-focus(`$\boxed{1}$`,`$\langle\rangle$`).`

The function `non-focus()` checks whether the CLAUSE value of the first *info-str* object of its second argument is identical with its first argument, and if so, constrains the *info-str* object to be *non-focus*. It then recursively checks each element of the list until the end in the same way.

Second, we may reformulate (17.10) as (17.13).

(17.13) **Focus Background Conflict constraint**

$$\begin{bmatrix} \textit{word} & \\ \textsc{synsem|loc} & \begin{bmatrix} \textsc{cat|head} & \textit{non-verbal} \\ \textsc{cont|hook} & \begin{bmatrix} \textsc{icons-key} & \textit{non-focus} \\ \textsc{clause-key} & \boxed{e} \end{bmatrix} \end{bmatrix} \end{bmatrix} \Rightarrow \begin{bmatrix}\textsc{arg-str} & \boxed{1}\end{bmatrix} \wedge \text{non-focus}(\boxed{e},\boxed{1})$$

I will now consider how the FBC constraint interacts with each of the following constructions: interrogatives, *c'est*-clefts and relative clauses.

17.3.2 The FBC constraint in interrogatives

In standard interrogatives with an extraction of the *wh*-word (*standard-wh-inter-cl*), the filler receives a *semantic-focus* interpretation, see (16.50). For a sentence like (17.14), in which there is an extraction out of the subject, the consequence is that the Designated Topic cannot be the topic of the utterance as defined in (17.9). It would otherwise go against the rule in (17.10).

(17.14) [De quelle innovation]$_i$ [l' originalité $__i$] enthousiasme-t-elle mes
of which innovation the uniqueness excites-0-3SG.SBJ.FEM my
collègues?
colleagues
'Of which innovation does the uniqueness excite my colleagues?'

In an extraction out of the subject in an interrogative, the subject cannot be Topic, i.e. either another element is Topic (*frame-setting-topic*) or the clause is *topicless*. For example, Chaves shows that example (17.15) is acceptable in English. In Abeillé et al. (2020), we use a test for topicality in order to show that the clause has an all-focus interpretation, see (17.16).

(17.15) Which problem will [the solution to _] never be found? Chaves 2013: 313

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 17.3: Simplified tree for [*De quelle innovation*]$_i$ [*l' originalité* –$_i$] *enthousiasme-t-elle mes collègues?* ('Of which inovation does the uniqueness excite my colleagues?')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(17.16) a. A solution to this problem will never be found.
b. # Speaking of a solution to this problem, it will never be found.

Figure 17.3 on page 452 illustrates such a case. In this example, the sentence in (17.14) is all-focus, as in (17.15).

On the other hand, if the filler is not a Focus, as in rhetorical questions, then the extraction is felicitous, as in example (11.9) reproduced in (17.17).

(17.17) [De quel pays]$_i$ [la dépense militaire $_{-i}$] dépasse annuellement
of which country the budget military exceeds yearly
mille milliards de dollars [...] ?
thousand billion of dollars
'Of which country does the military budget exceeds yearly 1000 Bn. dollars?'

Notice that the constraint predicts that interrogatives with an extraction out of postverbal subjects in languages in which postverbal subjects are Focus should be more felicitous than extraction out of preverbal subjects. Spanish, for example, is such a language.

As such, the constraint in (17.10) predicts that an interrogative with extraction out of the subject in a long distance dependency is felicitous. A *standard-wh-cl* constrains the filler from bearing the Focus with respect to the main clause (the HEAD-DTR), see (16.50). In this case, the value of the embedded subject's ICONS-KEY|CLAUSE does not match the value of the filler's ICONS-KEY|CLAUSE, and (17.10) is not violated. And indeed, I argued in Section 15.2 that I do not have evidence that the FBC constraint is violated in focalization involving a long distance dependency.

Figure 17.4 on page 454 illustrates the HPSG analysis for an interrogative with long distance dependency in which the filler is a Focus and the subject of the embedded clause a Topic. It does not violate (17.10).

(17.18) [De quelle innovation]$_i$ suppose-t-il [que [l'
of which innovation supposes-0-3SG.SBJ.MASC that the
originalité $_{-i}$] enthousiasme mes collègues] ?
uniqueness excites my colleagues
'Of which innovation does he suppose that the uniqueness excites my colleagues?'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 17.4: Simplified tree for [*De quelle innovation*]$_i$ *suppose-t-il* [*que* [*l'originalité* $-_i$] *enthousiasme mes collègues*]? ('Of which innovation does he suppose that the uniqueness excites my colleagues?')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

17.3.3 The FBC constraint in *c'est*-clefts

The FBC constraint makes the same predictions for *it*-clefts as for interrogatives involving a focalization. Figure 17.5 on page 456 illustrates a case of *c'est*-clefts with an extraction out of a subject. Even though it is an extraction out of a sentential complement, the structure is monoclausal and therefore the subject cannot be Topic, otherwise (17.10) would be violated.

(17.19) C' est [de cette innovation]$_i$ [que [l' originalité $_{-i}$] enthousiasme
it is of this innovation that the uniqueness excites
mes collègues].
my colleagues
'It's of this innovation that the uniqueness excites my colleagues.'

Notice that an interrogative with extraction out of the pivot is expected to be felicitous under the FBC constraint: the pivot is a focus and the *wh*-phrase is a focus as well, therefore there is no discourse clash.

(17.20) a. [Which car]$_i$ is it [the color of $_{-i}$]$_j$ that you loved $_{-j}$ most?
b. [De quelle innovation]$_i$ est - ce [l' originalité $_{-i}$]$_j$ que mes
of which innovation is it the uniqueness that my
collègues apprécient $_{-j}$?
colleagues appreciate
'Of which innovation is it the uniqueness that my colleagues appreciate?'

Extractions out of the *que*-clause, on the other hand, undergo the same constraints as any extraction in a long distance dependency. An interrogative involving an extraction out of the subject would not violate (17.10). Relativizations out of the *que*-clause are expected to be felicitous also.

17.3.4 The FBC constraint in relatives

Finally, the FBC constraint has no impact on relative clauses. Figure 17.6 on page 458 illustrates the relativization out of a Topic subject in a *comp-rel-cl* (with a complementizer). In this case, the slashed element is never realized; its INDEX value is only structure-shared with the INDEX value of the noun modified by the relative clause. The implication in (17.10) constrains the ICONS-KEY value of the slashed element to be *non-focus*, but it is otherwise completely underspecified.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 17.5: Simplified tree for *C'est* [*de cette innovation*]$_i$ [*que* [*l'originalité* –$_i$] *enthousiasme mes collègues*]. ('It's of this innovation that the uniqueness excites my colleagues.')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(17.21) une innovation [dont$_i$ [l' originalité $__i$] enthousiasme mes
an innovation of.which the uniqueness excites my
collègues]
colleagues
'an innovation of which the uniqueness excites my colleagues'

Figure 17.7 on page 459 illustrates the extraction out of the Topic subject of a *wh-rel-cl* (with pronominal filler). In this particular example, the filler is [P + pronoun]. The conditions are not met for (17.10) to constrain the elements of the ARG-ST list in example (17.22), because relative pronouns are informatively empty (Song 2017: 112) and therefore their ICONS-KEY's value is *i-empty*.

(17.22) un avocat [[de qui]$_i$ [l' associé $__i$] aide mon cousin]
a lawyer of who the associate helps my cousin
'a lawyer of whom the associate helps my cousin'

Another case of extraction out of the topic subject of a *wh-rel-cl* is illustrated by Figure 17.8 on page 460. Here, the relative pronoun is embedded in an NP, and the ICONS-KEY value of the filler is constrained by the implication in (17.10) to be *non-focus*. It is otherwise underspecified.

(17.23) Christelle, [[de la soeur de qui]$_i$ [l' arrogance $__i$] rebute mes
Christelle of the sister of who the arrogance repels my
collègues]
colleagues
'Christelle, whose sister's arrogance repels my colleagues'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 17.6: Simplified tree for *une innovation* [*dont*$_i$ [*l'originalité* $-_i$] *enthousiasme mes collègues*] ('an innovation of which the uniqueness excites my colleagues')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 17.7: Simplified tree for *un avocat* [[*de qui*]$_i$ [*l'associé* $-_i$] *aide mon cousin*] ('a lawyer of who the associate helps my cousin')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 17.8: Simplified tree for *Christelle,* [[*de la soeur de qui*]$_i$ [*l'arrogance* $-_i$] *rebute mes collègues*] ('Christelle, whose sister's arrogance repels my colleagues')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

18 Extractions out of infinitival and sentential subjects

Infinitival and sentential subjects are analyzed in a simple manner in HPSG, and there is not much HPSG literature about them. Scholars have been in general more interested by their impersonal variants like (18.1).

(18.1) It was assumed [that the teachers answered all written and oral questions honestly]. (example from COCA cited by Lee 2018: 72)

As previously said in Section 16.2.5, I assume that sentential and infinitival subjects are licensed for some verbs, similarly to sentential and infinitival complements, as is commonly assumed in HPSG. A lexical rule allows NP elements in ARG-ST to be an S or a VP when the element may refer to a situation or an event. The subject of *bark*, for example, cannot be sentential nor infinitival, but the subject of *annoy* can. Sentential subjects are finite (S [MARKING *que*]) and infinitival subjects are non-finite (VP [VFORM *infinitive*]).

In Section 14.2.3, I have argued based – on the results of Experiment 15 and 16 and following Kluender's (2004) proposal – that the effects observed in relativizing out of infinitival subjects can probably be explained best by processing factors. Overall, the experiments show that native speakers do not strongly reject these relativizations. The specificity of the filler, the complexity of the subject and probably many other intervening factors play a role in the fact that some extractions out of verbal subjects are very unnatural, and therefore received degraded acceptability judgments. Sentential subjects and infinitival subjects themselves are not common: in French, they are very rare in the corpora (Abeillé et al. (2019) found only 24 sentential subjects and 99 infinitival subjects in the French Treebank; Berard (2012: 153) finds in her corpora only complex NPs and no sentential or infinitival subject). Sentential subjects are harder to process than sentential complements (Frazier et al. 1988) and seem to be felicitous only under certain pragmatic conditions (according to Miller (2001: 685), English sentential subjects are only felicitous if their content is "discourse-old or inferrable"). My HPSG proposal therefore does not account for these effects and licences extractions out of sentential subjects. Hence, there is no constraint on the SLASH set of sentential and infinitival subjects.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

18.1 Sentential subjects

Erteschik-Shir (1973) has shown that sentential subjects are backgrounded – i.e. *non-focus* – with respect to the main clause (see also later Goldberg 2006). Indeed, Lee (2018) claims that turning the sentential subject into a sentential complement in an impersonal construction like (18.1) is the way to focalize the sentential subject in English.

Hence, the lexical rule which allows NP elements in ARG-ST to be an S [MARKING *que*], also assigns a *non-focus* value to the embedded clause with respect to the embedding clause whenever it is the subject. A verb like *agacer* ('to annoy') may create the lexical entry in (18.2) through this rule.

(18.2) Lexical item for *agacer* ('to annoy') with sentential subject

$$\begin{bmatrix} \text{PHON} & \langle \textit{agac-} \rangle \\ \text{CONT} & \begin{bmatrix} \text{HOOK} & \begin{bmatrix} \text{CLAUSE-KEY} & \boxed{e1} \\ \text{ICONS-KEY} & \begin{bmatrix} \text{TARGET} & \boxed{e2} \\ \text{CLAUSE} & \boxed{e1} \end{bmatrix} \\ \text{INDEX} & \boxed{e2} \end{bmatrix} \\ \text{ICONS} & \left\langle \begin{bmatrix} \textit{non-focus} \\ \text{TARGET} \ \boxed{e3} \\ \text{CLAUSE} \ \boxed{e2} \end{bmatrix} \right\rangle \oplus \textit{lnis} \end{bmatrix} \\ \text{ARG-ST} & \left\langle \text{S} \begin{bmatrix} \text{MARKING} & \textit{que} \\ \text{MOD} & \textit{none} \\ \text{INDEX} & \boxed{e3} \end{bmatrix}, \text{NP}\left[\text{CLAUSE-KEY} \ \boxed{e1}\right] \right\rangle \end{bmatrix}$$

The FBC constraint in (17.10) makes no particular prediction with respect to sentential subjects, because it does not apply to *verbal* heads. Still, extractions out of the sentential subject seem less felicitous in interrogatives and *it*-clefts than in relative clauses. Example (18.3b) is an interrogative with extraction out of the sentential subject of (18.3a).

(18.3) a. [Que Kim parle à Frank] agaçait Lee.
that Kim talked.SUBJ at Frank annoyed Lee
'That Kim talked to Frank annoyed Lee.'

b. * À qui [que Kim parle _] agaçait Lee?
at who that Kim talked.SUBJ annoyed Lee
'Who did that Kim talked to annoy Lee?' (intended: Who did it annoy Lee that Kim talked to?)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The reason why (18.3b) is degraded has probably nothing to do with the FBC constraint. Davies & Dubinsky (2009) argue that such extractions may be difficult because they are a case of center-embedding. Center-embedded structures, although they are grammatical, are very difficult to parse. Fodor et al. (2017) show that typical center-embedded sentences become more acceptable with the right prosody, see example (18.4a) where || indicates that a pause is inserted. It would be interesting to see if similar results can be achieved on sentences like (18.3b). Chaves (2012) shows that it is at least the case for extractions out of subject NPs.

(18.4) a. The elegant woman || that the man I love met || moved to Barcelona. (Fodor et al. 2017: ex. 11)

b. Which book || did a review of || appear in the Times? (Chaves 2012: ex. 56a)

Example (18.5) is a *c'est*-cleft with extraction out of the sentential subject of (18.3a). It is also unacceptable.

(18.5) * C' est à Frank [que [que Kim parle _] agaçait Lee].
it is at Frank that that Kim talked.SUBJ annoyed Lee
'It's Frank that that Kim talked to annoyed Lee.' (intended: It's Frank that it annoyed Lee that Kim talked to.)

In this case, the reason comes probably from a general ban on repetition of the complementizer, that is probably ruled out for processing reasons as well. For example, a sentential subject cannot contain a sentential subject, as in (18.6).

(18.6) a. * [That [that Kim was late] annoyed Lee] is not a secret.

b. * [Que [Que Kim parle à Frank] agaçait Lee] était connu
that that Kim talked.SUBJ at Frank annoyed Lee was known
de tous.
of all
'That that Kim talked to Frank annoyed Lee was known by all.' (intended: It was know by all that it annoyed Lee that Kim talked to Frank)

Therefore, this problem has nothing to do with extraction. It is also not restricted to sentential subjects, as shown by (18.7).

(18.7) ?? I understood [that [that Kim was late] annoyed Lee].

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

18.2 Infinitival subject

Infinitival arguments are defined as VP, hence not as independent clauses as far as information structure is concerned. As explained earlier, they share the value of their CLAUSE-KEY feature with the value of the CLAUSE-KEY feature of the embedding verb, like NP arguments (contrary to sentential complements that build a clause and whose CLAUSE-KEY value is not structure-shared with the one of the embedding verb). Compare the lexical entry (18.2) with the lexical entry (18.8).

(18.8) Lexical entry for *agacer* ('to annoy') with infinitival subject

$$\begin{bmatrix} \text{PHON} & \langle \textit{agac-} \rangle \\ \text{CONT} & \begin{bmatrix} \text{HOOK} & \begin{bmatrix} \text{CLAUSE-KEY} & \boxed{e1} \\ \text{ICONS-KEY} & \begin{bmatrix} \textit{info-str} & \\ \text{TARGET} & \boxed{e2} \\ \text{CLAUSE} & \boxed{e1} \end{bmatrix} \\ \text{INDEX} & \boxed{e2} \end{bmatrix} \\ \text{ICONS} & \left\langle \begin{bmatrix} \textit{info-str} & \\ \text{TARGET} & \boxed{e3} \\ \text{CLAUSE} & \boxed{e2} \end{bmatrix} \right\rangle \oplus \textit{lnis} \end{bmatrix} \\ \text{ARG-ST} & \left\langle \text{VP}\begin{bmatrix} \text{VFORM} & \textit{non-finite} \\ \text{INDEX} & \boxed{e3} \\ \text{CLAUSE-KEY} & \boxed{e1} \end{bmatrix}, \text{NP}\left[\text{CLAUSE-KEY } \boxed{e1}\right] \right\rangle \end{bmatrix}$$

Figure 18.9a on page 464 illustrates the HPSG analysis of a relative clause with a relative pronoun that contains an extraction out of the infinitival subject. An interrogative would be similar, except for the information structure of the filler, that would be *focus*. Focalizing part of a *non-focus* infinitival subject is not restricted by the FBC constraint, because the infinitival subject has the feature [HEAD *verb*]. On the other hand, Figure 18.9b on page 464 illustrates the HPSG analysis of a relative clause with a complementizer that contains an extraction out of an infinitival subject.

(18.9) a. Amsterdam, [où$_i$ [flâner $_{-i}$] est charmant]
Amsterdam where wander.INF is charming
'Amsterdam, where wandering is charming'

b. Amsterdam, [qu$_i$' [observer $_{-i}$] est charmant]
Amsterdam that observe.INF is charming
'Amsterdam, that observing is charming'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 18.1: Simplified tree for *Amsterdam,* [*où*$_i$ [*flâner* $__i$] *est charmant*] (‘Amsterdam, where wandering is charming’)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 18.2: Simplified tree for *Amsterdam,* [*qu*$_i$'[*observer* $__i$] *est charmant*] ('Amsterdam, that observing is charming')

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

19 Conclusion

In this last part of my thesis, I discussed in more detail the FBC constraint and its implications, and proposed a formal analysis in HPSG. This led me to sketch a substantial fragment of a French grammar in HPSG. I showed a cross-classification of interrogatives (inspired by Ginzburg & Sag 2000) and of relative clauses (based on Abeillé & Godard 2007), while *c'est*-clefts are formed by specific lexical entries of *être* ('be') (Winckel & Abeillé 2020). I explained how information structure interact with syntax in these non-local dependencies, for short and long distance dependencies. The impression of a "subject island" in focalizing constructions arises from the fact that subjects are preferred topics for a majority of verbs. I model this preference by having subjects of such verbs being the DESIGNATED TOPIC, following a proposal by Bildhauer & Cook (2010). This allows me to then propose a formalization of the FBC constraint (17.10).

When reflecting on all this evidence showing the nonexistence of subject islands, one cannot help but ask how we can explain the fact that so many linguists have postulate a subject island constraint. I suppose it is possible to see this as a consequence of the fact that most of the examples on which the discussion was based were interrogatives, as were most of the previous experiments.

One major element is missing in my HPSG analysis. In Section 15.1, I insisted the FBC constraint assumes that information structure is gradient. Besides Webelhuth's (2007) "more thematic than" function (which, I think, cannot be adapted to Song's (2017) representation of information structure), there has been no attempt in HPSG to account for the gradience of information structure. As the goal of the present work was not to determine how and why an element is more or less focus, topic or backgrounded, it can therefore not contribute much to building a model that could account for the gradience of information structure. However, we can speculate that several factors probably contribute to making an element more or less focus, more or less topic or more or less backgrounded. For example, the topic of an embedded clause may be less topic than the topic of the embedding clause. From this assumption, it would follow that the FBC constraint applies less strongly to elements that are less backgrounded, and this could explain why we do not see superadditive effects in the interrogatives with long distance dependencies. For the time being, this is unfortunately only speculation. Once the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

factors have been identified, it should be possible to treat them as weighted constraints and propose a modelization of gradience of information structure. Some proposals have been made to introduce weighted constraints in HPSG (in the *Verbmobil* project Müller & Kasper (2000); in Brew (1995); in Guzmán Naranjo (2015); or in An (2020); see Müller (2017: 164)), but they all attempted to compute probabilistic models of sentence processing (production and comprehension) – for example the probability of using one or the other dative construction for ditransitive verbs in English (*give Sandra the book / give the book to Sandra*). Any effeort to adapt these methods and propose a new way to treat information structure as a gradient feature instead of a categorical feature on lexical signs would contribute greatly to the scientific debate. However, such an attempt goes far beyond the scope of this work.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Part IV

Concluding remarks

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

The present work aimed to make an intervention in current debate on subextractions from subjects in French. Subjects are often considered to be "islands" environments, so in the first part of the book I discussed the definition of islands and how sentential subjects and subjects in general have been classified under this denomination. I also presented a state of the art divided into three main schools when accounting for the phenomenon: syntax-based approaches (often defended by Minimalists, but also other scholars from other frameworks, as well as in the early HPSG analyses), processing-based approaches and discourse-based approaches. This dissertation focuses especially on a discourse-based hypothesis that I presented with some colleagues in Abeillé et al. (2020) and called the Focus-Background Conflict (FBC) constraint. The FBC constraint states that part of a background cannot be focused.

I have shown that there is a disagreement on the data where subextraction out of the subject is concerned: Is subextraction out of the subject ungrammatical or only degraded? Are the constraints cross-linguistically valid? Do they apply in all constructions? Are all subjects underlying the same constraints? Working on French, the data on which are particularly debated (a.o. Godard 1988, Tellier 1991, Heck 2009), I gathered empirical evidence that enabled us to answer these questions at least partially.

In the second part of the current work, I presented the results of eight corpus studies. These studies show that extraction out of the subject is very common in relative clauses. It is even the most common usage with the complementizer *dont* ('of which'). Long distance dependencies are attested as well, which shows that *dont* relative clauses are extractions, contrary to a proposal made by Heck (2009). Relativizations out of the subject with *de qui* ('of who') are common, contrary to Tellier's (1991) claims, and so are relativizations out of the subject with *duquel* ('of the which'). Relativizations out of the subject with *avec qu-* ('with wh-') are not very common, but attested. The important finding of my corpus studies is that there is no attested extraction out of the subject in interrogatives. Because interrogatives, contrary to relative clauses, are focussing constructions, I argue that the findings of the corpus studies are in line with the FBC constraint, and the cross-construction difference unexpected under the other hypotheses.

In the third part, I present the results of 16 experiments. These experiments tested extractions out of the subject on different constructions (relative clauses, interrogatives, *it*-clefts), and compared them with extractions out of the direct object. All the experiments on relative clauses show that extractions out of the subject are not degraded compared to extractions out of the object: they receive similar or even higher acceptability judgments and do not slow down the reading times. Experiments on interrogatives show that extractions out of the subject in

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

short distance dependencies have lower ratings than extractions out of the object, but only in *wh*-questions and not in questions with *wh* in situ. Also, extractions out of the subject in long distance dependencies do not show a significant decrease of acceptability. In *it*-clefts, there is a tendency such that extractions out of the subject receive lower ratings than extractions out of the object. Interrogatives and *it*-clefts being focalizing constructions, contrary to relative clauses, the FBC constraint seems to be a good explanation for the results of my experiments.

Finally, I presented a formalization of the FBC constraint in the fourth part of the present book. I clarified some details about the FBC constraint, and especially how it applies to long distance dependencies and *it*-clefts. After this, I proposed a formalization of the FBC constraint in HPSG. For this, I sketched the basis for a French HPSG fragment in which I adopt Song's (2017) representation of information structure in MRS objects (Copestake et al. 2005). The FBC constraint states that parts of a non-focus element (elements on its ARG-STR list) must be non-focus as well. Extractions out of the subject in interrogatives and clefts are therefore not ruled out, but must have a specific interpretation. Extractions out of the subject in relative clauses are not constrained by the FBC, because the extracted element is non-focus.

Throughout the present work, even though I emphasized the impact of the FBC constraint, I also repeatedly said that many factors are at play in extractions, and that non-discourse factors such as the complexity of the subject, the length of the dependency, the number of gaps or the familiarity with the structure (habituation) are all important. Therefore, I am not claiming that the FBC constraint alone completely accounts for what is called the "subject island". On the other hand, the formulation of the FBC constraint clearly implies that the constraint is not restricted to extractions (let alone to subextractions from the subject), or even to verbal communication. It may, therefore, offer explanatory potential far beyond the scope I identified in this book.

I leave for future research the task to see in which respect the FBC constraint is able to account for other structures identified as "islands" in the literature. For example, restrictive relative clauses are presupposed and as such are concerned by the FBC constraint. Relative clauses are claimed to be islands to extractions, however no difference between relative clauses and interrogatives has been reported. Similarly, complements of factive verbs are claimed to be islands to extractions. Ambridge & Goldberg (2008) explain the contrast between bridge verbs and factive verbs through backgroundedness. Example (19.1) shows that extractions out of the complement of bridge verb (19.1a) are more acceptable than extractions out of the complement of factive verbs (19.1b).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(19.1) a. What did Jess think that Dan liked? (Ambridge & Goldberg 2008: 371)

b. ? What did Jess know that Dan liked?

According to Liu et al. (2019), the acceptability of subextractions from sentential complement is better explained by the frequency of the introducing verb than by the prepositional status of the sentential complement, but they tested only interrogatives. In these two cases alone, the FBC constraint could be shown by future research to explain previously ill-understood problems in linguistics.

Even though I concentrated on French in this book, there are strong reasons to expect that the FBC constraint should apply cross-linguistically. If we assume that the FBC constraint is a reflection in the language of a more general principle of cognitive attention, then we expect to see it having an impact in any given language. However, some languages seem to be more or less sensitive to the constraint as far as extractions out of the subject are concerned. In French, subextractions from the subject in interrogatives receive ratings that are clearly higher than ungrammatical controls. In English however, parallel experiments show that extractions out of the subject in interrogatives receive ratings that are not significantly higher than ungrammatical controls (Abeillé et al. 2020: third experiment). On the contrary, subextractions from the subject in Japanese are claimed to be acceptable in all constructions (a.o. Ross 1967, Kuno 1972, Kayne 1983, Stepanov 2007).[1] More research is needed in order to see what may cause these cross-linguistic differences, and why languages seem to be more or less constrained by the FBC. This may be related to how these languages account for information structure.

From the methodological point of view, the present work has shown that linguistic research can greatly profit from carefully conducted studies and experiments. This is not to say that intuitive judgments are necessarily unworthy. In fact, I was able in many occasion to confirm or explain linguists' intuitions. The problem comes from a misinterpretation of these intuitions. Some contrasts may not receive the attention they deserve, as for example the contrast between extractions out of the subject in interrogatives and in relative clauses, that has been mentioned in early works (Chomsky 1973: 32) but hardly ever addressed

[1]Notice that extractions out of relatives are supposed to be acceptable in Japanese as well.

(i) Kore wa [[_ kawaigatte ita] neko ga sinde simatta] kawaisoo na kodomo desu. (Kuno
this loved cat died poor child is
1987: 15)

'This is a poor child who the cat that (he) loved died.'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

afterwards. On the contrary, some contrasts may be considered by scholars as more important than they actually are, and we can often observe a tendency to overgenerate an observation. For example, the contrast between extractions out of the subject with *dont* and *de qui* in French claimed by Tellier (1991) has some grounds, but it seems to come from a general preference for subextractions out of NPs with *dont* and not from a problem specific to subextraction from subjects. A preference for extraction out of the subject of passives over extraction out of the subject of transitives can also be explained by the fact that transitive verbs tend to have less complex subjects, but this does not mean that subjects of passives are special as far as extraction is concerned. Looking carefully at the corpora and testing different extractions with the appropriate controls allowed me to clarify some inadequate intuitions while partially explaining where they come from.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Appendix A: Corpus studies annotation guidelines

In order to annotate the corpus results presented in part II of this work, we followed these guidelines:

- **Verb types**:
  - **state**: exclusively for the verb *être* ('be')
  - **transitive**: for any verb with a realized direct object, also includes transitive verbs whose direct object is realized as a reflexive pronoun (sometimes called 'true reflexives')
  - **mediopassive**: verb with a reflexive; its prototypical form is a transitive, but here the prototypical object is the grammatical subject of the verb
  - **passive**
  - **unaccusative**: verb without a realized direct object and building its *participe passé* (past participle) with the auxiliary *être* ('be'); this category also includes verbs with a reflexive that are neither true reflexives nor mediopassive and have a non-agentive subject
  - **unergative**: verb without a realized direct object and building its *participe passé* (past participle) with the auxiliary *avoir* ('have'); this category also includes verbs with a reflexive that are neither true reflexives nor mediopassive and have an agentive subject

  For the sake of simplicity, we use the auxiliary to distinguish between unaccusative and unergative verbs (Labelle 1992), except for reflexives (Legendre & Sorace 2003: 206–208). Notice that, with this method, the number of unergative verbs may be overestimated (Legendre & Sorace 2003).

- **Restrictiveness**: Whether a relative clause is restrictive or non-restrictive. Our annotation criterion is the following: the relative clause is considered appositive (restrictive = no) if the antecedent is a proper noun or if the

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

relative clause is given between commas; otherwise, the relative clause is considered restrictive (restrictive = yes). This annotation rule has obvious drawbacks, because the use of comma to surround a non-restrictive relative clause is not mandatory, but it enabled us to stay as objective as possible while annotating.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Appendix B: Semantic relations in relative clauses (corpus studies)

In addition to the factors already mentioned in Part II, we annotated the type of semantic relationship between the extracted element and its head. We performed this annotation for both extractions out of the subject and out of the direct object for comparison.

We identified seven different kinds of relations:

(i) agens or cause, where extracted element fulfills any kind of proto-agentive role with respect to the (often deverbal) head noun

(ii) part of whole, the whole being expressed by the head noun

(iii) patient, where the extracted element fulfills any kind of proto-patient role[1] with respect to the (often deverbal) head noun

(iv) possession

(v) quality, where the head noun denotes a quality of the extracted element

(vi) quantifier, where the extracted element has a quantifier scope over the head noun

(vii) relational, where the (mostly animate) head noun denotes a social relationship with respect to the extracted element

The following examples, taken from the corpus studies mentioned above, are extractions out of the subject illustrating these semantic relations.

(19.1) **agens/cause:**

[1]Experiencers are annotated as 'patient' (*l'angoisse de Grégoire*, 'Grégoire's anxiety') as well as topics in depicted-topic relations (*la peinture de la Vierge'*, 'the painting of the Virgin Mary') and information (*la biographie de Françoise Sagan*, 'the biography of Françoise Sagan').

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

a. l' Afghanistan, dont [la participation _] avait été
the Afghanistan of.which the participation had been
suspendue à la suite de l' invasion soviétique (FTB -
suspended at the result of the invasion Soviet
flmf7ah2ep-760)
'Afghanistan, whose participation had been suspended after the Soviet invasion'

b. un blondinet boutonneux, de qui [le geste _] l'
a blond boy pimpy of who the gesture her.ACC
électrisa (Pense à demain, Anne-Marie Garat, 2010)
electrified
'the pimply blonde boy, whose gesture electrified her'

c. ceux, du moins, de qui [le jugement _] garde une activité
these of least of who the judgment retains an activity
propre (Jean Barois, Roger Martin Du Gard, 1913)
own
'these, at least, whose judgment retains an activity of its own

(19.2) **part-of-whole:**

a. un groupe dont [les unités _] sont très autonomes (FTB -
a group of.which the units are very autonomous
flmf7af2ep-559)
'a group whose units are very independent'

b. l' ordinateur de plastique tout neuf, duquel il vous avait
the computer of plastic all new of.which he you.ACC had
demandé à quoi servaient [les prises de branchement _]
asked at what used the plugs of connection
(Mécanique, François Bon, 2001)
'the new plastic computer, of which he had asked you what the plugs were for'

c. une danseuse écoutante, dont [les petits pieds jubilants _]
a dancer.FEM listening of.which the little feet jubilant
sont cueillis par la mesure irrésistible ! (Partage de midi [1re
are caught by the beat irresistible
version], Paul Claudel, 1906)
'a listening dancer, whose jubilant little feet are caught by the irresistible beat!'

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

(19.3) **patient:**

a. cette arme dont [la gestion _] relève du ministère
this weapon of.which the management belongs of.the Ministry
de la défense (FTB - flmf3_03500_03999ep-3699)
of the Defense

'this weapon whose management belongs to the Ministry of Defense'

b. Viviane, de qui [l' euphorie _] augmentait sa tristesse (Pense
Viviane of who the euphoria increased her sadness
à demain, Anne-Marie Garat, 2010)

'Vivian, whose euphoria increased her sadness'

c. Millie, dont grandissait [l' angoisse _] (Dans la main du
Millie of.which grew the anxiety
diable, Anne-Marie Garat, 2006)

'Millie, whose anxiety was growing'

(19.4) **possession:**

a. American et United, dont [les flottes _] dépassent les cinq
American and United of.which the fleets surpass the five
cents avions (FTB - flmf3_11000_11499ep-11199)
hundred aircraft

'American and United, whose fleets contain more than five hundred aircrafts'

b. un vieux compagnon d' armes dont [les états de service _]
an old comrade of arms of.which the states of service
étaient superbes (L'Île des pingouins, Anatole France, 1908)
were superb

'an old comrade-in-arms whose service record was superb'

(19.5) **quality:**

a. l' économie américaine, dont [le poids _] est lourd (FTB -
the economy american of.which the weight is heavy
flmf7am2ep-661)

'the American economy, whose weight is high'

b. ce fameux sire de Caritena, de qui [le courage _], [la
this famous sire of Caritena of who the courage the
courtoisie envers les dames _] et [l' absurde frivolité _]
courtesy towards the ladies and the absurd frivolity

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

éclatent dans le livre de la conqueste publié par Buchon.
burst in the book of the conqueste published by Buchon
(Le Voyage de Sparte, Maurice Barrès, 1906)

'this famous sire of Caritena whose courage, courtesy towards the ladies and absurd frivolity shine through in the book of the conqueste published by Buchon.'

(19.6) **quantifier:**

a. des journalistes dont [certains _] ont connu le
some journalists of.which several have known the
chômage (FTB - flmf7ao1ep-492)
unemployment

'journalists among which several have experienced unemployment'

b. ses vingt et un enfants, dont [treize _] moururent avant
his twenty-one children of.which thirteen died before
lui (Jean-Christophe : La Foire sur la place, Romain Rolland,
him
1908)

'his twenty-one children, out of which thirteen died before him'

(19.7) **relational:**

a. Banexi und partner, [...] dont bon nombre [de clients _]
Banexi und partner of.which good amount of clients
sont des petits patrons (FTB - flmf7ai2ep-886)
are DET small bosses

'Banexi und partner, of which a good number of the clients own small businesses'

b. Un modeste papetier de qui [l' épouse _] [...] avait
a modest papermaker of who the wife had
constitué le premier rayon d' ouvrages pour dames
established the first section of books for ladies
(L'enfant des ténèbres, Anne-Marie Garat, 2008)

'the modest papermaker, whose wife had set up the first section for ladies' books'

c. quelqu'un dont [la fille _] a une copine de classe qui
someone of.which the daughter has a friend of class who

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

a une sclérose en plaques (Le corps incertain, Vanessa Gault, 2006)
has a multiple sclerosis

'someone whose daughter has a classmate who has multiple sclerosis'

1 *Dont* relatives in the French Treebank

Figure 1 on page 481 gives the proportion of every category among extractions

Figure 1: Semantics relations in the French Treebank *dont* relative clauses (subject vs. object subextractions)[2]

out of subjects in the FTB, with a comparison to extractions out of direct objects as a baseline. The most common kind are *de*-PPs denoting possession for both kind of extractions. We find almost no relational (if we take into account the confidence interval, the amount does not significantly excesses zero).

We fit a logistic regression model predicting the source of extraction (subject = 1; object = 0) for the kind of relation, and we perform a residual diagnostic to test

[2]See page 133 for the confidence intervals (here seven comparisons for subject and six for object). The percentage is given for each group (extraction out of the subject on one hand, extraction out of the object on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

the predictions of the model. The detailed results of the model are given in Table 1.[3] No category of relation is a good predictor for the variable to be explained, which corroborates what we can see in Figure 1 (confidence intervals overlap pairwise).

Table 1: Results of the logistic regression

	Estimate	Std. Error	z value	*p* value	Odd.ratio
(Intercept)	1.350	0.424	3.1827	0.0015	3.86
part-of-whole	1.289	1.119	1.1524	0.2491	3.63
patient	0.596	0.749	0.7958	0.4261	1.81
possession	-0.090	0.491	-0.1841	0.8539	1.09
quality	0.241	0.538	0.4484	0.6539	1.27
quantifier	0.483	0.685	0.7041	0.4814	1.62
relational	13.216	882.744	0.0150	0.9881	549135.22

We can therefore say that in this corpus, no semantic relation type seems to increase or decrease the ability to form an extraction out of the subject. But some types of semantic relations are more common than others (although we cannot say whether this is due to the extraction).

2 *Dont* relatives in Frantext 2000–2013

Figure 2 on page 483 gives the proportion of every category among extractions out of subjects in Frantext 2000–2013, with a comparison to extractions out of direct objects as a baseline. Part-of-whole is the most common relation for extractions out of the subject, and agens and patient are equally the most common relations for extractions out of the object. While there is almost no relational in the FTB (see above), 10% of the extractions out of the subject are relational subject nouns for Frantext 2000–2013. Among extractions out of the subject, the categories patient and quantifier are not significantly more frequent than zero.

[3]Validation of the model: The regression model is valid iff the number of data points is at least equal to 5 times the amount of explanatory variables. Here, it must be at least equal to 35, and there are 263 data points. Furthermore, the residual diagnostics are compelling. The model is therefore validated.

[4]See page 133 for the confidence intervals (here seven comparisons for subject and five for object). The percentage is given for each group (extraction out of the subject on one hand, extraction out of the object on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 2: Semantics relations in Frantext 2000 *dont* relative clauses (subject vs. object subextractions)[4]

Among extractions out of the object, there are no categories quantifier and relational, and the category part-of-whole is not significantly more frequent than zero.

We fit a logistic regression model predicting the source of extraction (subject = 1; object = 0) for the kind of relation, and we perform a residual diagnostic to test the predictions of the model. The detailed results of the model are given in Table 2.[5]

No category of relation is a good predictor for the variable to be explained, but if we drop all possible single terms (the different relations),[6] the variable relation is significant to explain the source of the extraction ($p<0.005$). Overall, there is a difference with respect to the kind of relation between *dont* and its head noun for extractions out of the subject compared to the extractions out of the object.

There is therefore a difference between FTB and Frantext, which is probably due to the modality of the corpus study. On the one hand, the corpora diverge

[5]Validation of the model: The regression model is valid iff the number of data points is at least equal to 5 times the amount of explanatory variables. Here, it must be at least equal to 35, and there are 91 data points. Furthermore, the residual diagnostics are compelling. The model is therefore validated.

[6]In order to do this, I use the function `drop1()` from the R package *stats* (R Core Team 2018).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 2: Results of the logistic regression

	Estimate	Std. Error	z value	*p* value	Odd.ratio
(Intercept)	0.560	0.443	1.2627	0.2067	1.75
part-of-whole	1.232	0.765	1.6105	0.1073	3.43
patient	-1.946	0.906	-2.1470	0.0318	7.00
possession	0.229	0.698	0.3278	0.7431	1.26
quality	-0.714	0.711	-1.0035	0.3156	2.04
quantifier	17.006	2284.102	0.0074	0.9941	24312471.33
relational	17.006	1615.104	0.0105	0.9916	24312471.33

in the kind of texts they contain. Newspaper articles have a lot of quantifiers because their texts often aim at being objective descriptions of a situation (numbers being considered objective facts), and often deal with economics. Frantext, on the other side, has a lot of autobiographical texts, with an introspective dimension. In the other hand, because we only looked at relatives with an animate antecedent, there are many social relations (brother, mother, uncle, etc.) and many body parts (part-of-whole) in our results for Frantext. In Frantext we observe an asymmetry in the subextractions. Part-of-whole and relational are rare (or not present at all) in the extractions ouf of objects.

3 *Dont* relatives in Frantext 1900–1913

Figure 3 on page 485 gives the proportion of every kind of relation between *dont* and its head noun among extractions out of subjects in Frantext 1900–1913, with a comparison to extractions out of direct objects as a baseline. The results corroborate to a certain extent what we see in Frantext 2000–2013. Part-of-whole is the most common relation for extractions out of the subject (similar in Frantext 2000–2013) and agens/cause and quality are similarly the most common relations for extractions out of the object (for Frantext 2000–2013, agens/cause and patient were the most common relations). For extractions out of the subject, the category relational is not significantly above zero. For extractions out of the object, the categories relational, quantifier and possession are not significantly above zero.

We fit a logistic regression model predicting the source of extraction (subject = 1; object = 0) for the kind of relation, and we perform a residual diagnostic to

[7]See page 133 for the confidence intervals (here seven comparisons for subject and five for object). The percentage is given for each group (extraction out of the subject on one hand, extraction out of the object on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 3: Semantics relations in Frantext 1900 *dont* relative clauses (subject vs. object subextractions)[7]

test the predictions of the model. The detailed results of the model are given in Table 3.[8]

Table 3: Results of the logistic regression

	Estimate	Std. Error	z value	*p*-value	Odd.ratio
(Intercept)	0.693	0.408	1.6979	0.0895	2.00
part-of-whole	1.224	0.629	1.9445	0.0518	3.40
patient	-0.827	0.659	-1.2541	0.2098	2.29
possession	1.012	0.870	1.1622	0.2451	2.75
quality	0.000	0.577	0.0000	1.0000	1.00
quantifier	1.504	1.130	1.3307	0.1833	4.50
relational	-0.000	1.291	-0.0000	1.0000	1.00

In this model, part-of-whole is close to the threshold for being a good predictor for the variable to be explained (but still p>0.05). If we drop all possible single

[8]Validation of the model: The regression model is valid iff the number of data points is at least equal to 5 times the amount of explanatory variables. Here, it must be at least equal to 35, and there are 134 data points. Furthermore, the residual diagnostics are compelling. The model is therefore validated.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

terms to the model, the variable relation is significant to explain the source of the extraction ($p<0.05$). Overall, there is a difference with respect to the kind of relation between *dont* and its head noun for extractions out of the subject compared to the extractions out of the object.

Dont relatives clauses are similar in Frantext for both the period 2000–2013 and the period 1900–1913. Generally speaking, the relation between the head subject noun and the extracted *dont* is often a part-to-whole relation, whereas the relation between the head object noun and *dont* is often a patient-of-event relation.

4 *De qui* relatives in Frantext 2000–2013

Figure 4 on page 486 illustrates the different semantic relations between the

Figure 4: Semantics relations in Frantext 2000 *de qui* relative clauses (subject vs. object subextractions)[9]

relative word and the head noun, regardless of the kind of relative word. The difference between subject and object is mainly in the part-of-whole, relational and patient relations. Indeed, the first two are frequent in extractions out of the subject and rare in extractions out of the object. On the contrary, extractions out of the object have many patient relations while extractions out of the subject have few.

We fit a logistic regression model predicting the source of extraction (subject = 1; object = 0) for the kind of relation, and we perform a residual diagnostic to

[9]See page 133 for the confidence intervals (here seven comparisons). The percentage is given for each group (extraction out of the subject on one hand, other extraction on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

test the predictions of the model. The detailed results of the model are given in Table 4.[10]

Table 4: Results of the logistic regression

	Estimate	Std. Error	z value	*p*-value	Odd.ratio
(Intercept)	0.588	0.322	1.8253	0.0680	1.80
part-of-whole	0.839	0.557	1.5066	0.1319	2.31
patient	-1.617	0.613	-2.6407	0.0083	5.04
possession	-0.128	0.490	-0.2620	0.7933	1.14
quality	0.000	0.509	0.0000	1.0000	1.00
quantifier	-0.182	0.968	-0.1883	0.8506	1.20
relational	2.245	1.078	2.0826	0.0373	9.44

A main effect is found only for the semantic relation of patient (5.04 less likely to occur in extractions out of the subject, $p<0.01$) and relational (9.44 more likely to occur in extractions out of the subject, $p<0.05$). If we drop all possible single terms to the model, the variable relation is significant to explain the source of the extraction ($p<0.001$).

As far as Frantext 2000–2013 is concerned, we do not observe any significant difference between the use of *dont* and the use of *de qui*. In general, we see that out-of-subject extractions are more often associated with relationals and out-of-subject extractions more often associated with patients.

5 *De qui* relatives in Frantext 1900–1913

Figure 5 on page 488 illustrates the different semantic relations between the filler and the head noun, and their proportions, comparing extractions out of the subject and out of the object. The difference between subject and object is mainly found in the semantic relations part-of-whole and quality, the former being very present in extractions out of the subject and the latter very frequent in extractions out of the object. There are few relationals and patients in both cases.

[10]Validation of the model: The regression model is valid iff the number of data points is at least equal to 5 times the amount of explanatory variables. Here, it must be at least equal to 35, and there are 175 data points. Furthermore, the residual diagnostics are compelling. The model is therefore validated.

[11]See page 133 for the confidence intervals (here six comparisons for subjects and four comparisons for objects). The percentage is given for each group (extraction out of the subject on one hand, other extraction on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 5: Semantics relations in Frantext 1900 *de qui* relative clauses (subject vs. object subextractions)[11]

We fit a logistic regression model predicting the source of extraction (subject = 1; object = 0) for the kind of relation, and we perform a residual diagnostic to test the predictions of the model. The detailed results of the model are given in Table 5.[12]

Table 5: Results of the logistic regression

	Estimate	Std. Error	z value	*p*-value	Odd.ratio
(Intercept)	0.788	0.539	1.4618	0.1438	2.20
part-of-whole	1.003	0.935	1.0730	0.2833	2.73
patient	16.778	2284.102	0.0073	0.9941	19338335.90
possession	-0.095	1.020	-0.0934	0.9256	1.10
quality	-0.634	0.775	-0.8186	0.4130	1.89
relational	16.778	3956.180	0.0042	0.9966	19338335.90

No category of relation is a good predictor for the variable to be explained, even if we drop all possible single terms to the model. The semantic relations are therefore not a good predictor for extracting out of the subject or out of the object.

In general, these results are in line with the previous results on Frantext. There is much less difference between *dont* and *de qui* than between Frantext and FTB.

[12]Validation of the model: The regression model is valid iff the number of data points is at least equal to 5 times the amount of explanatory variables. Here, it must be at least equal to 35, and there are 53 data points. Furthermore, the residual diagnostics are compelling. The model is therefore validated.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

As a reminder, the studies on Frantext are limited to animated antecedents (in order to compare the two relative words), which probably explains this. Nevertheless, these results are a little different from the other Frantext results, since extractions out of the object display very few patients, whereas in the other three cases this is the most typical semantic relation. We also notice a tendency when comparing Frantext 2000 and Frantext 1900 which is that there are few relationals in Frantext 1900 (and many relationals in the extractions out of the subject in Frantext 2000), and this without distinction between *dont* and *de qui*.

6 *Duquel* relatives in Frantext 2000–2013

Figure 6 on page 489 illustrates the different semantic relations between the

Figure 6: Semantics relations in Frantext 2000 *duquel* relative clauses (subject vs. object subextractions)[13]

filler and the head noun, and their proportions, comparing extractions out of the subject and out of the object. There are not enough occurrences to run a meaningful regression model (hence the very large confidence intervals in the Figure). Still, the observations we made previously for Frantext hold: there are many part-of-whole relations for extractions out of the subject and many patient relations for extractions out of the object.

[13]See page 133 for the confidence intervals (here three comparisons for subjects and five comparisons for objects). The percentage is given for each group (extraction out of the subject on one hand, other extraction on the other hand).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

7 Conclusion

As far as semantic relations are concerned, the results for FTB and Frantext are very different. Indeed, in FTB, there is a predominance of possessive relations, which is not found in Frantext. I imagine that the genre of the texts that the respective corpora are built on plays a big role in this distinction.

If we look only at the Frantext results, we can see a difference between subject and object. The extractions out of the subject contain a lot of part-of-whole and relational relations (the latter only for Frantext 2000). The extractions out of the object contain mainly patient, quality and agens relations. In general, however, the filler itself does not seem to be a factor.

I do not know what is the cause of the diachronic difference between Frantext 2000–2013 and Frantext 1900–1913 (the latter having almost no relationals). As for the difference between subjects and objects, I suspect that it can be linked to the type of nouns that are most often used as subject or as object: Are relationals such as *father*, *sister* more often used as subjects/agens while events such as *management*, *death* and qualities such as *beauty*, *colour* are more often used as objects? The scope of these corpus studies does not allow me to answer this question.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Appendix C: Numerus, definiteness and restrictiveness in relative clauses (corpus studies)

In the corpus studies mentioned in this book, I have annotated several factors of the relative clauses that are not reported in Part II of the book. Indeed, these factors do not provide any additional conclusive explanation. The results are, however, worthy of being mentioned, if only because they show that the factors in question do not play a dominant role.

I annotated two factors regarding the antecedent of the relative clauses: whether the antecedent was singular or plural, definite or indefinite. Figure 1 on page 492 illustrates graphically the results for the numerus of the antecedent, while Figure 2 on page 493 illustrates graphically the results for the definiteness of the antecedent. The main observation to emerge from these results is that antecedents are often singular and often definite. The type of extraction seems to be irrelevant, so extractions out of the subject do not stand out.

Finally, I annotated the restrictiveness of the relative clauses, following the guidelines explained above (Appendix, section IV). Figure 3 on page 494 illustrates visually the results of this annotation.

Generally speaking, we can say that the corpus seems to contain about as many restrictive as non-restrictive relative clauses. Extractions of the complement of the verb stand out in that they seem to display a particularly high number of restrictive occurrences (extractions of the complement of the adjective also, but as the observation is based on few occurrences, it is not very reliable).

Following Song (2017), the extracted element in a non-restrictive relative clause is necessarily a topic, but it may be something else in a restrictive relative clause. For this reason, we expected to find more non-restrictive relative clauses in extractions out of the subject than in the other kinds of extractions. The data show us that relativizations out of the subject are quite often non-restrictive, but not necessarily more than relativizations out of other kinds of NPs. Relativizations out of the subject with *duquel* strikes as an outlier with very few restrictive relative clauses.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 1: Numerus of the antecedent for all relative clauses from the corpus studies

Table 1 compares the extractions out of subjects with extractions out of objects and extractions of the complement of the verb, because they are the kind of extractions that always have a frequency significantly above zero. The sign + indicates that there are more non-restrictive relative clauses in extraction out of a subject, and – that there less non-restrictive relative clauses in extraction out of a subject. A doubled sign indicates that the difference is important.

We can see a clear tendency that confirms our expectations. However, the difference with extractions out of the object is not as strong as expected. Notice, however, that our annotation criteria for restrictiveness were somewhat rudimentary, and that it would be desirable to take into account the whole context in order to assign the value of the restrictiveness. The internal information structure of restrictive and non-restrictive relative clauses is in general not well understood and should be studied on its own.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

1 = FTB dont ; 2 = Frantext 2000 dont ; 3 = Frantext 1900 dont ;
4 = Frantext 2000 de qui ; 5 = Frantext 1900 ;
6 = Frantext duquel ; 7 = Frantext avec qu-

Figure 2: Definiteness of the antecedent for all relative clauses from the corpus studies

Table 1: Comparison of the amount of non-restrictive relative clauses in the different corpus studies

more non-restrictive relative clauses in extractions out of the subject...	...than in extractions of the complement of the verb	...than in extractions out of the object
dont in FTB	++	+
dont in Frantext 2000–2013	++	++
dont in Frantext 1900–1913	+	+
de qui in Frantext 2000–2013	+	– –
de qui in Frantext 1900–1913	++	+
duquel in Frantext 2000–2013	+	++
avec + *wh* in Frantext 2000–2013	++	+

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

1 = FTB dont ; 2 = Frantext 2000 dont ; 3 = Frantext 1900 dont ;
4 = Frantext 2000 de qui ; 5 = Frantext 1900 ;
6 = Frantext duquel ; 7 = Frantext avec qu-

Figure 3: Restrictiveness of all relative clauses from the corpus studies

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Appendix D: Exclusion criteria for participants' data

The decision on whether to include a participant's response in statistical analysis, was made by applying the same criteria for all experiments.

1. The responses of the participants that did not complete the entire experiment were deleted altogether, as were the data from participants who did not give their explicit consent.

2. For legal reasons, I kept only the data from participants over 18 (age of the legal majority in France).

3. I kept only data from native monolingual speakers of French. Participants were asked to mention their native language, but also to mention the other languages their speak and their level of proficiency on a scale from 1 to 10. I considered as non-native speakers participants who indicated another language than French as their native language, did not answer the question, or gave an unrelated answer. I considered as bilingual or potentially bilingual participants who either indicated two languages as their native languages or indicated an L2 with a proficiency of 10. The data from non-native speakers, bilinguals and potential bilinguals are excluded from the statistical analysis.

4. I kept only data from participants who grew up in a French-speaking country. I considered as francophone country any country in which French is one of the official languages, as well as Algeria and Morocco. The data from participants who did not grow up in a francophone country following this criterium are excluded from the statistical analysis. Overall, most likely due to how the participants were recruited for internet experiments (over social media per snowballing effects), or due to the fact that the experiments run in the lab were conducted at the university in Paris, the great majority of participants grew up in Metropolitan France.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

5. Based on the answers to comprehension questions (if there were any), I computed each participant's accuracy. For this, the answers to the comprehension questions related to practice items and ungrammatical controls were not taken into account. If I noticed that one condition, or one particular set of distractors, received overall an unusually high amount of inaccurate answers, then these answers were also not taken into account to compute the participant's accuracy rate. I mention these details in the relevant sections. Data from participants with an accuracy rate below 75% are excluded from the statistical analysis.

6. Finally, I sometimes had to exclude participants that did not discriminate between conditions in my test items, and always gave the same rating (or almost always with one or two outliers). I mention these cases in the relevant sections.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Appendix E: Experiment 3, detailed results and analysis

I report here the detailed step of the statistical analysis for the Eye-tracking study described in Section 8.4 (Experiment 3). Notice that I only report results from statistical models that satisfied the validity criteria and whose residual analysis was compelling (see on page 177).

Reaction times typically have a non-normal distribution with very long tail for longer reaction time. That's why, following the usual methodology used for reading time studies, the results presented here are based on log-transformed reading times, that have a distribution closer to normal.

I suppressed data for skipped regions, i.e. regions for which there was no fixation at all.

1 Total reading time

In order to look at total reading times, I built a subset of the data in which I suppressed outliers, i.e. total reading time measurements that were more than 3 standard deviation away from each participant's mean reading time (each region in each condition considered separately).

Figure 1 on page 498 shows the total reading time on the experimental items and Figure 2 on page 498 shows in more detail the distribution of the reading times for regions 3+4+5[1]. A visual inspection of the graph show no strong increase of reading times for the subextraction from subject or the subextraction from object. Only the medium condition with a clitic subject is read more quickly, which is not surprising.

We fit a first linear mixed model to predict log-transformed total reading times on the 3 regions by comparing the extractions out of the subject and out of the object with nominal subject (mean centered with subject coded positive and object coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the

[1]Notice that skipped regions are then necessarily counted as having a 0 reading time.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 1: Region means and 95% confidence intervals for the log-transformed total reading time of all conditions in Experiment 3

Figure 2: Sum of the mean log-transformed total reading time for the regions 3, 4 and 5 for each condition of Experiment 3 with 95% confidence intervals.

region (number of characters) as covariate[2], and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 1. There is a significant effect of extraction type such that coordination controls are read more slowly than the extraction conditions, but there is no significant interaction.

Therefore, the data do not confirm any of the predictions. Extractions out of the subject do not lead to increased total reading times, and nor do extractions out of the object. Surprisingly, extractions even lead to shorter total reading times than non-extractions.

[2]Frequency is not an appropriate covariate, because we are looking at several regions in the same time.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 1: Results of the Linear Mixed Model (model n°1)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	0.856	0.577	152.52	1	0.1403	2.35
extraction type	-0.131	0.061	23.29	-2	p<.05	1.14
distance	0.169	0.105	25.66	2	0.1213	1.18
length	0.557	0.014	521.85	39	p<.001	1.74
extraction type:distance	-0.042	0.073	29.31	-1	0.5741	1.04

2 Regressions in region 3 (subject)

I built a different subset of the data in which I suppressed outliers, i.e. regression path duration measurements that were more than 3 standard deviation away from each participant's mean reading time (each region in each condition considered separately). Figure 3 on page 499 shows the regression path duration on the experimental items.

Figure 4 on page 500 shows in more details the distribution of the regression path duration for the regions 3.

Figure 3: Region means and 95% confidence intervals for the log-transformed regression path duration of all conditions in Experiment 3

We fit a second linear mixed model to predict log-transformed regression path duration by comparing the extractions out of the subject and out of the object with nominal subject (mean centered with subject coded positive and object coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) and the frequency of the lemme as covariates, and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 2. There is a significant effect of extraction

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 4: Regression path duration for the region 3 for each condition of Experiment 3 with 95% confidence intervals.

type such that coordination controls are read more slowly than the extraction conditions, but there is no significant interaction.

Table 2: Results of the Linear Mixed Model (model n°2)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	5.578	0.149	158.43	37	p<.001	264.55
extraction type	-0.074	0.026	30.28	-3	p<.01	1.08
distance	0.002	0.025	29.04	0	0.9238	1.00
length	0.040	0.012	137.54	3	p<.005	1.04
frequency	0.000	0.000	92.50	0	0.8217	1.00
extraction type:distance	-0.020	0.026	27.04	-1	0.4538	1.02

Figure 5 on page 501 shows the rate and amount of regression out from the subject.

We fit a third binominal regression model to predict regression out (yes coded 1, no coded 0). The explanatory variables are distance (mean centered with low distance coded positive and high distance coded negative) crossed with extraction type (mean centered with no extraction coded negative, subextraction coded positive). We included the length of the region (number of characters) and the frequency of the lemme as covariates, and participants and items as random factors. The results of the model are reported in Table 3. Only length is a significant predictor.

We fit a fourth poisson regression model to predict the amount of regression out. The explanatory variables are distance (mean centered with low distance coded positive and high distance coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded pos-

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 5: Rate (top) and mean amount (bottom) of regression out in Region 3 in Experiment 3

Table 3: Results of the Regression Mixed Model (model n°3)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-3.3413	0.7353	-4.5439	p<.001	28.26
extraction type	0.0394	0.104	0.3785	0.7051	1.04
distance	0.0013	0.1068	0.0118	0.9906	1.00
length	0.1714	0.0583	2.9403	p<.005	1.19
frequency	0.0018	0.0014	1.3136	0.189	1.00
extraction type:distance	0.1435	0.1039	1.3809	0.1673	1.15

itive). We included the length of the region (number of characters) as covariate[3], and participants and items as random factors. The results of the model are reported in Table 4 and are similar to model n°3.

Figure 6 on page 502 shows the rate and amount of regression in to the subject. We observe that there are less regressions in when there is an extraction out of the subject than for both the coordination control condition and the extraction out of the object.

[3]In this model and some following models, I do not add the frequency of the lemme as covariate, because it makes the model fail to converge.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 4: Results of the Regression Mixed Model (model n°4)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-2.832	0.5322	-5.3215	p<.001	16.98
extraction type	-0.0004	0.0774	-0.005	0.996	1.00
distance	0.0154	0.0769	0.2005	0.8411	1.02
length	0.114	0.0427	2.6712	p<.01	1.12
extraction type:distance	0.064	0.0771	0.8305	0.4062	1.07

Figure 6: Rate (top) and mean amount (bottom) of regression in in Region 3 in Experiment 3

We fit a fifth binominal regression model to predict regression in (yes coded 1, no coded 0). The explanatory variables are distance (mean centered with low distance coded positive and high distance coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) as covariate, and participants and items as random factors. The results of the model are reported in Table 5. There is a significant main effect of extraction type, such that there is more often a regression in back to the subject in the non-extraction conditions. There is also a significant interaction, such that the subject non-extraction condition has more often a regression in.

We fit a sixth poisson regression model to predict the amount of regression in.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 5: Results of the Regression Mixed Model (model n°5)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-1.2344	0.7187	-1.7176	0.0859	3.44
extraction type	-0.229	0.102	-2.2444	p<.05	1.26
distance	0.1072	0.1019	1.0519	0.2928	1.11
length	0.0193	0.0592	0.3258	0.7446	1.02
extraction type:distance	-0.3126	0.1024	-3.0536	p<.005	1.37

The explanatory variables are distance (mean centered with low distance coded positive and high distance coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) as covariate, and participants and items as random factors. The results of the model are reported in Table 6 that corroborate the results of model n°5.

Table 6: Results of the Regression Mixed Model (model n°6)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-1.5653	0.4991	-3.1362	p<.005	4.78
extraction type	-0.1756	0.0673	-2.6073	p<.01	1.19
distance	0.0849	0.067	1.2673	0.2051	1.09
length	0.0273	0.0408	0.6683	0.504	1.03
extraction type:distance	-0.197	0.0678	-2.907	p<.005	1.22

There is therefore no evidence in the data that extractions out of the subject lead to longer regression path duration, or to more regressions. Actually, there is more regression in back to the subject when there is an extraction out of the object than when there is an extraction out of the subject.

3 First fixation and regression path durations in region 4 (verb)

Figure 7 on page 504 shows the distribution of the first fixation and regression path duration for the regions 4. For first fixation durations, I built a different subset of the data in which I suppressed outliers, i.e. first fixation duration measurements that were more than 3 standard deviation away from each participant's mean reading time (each region in each condition considered separately).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 7: First fixation duration (top) and regression path duration (bottom) for the region 4 for each condition of Experiment 3 with 95% confidence intervals.

We fit a seventh linear mixed model to predict log-transformed first fixation duration by comparing the extractions out of the subject and out of the object with nominal subject (mean centered with subject coded positive and object coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) and the frequency of the lemme as covariates, and participants and items as random variables. The results of the model are reported in Table 7. There is a significant main effect of extraction type such that coordination controls are read more slowly than the extraction conditions, but there is no significant interaction.

We fit an eighth linear mixed model to predict log-transformed regression path duration by comparing the extractions out of the subject and out of the object with nominal subject (mean centered with subject coded positive and object coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) and the frequency of the lemme as covariates, and participants and items as random variables. The results of the model are reported in Table 8. There is no significant factor in the model, even though there is a small tendency for an interaction effect (marginally significant), that we can

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 7: Results of the Linear Mixed Model (model n°7)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	5.468	0.086	403.36	64	p<.001	236.91
extraction type	0.012	0.017	515.96	1	0.4713	1.01
distance	-0.014	0.018	514.96	-1	0.4151	1.01
length	-0.006	0.009	520.02	-1	0.5205	1.01
frequency	-0.000	0.000	522.58	-1	0.1397	1.00
extraction type:distance	0.018	0.017	515.64	1	0.2937	1.02

also identify on Figure 7: this effect would rather be in disfavor of extractions out of the object, in which the verb is read slightly slower, especially compared to the non-extraction control.

Table 8: Results of the Linear Mixed Model (model n°8)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	5.748	0.125	82.27	46	p<.001	313.66
extraction type	-0.031	0.022	493.48	-1	0.1545	1.03
distance	0.024	0.023	513.06	1	0.3118	1.02
length	0.014	0.013	60.08	1	0.2921	1.01
frequency	-0.001	0.000	155.47	-2	0.1356	1.00
extraction type:distance	-0.042	0.022	494.78	-2	0.0585	1.04

There is therefore no evidence on the data for region 4 that extractions out of the subject lead to longer reading times. If anything, there is a reverse tendency, indicating maybe a small spillover effect on the verb for extractions out of the object.

4 Regressions in region 5 (object)

Figure 8 on page 506 shows in more details the distribution of the regression path duration for the region 5, and Figure 9 on page 506 shows the rate and amount of regression out from the object.

I first compare the low and high distance conditions, before comparing the medium and high conditions.

We fit a ninth linear mixed model to predict log-transformed regression path duration by comparing the extractions out of the subject and out of the object with nominal subject (mean centered with subject coded positive and object

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 8: Regression path duration for the region 5 for each condition of Experiment 3 with 95% confidence intervals.

Figure 9: Rate (top) and mean amount (bottom) of regression out in Region 5 in Experiment 3

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) and the frequency of the lemme as covariates, and participants and items as random variables. The results of the model are reported in Table 9. There is no significant effect in the model.

Table 9: Results of the Linear Mixed Model (model n°9)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	5.590	0.197	38.29	28	p<.001	267.78
extraction type	-0.037	0.022	509.65	-2	0.1038	1.04
distance	0.034	0.023	534.32	1	0.1482	1.03
length	0.033	0.016	33.51	2	0.0536	1.03
frequency	0.001	0.000	175.50	1	0.2014	1.00
extraction type:distance	0.017	0.022	510.91	1	0.4454	1.02

We fit a tenth binominal regression model to predict regression out (yes coded 1, no coded 0). The explanatory variables are distance (mean centered with low distance coded positive and high distance coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) as covariate, and participants and items as random factors. The results of the model are reported in Table 10. In this model also, there is no significant effect.

Table 10: Results of the Regression Mixed Model (model n°10)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-2.1957	1.0002	-2.1951	p<.05	8.99
extraction type	-0.082	0.111	-0.7388	0.46	1.09
distance	0.0799	0.1112	0.7186	0.4724	1.08
length	0.0481	0.0848	0.5675	0.5704	1.05
extraction type:distance	-0.1322	0.1111	-1.1891	0.2344	1.14

We fit an eleventh poisson regression model to predict the amount of regression out. The explanatory variables are distance (mean centered with low distance coded positive and high distance coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) as covariate, and participants and items as random factors. The results of the model are reported in Table 11 and there is again no significant effect.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 11: Results of the Regression Mixed Model (model n°11)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-2.6385	0.7112	-3.71	p<.001	13.99
extraction type	-0.0626	0.0901	-0.6942	0.4875	1.06
distance	0.0366	0.0903	0.4052	0.6853	1.04
length	0.0799	0.0596	1.3393	0.1805	1.08
extraction type:distance	-0.0271	0.0904	-0.2995	0.7646	1.03

There is therefore no evidence in the data that extractions out of the subject lead to longer regression path duration, or to more regressions, and also no evidence of the contrary. I now compare the medium and high conditions, that the DLT expect to differ from each other in terms of processing.

We fit a twelfth linear mixed model to predict log-transformed regression path duration by comparing the extractions out of the object with clitic subject and with nominal subject (mean centered with clitic subject coded positive and nominal subject coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) and the frequency of the lemme as covariates, and participants and items as random variables. The results of the model are reported in Table 12. There is a main effect of extraction type, such that the extraction conditions have shorter regression path durations than the control conditions. There is no interaction effect.

Table 12: Results of the Linear Mixed Model (model n°12)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	5.431	0.190	41.56	29	p<.001	228.28
extraction type	-0.061	0.023	520.45	-3	p<.01	1.06
distance	-0.040	0.024	541.89	-2	0.0934	1.04
length	0.047	0.016	34.74	3	p<.01	1.05
frequency	0.000	0.000	142.43	0	0.8521	1.00
extraction type:distance	-0.042	0.023	522.26	-2	0.0677	1.04

We fit a thirteenth binominal regression model to predict regression out (yes coded 1, no coded 0). The explanatory variables are distance (mean centered with medium distance coded positive and high distance coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters)

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

as covariate, and participants and items as random factors. The results of the model are reported in Table 13. In line with model n°12, there is a main effect of extraction type, such that control conditions have more often regressions out than the subextraction conditions.

Table 13: Results of the Regression Mixed Model (model n°13)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-2.8826	0.8373	-3.4426	p<.001	17.86
extraction type	-0.2885	0.1139	-2.5326	p<.05	1.33
distance	-0.1803	0.1143	-1.5775	0.1147	1.20
length	0.1031	0.0698	1.4773	0.1396	1.11
extraction type:distance	-0.0822	0.1139	-0.7221	0.4702	1.09

A fourteenth poisson regression model trying to predict the amount of regression out fails to converge.

There is therefore no evidence in the data that extractions out of the object with a nominal subject lead to longer regression path duration, or to more regressions, than extractions out of the object with a clitic subject.

5 Regressions in the extraction site (subject/object)

Figure 10 on page 509 shows the regression path duration for the extraction site, i.e. on region 3 for the subject conditions and on region 5 for the object conditions (we only look here at the cases with a nominal subject).

Figure 10: Regression path duration for the region 3 on one hand (subject) and the region 5 on the other hand (object) of Experiment 3 with 95% confidence intervals.

We fit a fifteenth linear mixed model to predict log-transformed regression path duration by comparing the extractions out of the subject and the extractions

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

out of the object with nominal subject (mean centered with subject coded positive and object coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region (number of characters) and the frequency of the lemme as covariates, and participants and items as random variables. The results of the model are reported in Table 14. There is a main effect of extraction type, such that the extraction conditions have shorter regression path durations than the control conditions. There is a main effect of distance, such that the subject conditions have longer regression path durations. However, there is no significant interaction effect.

Table 14: Results of the Linear Mixed Model (model n°15)

	Estimate	Std. Error	df	t value	Pr(> |t|)	Odd.ratio
(Intercept)	5.424	0.170	31.62	32	p<.001	226.87
extraction type	-0.076	0.023	516.04	-3	p<.005	1.08
distance	0.054	0.024	531.36	2	p<.05	1.05
length	0.048	0.014	26.63	3	p<.005	1.05
frequency	0.001	0.000	119.86	2	p<.05	1.00
extraction type:distance	-0.024	0.023	508.31	-1	0.3036	1.02

Hence, there is no evidence when we compare extraction sites that extractions out of the subject lead to longer regression path durations.

6 Regressions in region 2 (relative word)

I first look at the rate of regressions in, comparing the three distance conditions two by two, and then turn to the amount of regressions in.

Figure 11 on page 511 shows the rate of regression in to the relative word or coordination word. There are almost no regression in in the coordinations, and for this reason the following three models only compare the extraction conditions. We observe an increase of regressions in as the distance becomes longer.

I first compare the conditions low and medium. We fit a sixteenth binominal regression model to predict regression in (yes coded 1, no coded 0). The explanatory variable is the distance (mean centered with low distance coded positive and medium distance coded negative). We included the frequency of the lemme (number of characters) as covariate[4], and participants and items as random fac-

[4]In the models 16, 17, 18 and 19, I do not add the length of the region as covariate, because it makes the model fail to converge.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Figure 11: Rate of regression in in Region 2 of Experiment 3

tors. The results of the model are reported in Table 15. There is no significant effect in the model.

Table 15: Results of the Regression Mixed Model (model n°16)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-1.6939	0.2925	-5.7917	p<.001	5.44
distance	0.0789	0.2478	0.3184	0.7502	1.08
frequency	-0.001	0.0033	-0.2966	0.7668	1.00

I then compare the conditions low and high. We fit a seventeenth binominal regression model to predict regression in (yes coded 1, no coded 0). The explanatory variable is the distance (mean centered with low distance coded positive and high distance coded negative). We included the frequency of the lemme (number of characters) as covariate, and participants and items as random factors. The results of the model are reported in Table 16. There is no significant effect in the model.

Table 16: Results of the Regression Mixed Model (model n°17)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-2.7473	1.0553	-2.6034	p<.01	15.60
distance	0.3616	0.7011	0.5157	0.6061	1.44
frequency	0.0087	0.0072	1.2047	0.2283	1.01

I finally compare the conditions medium and high. We fit an eighteenth binominal regression model to predict regression in (yes coded 1, no coded 0). The explanatory variable is the distance (mean centered with the medium distance coded positive and the high distance coded negative). We included the frequency

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

of the lemme (number of characters) as covariate, and participants and items as random factors. The results of the model are reported in Table 17. There is no significant effect in the model, but a slight tendency such extractions out of the object with clitic subject show less regression in back to the relative word.

Table 17: Results of the Regression Mixed Model (model n°18)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-1.8922	0.45	-4.2053	p<.001	6.63
distance	-0.4382	0.2403	-1.8234	0.0682	1.55
frequency	0.0012	0.0028	0.4218	0.6732	1.00

Figure 12 on page 512 shows the amount of regression in to the relative word or coordination word. What is here striking is the higher amount of regression in for coordinations, given that it concerns only very few occurrences (Figure 11). It is especially true for the high distance condition.

Figure 12: Mean amount of regression in in Region 2 of Experiment 3

I first compare the conditions low and medium. We fit a nineteenth poisson regression model to predict the amount of regression in. The explanatory variables are distance (mean centered with low distance coded positive, medium coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the frequency of the lemme (number of characters) as covariate, and participants and items as random factors. The results of the model are reported in Table 18. There is no significant effect in the model.

I then compare the conditions low and high. We fit a twentieth poisson regression model to predict the amount of regression in. The explanatory variables are distance (mean centered with low distance coded positive and high distance coded negative) crossed with extraction type (mean centered with no extraction

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 18: Results of the Regression Mixed Model (model n°19)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-1.7567	0.2936	-5.9841	p<.001	5.79
extraction type	0.1731	0.2365	0.7321	0.4641	1.19
distance	0.1922	0.2005	0.9587	0.3377	1.21
frequency	-0.0012	0.0029	-0.4327	0.6652	1.00
extraction type:distance	-0.074	0.215	-0.3441	0.7308	1.08

coded negative and subextraction coded positive). We included the frequency of the lemme (number of characters) and the length of the region as covariates, and and random slopes for all fixed effects grouped by participants and items. The results of the model are reported in Table 19. There is no significant effect in the model.

Table 19: Results of the Regression Mixed Model (model n°20)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-3.521	2.880	-1.2224	0.2216	33.81
extraction type	-0.240	0.661	-0.3629	0.7167	1.27
distance	-0.149	0.371	-0.4005	0.6888	1.16
frequency	0.003	0.003	1.1416	0.2536	1.00
length	0.393	0.758	0.5181	0.6044	1.48
extraction type:distance	0.233	0.508	0.4586	0.6466	1.26

I finally compare the conditions medium and high. We fit a twenty-first poisson regression model to predict the amount of regression in. The explanatory variables are distance (mean centered with with the medium distance coded positive and the high distance coded negative) crossed with extraction type (mean centered with no extraction coded negative and subextraction coded positive). We included the length of the region as covariate, and participants and items as random factors. The results of the model are reported in Table 20. There is no significant effect in the model either.

Therefore, and except for a very small tendency with a marginally significant effect of distance in model n°18, there is no evidence that distance has an impact on regressions back to the relative word.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Table 20: Results of the Regression Mixed Model (model n°21)

	Estimate	Std. Error	z value	Pr(> |z|)	Odd.ratio
(Intercept)	-3.938	2.399	-1.6416	0.1007	51.29
extraction type	-0.321	0.424	-0.7560	0.4496	1.38
distance	-0.273	0.180	-1.5187	0.1288	1.31
length	0.573	0.633	0.9059	0.3650	1.77
extraction type:distance	0.157	0.208	0.7540	0.4508	1.17

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

References

Abeillé, Anne. 2007. *Les grammaires d'unification*. Paris: Hermes science publications.

Abeillé, Anne, Olivier Bonami, Danièle Godard & Jesse Tseng. 2004. The Syntax of French N′ Phrases. In Stefan Müller (ed.), *Proceedings of the HPSG-2004 Conference, Center for Computational Linguistics, Katholieke Universiteit Leuven*, 6–26. Stanford: CSLI Publications. http://cslipublications.stanford.edu/HPSG/5/.

Abeillé, Anne, Olivier Bonami, Danièle Godard & Jesse Tseng. 2006. The Syntax of French *à* and *de*: An HPSG Analysis. In Patrick Saint-Dizier (ed.), *Syntax and Semantics of Prepositions* (Text, Speech and Language Technology 29), 147–162. Springer Verlag.

Abeillé, Anne & Robert D. Borsley. 2008. Comparative correlatives and parameters. en. *Lingua* 118(8). 1139–1157. DOI: 10.1016/j.lingua.2008.02.001.

Abeillé, Anne, Robert D. Borsley & Maria-Teresa Espinal. 2006. The syntax of Comparative Correlatives in French and Spanish. In Stefan Müller (ed.), *The Proceedings of the 13th International Conference on Head-Driven Phrase Structure Grammar*, 6–26. Stanford: CSLI Publications. http://cslipublications.stanford.edu/HPSG/7/.

Abeillé, Anne & Rui Chaves. 2020. Chapter 16: Coordination. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook* (Empirically Oriented Theoretical Morphology and Syntax). Berlin: Language Science Press.

Abeillé, Anne, Lionel Clément & Loïc Liégeois. 2019. Un corpus annoté pour le français : le French Treebank. *TAL Traitement Automatique des Langues* 60(2). 19–43.

Abeillé, Anne, Lionel Clément & François Toussenel. 2003. Building a treebank for French. In Anne Abeillé (ed.), *Treebanks*. Dordrecht: Kluwer.

Abeillé, Anne, Benoît Crabbé, Jean-Marie Marandin & Danièle Godard. 2012. French questioning declaratives: a corpus study. In *Proceedings of the 16th Workshop on the Semantics and Pragmatics of Dialogue – Full Papers*, 70–79. Paris: SEMDIAL. http://semdial.org/anthology/Z12-Abeille%5C_semdial%5C_0011.pdf.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Abeillé, Anne & Danièle Godard. 1997. The syntax of French negative adverbs. In Danielle Forget, Paul Hirschbuhler, France Martineau & Maria Luisa Rivero (eds.), *Negation and Polarity*. Amsterdam & Philadelphia: John Benjamins.

Abeillé, Anne & Danièle Godard. 1999a. French Word Order And Lexical Weight. English. In Robert D. Borsley (ed.), *Nature and function of syntactic categories*, 325–360. Bradford: Emerald Group.

Abeillé, Anne & Danièle Godard. 1999b. La position de l'adjectif épithète en français : le poids des mots. *Recherches Linguistiques de Vincennes* 28. 9–32.

Abeillé, Anne & Danièle Godard. 2002. The syntactic structures of French auxiliaries. *Language* 78. 404–452.

Abeillé, Anne & Danièle Godard. 2003. The Syntactic Flexibility of Adverbs: French Degree Adverbs. In Stefan Müller (ed.), *Proceedings of the HPSG-2003 Conference, Michigan State University, East Lansing*, 26–46. Stanford: CSLI Publications. http://cslipublications.stanford.edu/HPSG/4/.

Abeillé, Anne & Danièle Godard. 2007. Les relatives sans pronom relatif. In Michaël Abecassis, Laure Ayosso & Elodie Vialleton (eds.), *Le francais parlé au 21ème siècle: Normes et variations dans les discours et en interaction*, vol. 2, 37–60. Paris: L'Harmattan. https://halshs.archives-ouvertes.fr/halshs-00748342 (15 March, 2017).

Abeillé, Anne, Danièle Godard & Frédéric Sabio. 2008. Two types of NP preposing in French. In Stefan Müller (ed.), *The Proceedings of the 15th International Conference on Head-Driven Phrase Structure Grammar*, 306–324. Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/HPSG/9/.

Abeillé, Anne, Danièle Godard & Ivan A. Sag. 1998. *French relative clauses*. manuscript.

Abeillé, Anne, Barbara Hemforth & Elodie Winckel. 2016. Les relatives en *dont* du français : études empiriques. In Franck Neveu, Gabriel Bergounioux, Marie-Hélène Côté, Jean-Michel Fournier & Linda Hriba et Sophie Prévost (eds.), *5e Congrès Mondial de Linguistique Française* (SHS Web of Conferences 27). https://www.shs-conferences.org/articles/shsconf/abs/2016/05/shsconf_cmlf2016_14011/shsconf_cmlf2016_14011.html.

Abeillé, Anne, Barbara Hemforth, Elodie Winckel & Edward Gibson. 2020. Extraction from subjects: Differences in acceptability depend on the discourse function of the construction. en. *Cognition* 204. 104293. DOI: 10.1016/j.cognition.2020.104293. (21 August, 2020).

Abeillé, Anne & Elodie Winckel. 2019. Extracting out of the subject in French: experimental evidence. In *Proceedings of the First Workshop on Quantitative Syntax (Quasy, SyntaxFest 2019)*, 68–74. Paris, France: Association for Computational Linguistics. https://www.aclweb.org/anthology/W19-7908.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Abeillé, Anne & Elodie Winckel. 2020. French subject island? Empirical studies of *dont* and *de qui*. *Journal of French Language Studies*. 1–26. DOI: 10.1017/S0959269520000137.

Adli, Aria. 2006. French wh-in-situ Questions and Syntactic Optionality: Evidence from Three Data Types. *Zeitschrift für Sprachwissenschaft* 25(2). DOI: 10.1515/ZFS.2006.007. (22 July, 2020).

Aguila-Multner, Gabriel & Berthold Crysmann. 2020. French clitic climbing as periphrasis. *Lingvisticæ Investigationes* 43(1). 23–61.

Alexiadou, Artemis, Elena Anagnostopoulou & Florian Schäfer. 2015. *External Arguments in Transitivity Alternations: A Layering Approach*. en. Google-Books-ID: NR8UDAAAQBAJ. Oxford University Press.

Almeida, Diego. 2014. Subliminal wh-islands in brazilian Portuguese and the consequences for Syntactic theory. *Revista da ABRALIN* 13(2). DOI: 10.5380/rabl.v13i2.39611.

Ambar, Manuela. 2002. Wh-questions and Wh-exclamatives: Unifying mirror effects. en. In Claire Beyssade, Reineke Bok-Bennema, Frank Drijkoningen & Paola Monachesi (eds.), *Romance Languages and Linguistic Theory 2000: Selected papers from 'Going Romance' 2000, Utrecht, 30 November–2 December* (Current Issues in Linguistic Theory 232), 15–40. Amsterdam: John Benjamins Publishing Company. DOI: 10.1075/cilt.232.03amb. (16 May, 2022).

Ambridge, Ben & Adele E. Goldberg. 2008. The island status of clausal complements: evidence in favor of an information structure explanation. *Cognitive Linguistics* 19(3). 349–381.

An, Aixiu. 2020. *Theoretical, empirical and computational approaches to agreement with coordination structures*. Paris: Université de Paris. (Ph.D. Thesis).

Aoun, Joseph & Yen-hui Audrey Li. 1993. Wh-Elements in Situ: Syntax or LF? *Linguistic Inquiry* 24(2). Publisher: The MIT Press, 199–238. https://www.jstor.org/stable/4178811 (16 May, 2023).

Ariel, Mira. 1988. Referring and accessibility. *Journal of Linguistics* 24. 65–87.

Armstrong, Nigel. 2001. *Social and stylistic variation in spoken French: a comparative approach*. eng (IMPACT: Studies in Language, Culture and Society 8). Amsterdam & Philadelphia: John Benjamins.

ATILF, CNRS & Université de Lorraine. Version décembre 2016. *Base textuelle FRANTEXT*. http://www.frantext.fr.

Bach, Emmon & George Horn. 1976. Remarks on 'Conditions on Transformations'. *Linguistic Inquiry* 7. 265–299. https://www.jstor.org/stable/4177922.

Bader, Markus & Jana Häussler. 2010. Toward a model of grammaticality judgments. en. *Journal of Linguistics* 46(2). 273–330. DOI: 10.1017/S0022226709990260.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Baroni, Marco, Silvia Bernardini, Adriano Ferraresi & Eros Zanchetta. 2009. The WaCky wide web: a collection of very large linguistically processed web-crawled corpora. *Language Resources and Evaluation* 43(3). 209–226. http://www.jstor.org.359218229.erf.sbb.spk-berlin.de/stable/27743614.

Barr, Dale J., Roger Levy, Christoph Scheepers & Harry J. Tily. 2013. Random effects structure for confirmatory hypothesis testing: Keep it maximal. *Journal of memory and language* 68(3). 255–278.

Belletti, Adriana & Luigi Rizzi. 1988. Psych-Verbs and Θ-Theory. *Natural Language and Linguistic Theory* 6(3). 291–352. http://www.jstor.com/stable/4047649.

Berard, Lolita. 2012. *Dépendances à distance en français contemporain. : etude sur corpus "c'est ce qu'on pense qui devrait être fait"*. Université de Lorraine. (Ph.D. Thesis). http://www.theses.fr/2012LORR0321/document.

Beyssade, Claire. 2006. La structure de l'information dans les questions : quelques remarques sur la diversité des formes interrogatives en français. *Linx* 55. 173–193. DOI: 10.4000/linx.470.

Bianchi, Valentina & Cristiano Chesi. 2014. Subject islands, reconstruction, and the flow of the computation. *Linguistic Inquiry* 45(4). 525–569.

Bianchi, Valentina & Cristiano Chesi. 2015. On a PP/DP asymmetry in extraction. In Elisa Di Domenico, Cornelia Hamann & Simona Matteini (eds.), *Structures, Strategies and Beyond: Studies in honour of Adriana Belletti* (Linguistik Aktuell/Linguistics Today 223), 47–66. Amsterdam & Philadelphia: John Benjamins. https://doi.org/10.1075/la.223.03bia.

Bîlbîie, Gabriela & Frédéric Laurens. 2010. Towards a non-elliptical analysis of verbless relative adjuncts. *Bucharest Working Papers in Linguistics* 1. 51–67.

Bildhauer, Felix. 2008. *Representing Information Structure in an HPSG grammar of Spanish*. Universität Bremen. (Ph.D. Thesis).

Bildhauer, Felix & Philippa Cook. 2010. German Multiple Fronting and Expected Topic-Hood. In Stefan Müller (ed.), *The Proceedings of the 17th International Conference on Head-Driven Phrase Structure Grammar*, 68–79. Stanford: CSLI Publications. http://cslipublications.stanford.edu/HPSG/2010/.

Blanche-Benveniste, Claire. 1990. Usages normatifs et non normatifs dans des relatives en français, espagnol, portugais. In Johannes Bechert, Giuliano Bernini & Claude Buridant (eds.), *Towards a typology of European languages*, 317–333. Berlin & New York: Mouton de Gruyter.

Blaszczak, Joanna, Stefanie Dipper, Gisbert Fanselow, Shinishiro Ishihara, Svetlana Petrova, Stavros Skopeteas, Thomas Weskott & Malte Zimmermann. 2007. Morphology. In Stefanie Dipper, Stavros Skopeteas & Michael Goetze (eds.), *Information Structure in Cross-Linguistic Corpora* (Interdisciplinary Studies on

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Information Structure 7), 55–94. https://publishup.uni-potsdam.de/opus4-ubp/frontdoor/deliver/index/docId/2033/file/Kapitel3%5C_07.pdf.

Bloom, Paul. 1990. Subjectless Sentences in Child Language. *Linguistic Inquiry* 21(4). 491–504. http://www.jstor.org/stable/4178692.

Bloom, Paul. 1993. Grammatical Continuity in Language Development: The Case of Subjectless Sentences. *Linguistic Inquiry* 24(4). 721–734. http://www.jstor.org/stable/4178837.

Boeckx, Cedric. 1999. Decomposing French Questions. *University of Pennsylvania Working Papers in Linguistics* 6(1). 69–80.

Boeckx, Cedric. 2003. *Islands and chains: resumption as stranding*, vol. 63 (Linguistik Aktuell/Linguistics Today). Amsterdam & Philadelphia: John Benjamins.

Boland, Julie E., Michael K. Tanenhaus, Susan M. Garnsey & Greg N. Carlson. 1995. Verb argument structure in parsing and interpretation: Evidence from wh-questions. *Journal of Memory and Language* 43. 413–432.

Bolinger, Dwight. 1979. Asking more than one thing at a time. English. In Henry Hiz (ed.), *Questions*, 107–150. Dordrecht: Springer Netherlands. https://doi.org/10.1007/978-94-009-9509-3 (16 June, 2020).

Bonami, Olivier & Elisabeth Delais-Roussarie. 2006. Metrical Phonology in HPSG. In Stefan Müller (ed.), *The Proceedings of the 13th International Conference on Head-Driven Phrase Structure Grammar*, 39–59. Stanford: CSLI Publications. http://cslipublications.stanford.edu/HPSG/7/.

Bonami, Olivier & Danièle Godard. 2001. Inversion du sujet: constituance et ordre des mots. In Jean-Marie Marandin (ed.), *Cahier Jean-Claude Milner*, 117–174. Lagrasse (Aude): Verdier.

Bonami, Olivier, Danièle Godard & Jean-Marie Marandin. 1998. French subject inversion in extraction contexts. In Gosse Bouma, Geert-Jan Kruijff & Richard T. Oehrle (eds.), *Proceedings Joint Conference on Formal Grammar, Head-Driven Phrase Structure Grammar, and Categorial Grammar*, 101–112.

Borsley, Robert D. & Berthold Crysmann. 2020. Chapter 13: Unbounded dependencies. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook* (Empirically Oriented Theoretical Morphology and Syntax). Berlin: Language Science Press.

Bosch, Sina, Ilaria De Cesare, Claudia Felser & Ulrike Demske. 2020. *A multi-methodological approach to word order variation in German infinitival complementation.* Talk. Talk at Linguistic Evidence 2020 in Tübingen. Tübingen. https://uni-tuebingen.de/en/research/core-research/collaborative-research-centers/crc-833/linguistic-evidence-2020/le-2020-programme (23 July, 2020).

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Bošković, Željko. 1998. LF movement and the Minimalist Program. In *Proceedings of the North East Linguistic Society*, vol. 28, 43–57. Amherst, MA: GLSA (Graduate Linguistic Student Association).

Bouma, Gosse, Robert Malouf & Ivan A. Sag. 2001. Satisfying Constraints on Extraction and Adjunction. *Natural Language and Linguistic Theory* 19(1). 1–65. DOI: 10.1023/A:1006473306778.

Bresnan, Joan & Sam A. Mchombo. 1987. Topic, Pronoun, and Agreement in Chicheŵa. *Language* 63(4). 741. DOI: 10.2307/415717.

Brew, Chris. 1995. Stochastic HPSG. In *Proceedings of the 7th Conference of the EACL*. Dublin.

Bröker, Norbert. 1999. *Eine Dependenzgrammatik zur Kopplung heterogener Wissensquellen* (Linguistische Arbeiten 405). Tübingen: Max Niemeyer Verlag.

Burzio, Luigi. 1986. *Italian syntax: a government-binding approach*. Dordrecht: Reidel.

Candito, Marie & Djamé Seddah. 2012a. Effectively long-distance dependencies in French: annotation and parsing evaluation. In *TLT 11 – The 11th International Workshop on Treebanks and Linguistic Theories*. Lisbon. https://hal.archives-ouvertes.fr/hal-00769625.

Candito, Marie & Djamé Seddah. 2012b. Le corpus sequoia : annotation syntaxique et exploitation pour l'adaptation d'analyseur par pont lexical. In *Proceedings of TALN 2012 (in French)*. Grenoble.

Carroll, John M. 1979. Complex compounds: Phrasal embedding in lexical structures. *Linguistics* 17. 863–877.

Cattell, Ray. 1976. Constraints on movement rules. *Language* 52(1). 18–50.

Chafe, Wallace L. 1976. Givenness, contrastiveness, definiteness, subjects, topics and point of view. In Charles N. Li (ed.), *Subject and Topic*, 27–55. New York: Academic Press.

Chaves, Rui P. 2012. On the grammar of extraction and coordination. *Natural Language and Linguistic Theory* 2(30). 465–512.

Chaves, Rui P. 2013. An expectation-based account of subject islands and parasitism. *Journal of Linguistics* 49(2). 297–344.

Chaves, Rui P. & Jeruen E. Dery. 2014. Which subject islands will the acceptability of improve with repeated exposure? In Robert E. Sanatana-LaBarge (ed.), *31st West Coast Conference on Formal Linguistics*, 96–106. Somerville, MA: Cascadilla Proceedings Project.

Chaves, Rui P. & Jeruen E. Dery. 2019. Frequency effects in subject islands. *Journal of linguistics* 55(3). 475–521. DOI: 10.1017/S0022226718000294.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Chaves, Rui P. & Michael T. Putnam. 2020. *Unbounded Dependency Constructions: Theoretical and Experimental Perspectives*. Oxford, UK & New York: Oxford University Press.

Cheng, Lisa Lai Shen. 1991. *On the typology of wh-questions*. eng. Massachusetts Institute of Technology. (Ph.D. Thesis). https://dspace.mit.edu/handle/1721.1/13938 (22 July, 2020).

Cheng, Lisa Lai Shen & Johan Rooryck. 2000. Licensing Wh-in-situ. en. *Syntax* 3(1). 1–19. DOI: 10.1111/1467-9612.00022.

Chomsky, Noam. 1964. Current issues in linguistic theory. In Jerry A. Fodor & Jerrold J. Katz (eds.), *The structure of language: readings in the philosophy of language*, Prentice Hall, 50–118. Englewood Cliffs, NJ.

Chomsky, Noam. 1965. *Aspects of the Theory of Syntax*. Cambridge, MA: MIT Press.

Chomsky, Noam. 1973. Conditions on transformations. In Steven Anderson & Paul Kiparsky (eds.), *A festschrift for Morris Halle*, 232–285. New York: Winston.

Chomsky, Noam. 1981. *Lectures on Government and Binding*. Berlin & New York: Mouton de Gruyter.

Chomsky, Noam. 1986. *Barriers*, vol. 13 (Linguistic inquiry monographs). Cambridge, MA: MIT Press.

Chomsky, Noam. 1995. *The Minimalist program*, vol. 28 (Current studies in linguistics). Cambridge, MA: The MIT Press.

Chomsky, Noam. 2001. Derivation by phase. In Michael Kenstowicz (ed.), *Ken Hale: A Life in Language* (Current studies in linguistics), 1–52. The MIT Press. DOI: 10.7551/mitpress/4056.001.0001.

Chomsky, Noam. 2005. On Phases. manuscript. http://www.fosssil.in/Chomsky%5C_Phases.pdf.

Chomsky, Noam. 2008. On Phases. In Robert Freidin, David Michaels, Carlos P. Otero & Maria Luisa Zubizarreta (eds.), *Foundational Issues in Linguistic Theory: Essays in Honor of Jean-Roger Vergnaud*, 133–165. Cambridge, MA: MIT Press.

Christensen, Rune H. B. 2019. *Ordinal – Regression Models for Ordinal Data*. R package version 2019.12-10. https://CRAN.R-project.org/package=ordinal.

Cinque, Guglielmo. 1990. *Types of ā-dependencies*, vol. 17 (Linguistic inquiry monographs). Cambridge, MA: MIT Press.

Clark, Herbert H. & Thomas Wasow. 1998. Repeating Words in Spontaneous Speech. en. *Cognitive Psychology* 37(3). 201–242. DOI: 10.1006/cogp.1998.0693.

Clifton, Charles & Lyn Frazier. 1989. Comprehending sentences with long distance dependencies. In Gregory N. Carlson & Michael K. Tannenhaus (eds.), *Linguistic structure in language processing*, 272–317. Dordrecht: Kluwer.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Clifton, Charles, Adrian Staub & Keith Rayner. 2007. Eye movements in reading words and sentences. In *Eye Movements*, 341–371. Oxford, UK: Elsevier Science Ltd. DOI: 10.1016/B978-008044980-7/50017-3.

Clopper, C. J. & E. S. Pearson. 1934. The Use of Confidence or Fiducial Limits Illustrated in the Case of the Binomial. *Biometrika* 26(4). 404–413. DOI: 10.1093/biomet/26.4.404.

Comorovski, Ileana. 1996. *Interrogative Phrases and the Syntax-Semantics Interface*. English. Dordrecht: Springer Netherlands. http://public.ebookcentral.proquest.com/choice/publicfullrecord.aspx?p=3105068 (22 July, 2020).

Comrie, Bernard & Tania Kuteva. 2013. Relativization strategies (v2020.3). In Matthew S. Dryer & Martin Haspelmath (eds.), *The world atlas of language structures online*. Zenodo. DOI: 10.5281/zenodo.7385533. https://doi.org/10.5281/zenodo.7385533.

Conklin, Kathryn, Ana Pellicer-Sanchez & Gareth Carrol. 2018. *Eye-tracking: a guide for applied linguistics research*. English. Cambridge, UK: Cambridge University Press.

Copestake, Ann, Dan Flickinger, Carl Pollard & Ivan A. Sag. 2005. Minimal Recursion Semantics. *Research on Language and Computation* 3. 281–332.

Corver, Norbert. 2006. Freezing Effects. In Martin Everaert & Henk C. van Riemsdijk (eds.), *The Blackwell companion to syntax*, 383–406. Oxford, UK: Blackwell.

Coveney, Aidan B. 1996. *Variability in Spoken French. A Sociolinguistic Study of Interrogation and Negation*. Exeter: Elm Bank.

Crysmann, Berthold. 2012. Resumption and Islandhood in Hausa. In Philippe de Groote & Mark-Jan Nederhof (eds.), *Formal Grammar. 15th and 16th International Conference on Formal Grammar, FG 2010 Copenhagen, Denmark, August 2010, FG 2011 Lubljana, Slovenia, August 2011*, vol. 7395. Springer.

Culicover, Peter W. & Ray Jackendoff. 2005. *Simpler syntax* (Oxford linguistics). Oxford, UK & New York: Oxford University Press.

Culicover, Peter W. & Kenneth Wexler. 1977. Some syntactic implications of a theory of language learnability. In Peter W. Culicover, Thomas Wasow & Adrian Akmajian (eds.), *Formal Syntax*. New York: Academic Press.

Davies, William D. & Stanley Dubinsky. 2009. On the existence (and distribution) of sentential subjects. In Donna B. Gerdts, John C. Moore & Maria Polinsky (eds.), *Hypothesis A/hypothesis B: Linguistic explorations in honor of David M. Perlmutter*, 111–128. Cambridge, MA: MIT Press. https://scholarcommons.sc.edu/cgi/viewcontent.cgi?article=1024%5C&context=ling%5C_facpub.

De Kuthy, Kordula. 2002. *Discontinuous NPs in German*, vol. 14 (Series in Contraint-Based Lexicalism). Stanford, CA: CSLI Publications.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

De Kuthy, Kordula. 2020. Information structure. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook* (Empirically Oriented Theoretical Morphology and Syntax). To appear. Berlin: Language Science Press.

Deane, Paul. 1991. Limits to Attention: a Cognitive Theory of Island Phenomena. *Cognitive Linguistics* 2(1). 1–63.

Destruel, Emilie. 2012. The French c'est-cleft: An empirical study on its meaning and use. In Christopher Piñon (ed.), *Empirical Issues in Syntax and Semantics 9 (Selected papers from CSSP 2011)*, 95–112. CSSP. http://www.cssp.cnrs.fr/eiss9/.

Destruel, Emilie, David I. Beaver & Elizabeth Coppock. 2019. It's Not What You Expected! The Surprising Nature of Cleft Alternatives in French and English. *Frontiers in Psychology* 10. 1400. DOI: 10.3389/fpsyg.2019.01400.

Deulofeu, José. 1981. Perspective linguistique et sociolinguistique dans l'étude des relatives en français. In *Recherches sur le français parlé*, vol. 3, 135–193. Publications du Gars, Université de Provence.

Dillon, Brian & Matthew Wagers. 2019. *Approaching gradience in acceptability with the tools of signal detection theory*. OSF Preprints. DOI: 10.31219/osf.io/apxru.

Do, Monica L. & Elsi Kaiser. 2017. The relationship between Syntactic Satiation and Syntactic Priming: a First Look. *Frontiers in Psychology* 8. 1851. DOI: 10.3389/fpsyg.2017.01851.

Doetjes, Jenny, Georges Rebuschi & Annie Rialland. 2004. Cleft sentences. In Francis Corblin & Henriette de Swart (eds.), *Handbook of French semantics* (CSLI Lecture Notes no. 170), 529–552. Stanford, CA: CSLI Publications. DOI: OCLC:ocm54823030.

Dong, Zhiyin, Ryan Rhodes & Arild Hestvik. 2021. Active Gap Filling and Island Constraint in Processing the Mandarin "Gap-Type" Topic Structure. *Frontiers in Communication* 6. 650659. DOI: 10.3389/fcomm.2021.650659. https://www.frontiersin.org/articles/10.3389/fcomm.2021.650659/full (14 May, 2022).

Downing, Bruce. 1978. Some Universals of Relative Clause Structure. In Joseph H. Greenberg (ed.), *Universals of Human Language*, vol. 4, 375–418. Stanford, CA: Stanford University Press.

Dowty, David R., Robert Eugene Wall & Stanley Peters. 1981. *Introduction to Montague semantics* (Synthese language library 11). Dordrecht, Holland & Boston, MA: D. Reidel Pub. Co. & Kluwer Boston Inc.

Drummond, Alex. 2010. *Internet Based EXperiments (IBEX)*. http://spellout.net/ibexfarm.

Edwards, Allen L. 1957. *The social desirability variable in personality assessment and research*. New York: Dryden.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Ehrlich, Susan F. & Keith Rayner. 1981. Contextual effects on word perception and eye movements during reading. en. *Journal of Verbal Learning and Verbal Behavior* 20(6). 641–655. DOI: 10.1016/S0022-5371(81)90220-6.

Engdahl, Elisabet. 1999. Integrating pragmatics into the grammar. In Lunella Mereu (ed.), *Boundaries of Morphology and Syntax*, 175–194. Amsterdam & Philadelphia: John Benjamins.

Engdahl, Elisabeth & Enric Vallduví. 1996. Information packaging in HPSG. In Claire Grover & Enric Vallduví (eds.), *Studies in HPSG*, vol. 12 (Edinburgh working papers in cognitive science), 1–31. Edinburgh: Centre for Cognitive Science.

Erteschik-Shir, Nomi. 1973. *On the nature of island constraints*. MIT. (Ph.D. Thesis).

Erteschik-Shir, Nomi. 2006. What's What? In Gisbert Fanselow, Caroline Féry, Matthias Schlesewsky & Ralf Vogel (eds.), *Gradience in Grammar: Generative Perspectives*, 317–335. Oxford, UK & New York: Oxford University Press.

Erteschik-Shir, Nomi, Associate Professor Department of Foreign Literatures and Linguistics Nomi Erteschik-Shir & Erteschik-Shir Nomi. 1997. *The Dynamics of Focus Structure*. en. Cambridge, UK: Cambridge University Press.

Erteschik-Shir, Nomi & Shalom Lappin. 1979. Dominance and the functional explanation of island phenomena. *Theoretical Linguistics* 6. 41–86.

Fadlon, Julie, Adam M. Morgan, Aya Meltzer-Asscher & Victor S. Ferreira. 2019. It depends: Optionality in the production of filler-gap dependencies. *Journal of Memory and Language* 106. 40–76.

Fodor, Janet Dean, Stefanie Nickels & Esther Schott. 2017. Center-Embedded Sentences. en. In Roberto G. de Almeida & Lila R. Gleitman (eds.), *On Concepts, Modules, and Language: Cognitive Science at Its Core*. Oxford, UK & New York: Oxford University Press. DOI: 10.1093/oso/9780190464783.003.0007.

Francom, Jerid Cole. 2011. *Experimental Syntax: Exploring the Effect of Repeated Exposure to Anomalous Syntactic Structure—Evidence from Rating and Reading Tasks*. English. Proquest, Umi Dissertation Publishing.

Frazier, Lyn. 1987. Syntactic processing: evidence from Dutch. *Natural Language and Linguistic Theory* 5. 519–559.

Frazier, Lyn, Keith Rayner & John A. Hawkins. 1988. Parameterizing the language processing system: Left versus right branching within and across languages. In *Explaining language universals*, 247–279. Oxford, UK: Blackwell.

Fukuda, Shin, Grant Goodall, Michel Dan & Henry Beecher. 2012. Is Magnitude Estimation Worth the Trouble? In Jaehoon Choi, E. Alan Hogue, Jeffrey Punske, Deniz Tat, Jessamyn Schertz & Alex Trueman (eds.), *Proceedings of the 29th West Coast Conference on Formal Linguistics*. Sommerville, MA: Cascadilla Proceedings Project.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Fukuda, Shin-ichi, Chizuru Nakao, Akira Omaki & M. Polinsky. 2014. Revisiting Subject-Object Asymmetry: Subextraction in Japanese. In Theodore Levin & Ryo Masuda (eds.), *Proceedings of the 10th Workshop on Altaic Formal Linguistics (WAFL10)*, vol. 87 (MIT Working Papers in Linguistics). Cambridge, MA: Massachusetts Institute of Technology. https://www.semanticscholar.org/paper/Revisiting-Subject-Object-Asymmetry%3A-Subextraction-Fukuda-Nakao/a3cddab1c39c54d305c077dc2c979d61afc417fa (22 June, 2023).

Gallego, Ángel J. & Juan Uriagereka. 2007. Conditions on sub-extraction. In Luis Eguren & Olga Fernández Soriano (eds.), *Coreference, modality, and focus*, vol. 111 (Linguistik Aktuell/Linguistics Today), 45–70. Amsterdam & Philadelphia: John Benjamins. DOI: 10.1075/la.111.04gal.

Gazdar, Gerald. 1981. Unbounded Dependencies and Coordinate Structure. *Linguistic Inquiry* 12(2). 155–184.

Gennari, Silvia P. & Maryellen C. McDonald. 2008. Semantic indeterminacy in object relative clauses. *Journal of Memory and Language* 58(4). 161–187.

Gibson, Edward & Evelina Fedorenko. 2013. The need for quantitative methods in syntax and semantics research. *Language and Cognitive Processes* 28. 88–124.

Gibson, Ted. 1998. Linguistic complexity: locality of syntactic dependencies. *Cognition* 68. 1–76.

Gibson, Ted. 2000. The dependency locality theory: a distance-based theory of linguistic complexity. In Alec Marantz, Yasushi Miyashita & Wayne O'Neil (eds.), *Image, Language, Brain*, 95–126. MIT Press.

Ginzburg, Jonathan & Ivan A. Sag. 2000. *Interrogative Investigations: the form, meaning, and use of English Interrogatives*. Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/site/1575862786.html.

Giorgi, Alessandra & Giuseppe Longobardi. 1991. *The syntax of noun phrases: configuration, parameters, and empty categories*, vol. 57 (Cambridge studies in linguistics). Cambridge, UK, & New York: Cambridge University Press.

Godard, Danièle. 1985. French Relative Clauses with DONT: ā-Chains and Binding Principles. In Jacqueline Guéron, Hans-Georg Obenauer & Jean-Yves Pollock (eds.), *Grammatical Representation*. Dordrecht: Foris.

Godard, Danièle. 1988. *La syntaxe des relatives en français*. Paris: Ed. du Centre national de la Recherche Scientifique.

Godard, Danièle. 1992. Extraction out of NP in French. *Natural Language and Linguistic Theory* 10. 233–277.

Godard, Danièle & Ivan A. Sag. 1996. Quels compléments de nom peut-on extraire en français? *Langages* 122. 60–79.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Godfrey, John J., Edward C. Holliman & Jane McDaniel. 1992. SWITCHBOARD: telephone speech corpus for research and development. In *ICASSP-92: IEEE International Conference on Acoustics, Speech, and Signal Processing, San Francisco, CA, USA*, vol. 1, 517–520. Piscataway, NJ: IEEE Service Center.

Goldberg, Adele. 2006. *Constructions at Work*. Oxford, UK & New York: Oxford University Press.

Goldberg, Adele. 2013. Backgrounded constituents cannot be extracted. In Jon Sprouse & Norbert Hornstein (eds.), *Experimental Syntax and Island Effects*, 221–238. Cambridge, UK: Cambridge University Press.

Goodall, Grant. 2011. Syntactic Satiation and the Inversion Effect in English and Spanish Wh-Questions. en. *Syntax* 14(1). _eprint: https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1467-9612.2010.00148.x, 29–47. DOI: 10.1111/j.1467-9612.2010.00148.x. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1467-9612.2010.00148.x (22 June, 2023).

Götze, Michael, Thomas Weskott, Cornelia Endriss, Ines Fiedler, Stefan Hinterwimmer, Svetlana Petrova, Anne Schwarz, Stavros Skopeteas & Ruben Stoel. 2007. Information Structure. In Stefanie Dipper, Michael Götze & Stavros Skopeteas (eds.), *Information Structure in Cross-Linguistic Corpora: annotation Guidelines for Phonology, Morphology, Syntax, Semantics and Information Structure*, vol. 7 (Working Papers of the SFB632, Interdisciplinary Studies on Information Structure (ISIS)), 147–187. Potsdam: Universitätsverlag Potsdam.

Greco, Ciro, Marco Marelli & Liliane Haegeman. 2017. External syntax and the Cumulative Effect in subject sub-extraction: An experimental evaluation. *The Linguistic Review* 34(3). DOI: 10.1515/tlr-2017-0009.

Grice, Paul H. 1975. Logic and conversation. In Peter Cole & Jerry L. Morgan (eds.), *Studies in Syntax and Semantics III: Speech Acts*, 183–98. New York: Academic Press.

Gries, Stefan Th. & Vida Samiian. 2002. Preposition stranding in English: predicting speakers' behaviour. In *Proceedings of the Western Conference on Linguistics*, vol. 12, 230–241. Fresno, CA.

Grosu, Alexander. 1981. *Approaches to island phenomena*, vol. 45. Amsterdam: North-Holland.

Guéron, Jacqueline. 1980. On the Syntax and Semantics of PP Extraposition. *Linguistic Inquiry* 11(4). 637–678.

Gussenhoven, Carlos. 2007. Types of Focus in English. In Chungmin Lee, Matthew Gordon & Daniel Büring (eds.), *Topic and Focus: cross-Linguistic Perspectives on Meaning and Intonation*, vol. 82 (Studies in Linguistics and Philosophy), 83–100. Dordrecht: Springer Netherlands. DOI: 10.1007/978-1-4020-4796-1_5.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Guzmán Naranjo, Matías. 2015. Unifying everything: Integrating quantitative effects into formal models of grammar. en. In Johannes Wahle, Marisa Köllner, Harald Baayen, Gerhard Jäger & Tineke Baayen-Oudshoorn (eds.), *Proceedings of the 6th Conference on Quantitative Investigations in Theoretical Linguistics*. DOI: 10.15496/PUBLIKATION-8636.

Haegeman, Liliane, Ángel L. Jiménez-Fernández & Andrew Radford. 2014. Deconstructing the Subject Condition in terms of cumulative constraint violation. *The Linguistic Review* 31. 73–150.

Hartig, Florian. 2019. *DHARMa: Residual Diagnostics for Hierarchical (Multi-Level / Mixed) Regression Models*. R package version 0.2.2. https://CRAN.R-project.org/package=DHARMa.

Hawkins, John A. 1999. Processing Complexity and Filler-Gap Dependencies across Grammars. *Language* 75(2). 244. DOI: 10.2307/417261.

Heck, Fabian. 2009. On certain properties of pied-piping. *Linguistic Inquiry* 40(1). 75–111.

Herschensohn, Julia. 1992. Case marking and French Psych-Verbs. *Lingvisticae Investigationes* 15(1). 21–40.

Hirschbühler, Paul & Daniel Valois. 1992. Argument extraction out of indirect questions in French. In Helen Goodluck & Michael Rochemont (eds.), *Island Constraints*, vol. 15 (Studies in Theoretical Psycholinguistics), 195–222. Dordrecht: Springer Netherlands.

Hofmeister, Philip, Laura Staum Casasanto & Ivan A. Sag. 2013. Islands in the grammar? Standards of evidence. In Jon Sprouse & Norbert Hornstein (eds.), *Experimental Syntax and Island Effects*, 42–63. Cambridge, UK: Cambridge University Press.

Hofmeister, Philip & Ivan A. Sag. 2010. Cognitive constraints and island effects. *Language* 86(2). 366–415.

Holmes, Virginia M. & J. Kevin O'Reagan. 1981. Eye Fixation Patterns during the Reading of Relative-Clause Sentences. *Journal of Verbal Learning and Verbal Behaviour* 20. 417–430.

Horn, George. 1972. Generalizing the Sentential Subject Constraint. *North-East Linguistic Society* 3.

Huang, Cheng-Teh J. 1982. *Logical relations in Chinese and the theory of grammar*. MIT. (Ph.D. Thesis).

Huang, Cheng-Teh J. 1984. On the distribution and reference of empty pronouns. *Linguistic Inquiry* 15(4). 531–574.

Huddleston, Ronald & Geoffrey Pullum (eds.). 2002. *The Cambridge Grammar of the English Language*. Cambridge, UK: Cambridge University Press.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Hudson, Richard A. 2010. *An Introduction to Word Grammar*. Cambridge University Press. DOI: doi.org/10.1017/CBO9780511781964.

Hukari, Thomas E. & Robert D. Levine. 1995. Adjunct Extraction. *Journal of Linguistics* 31(2). 195–226.

Hyams, Nina & Kenneth Wexler. 1993. On the Grammatical Basis of Null Subjects in Child Language. *Linguistic Inquiry* 24(3). 421–459. http://www.jstor.org/stable/4178822.

Jackendoff, Ray. 1977. *X-bar Syntax: a Study of Phrase Structure*. Cambridge, MA: MIT Press.

Jacobs, Joachim. 2001. The dimensions of topic-comment. *Linguistics* 39. 641–681.

Jiménez-Fernández, Angel. 2009. On the composite nature of subject islands: A phase-based approach. *SKY Journal of Linguistics* 22. 91–138.

Jurka, Johannes. 2010. *The importance of being a complement*. University of Maryland. (Ph.D. Thesis).

Jurka, Johannes, Chizuru Nakao & Akira Omaki. 2011. It's Not the End of the CED as We Know It: Revisiting German and Japanese Subject Islands. In Mary Byram Washburn, Katherine McKinney-Bock, Erika Varis, Ann Sawyer & Barbara Tomaszewicz (eds.), *Proceedings of the 28th West Coast Conference on Formal Linguistics*, 124–132. Sommerville: Cascadilla Proceedings Project.

Just, Marcel A, Patricia A Carpenter & Jacqueline D Woolley. 1982. Paradigms and processes in reading comprehension. *Journal of experimental psychology: General* 111(2). 228.

Just, Marcel A. & Patricia A. Carpenter. 1980. A theory of reading: From eye fixations to comprehension. en. *Psychological Review* 87(4). 329–354. DOI: 10.1037/0033-295X.87.4.329.

Kaan, Edith, Anthony Harris, Edward Gibson & Phillip Holcomb. 2000. The P600 as an index of syntactic integration difficulty. *Language and Cognitive Processes* 15(2). 159–201.

Kaiser, Georg & Stefano Quaglia. 2015. In search of wh-in-situ in Romance: An investigation in detective stories. In Ellen Brandner, Anna Czypionka, Constantin Freitag & Andreas Trotzke (eds.), *Charting the Landscape of Linguistics: On the Scope of Josef Bayer's Work*, 92–103.

Karssenberg, Lena & Karen Lahousse. 2018. The information structure of French *il y a* clefts and *c'est* clefts: A corpus-based analysis. *Linguistics* 56(3). 513–548. DOI: 10.1515/ling-2018-0004.

Kayne, Richard S. 1974. French Relative que. *Recherches Linguistiques de Vincennes* 2&3. 40–61 & 27–92.

Kayne, Richard S. 1975. *French syntax: The transformational cycle*. Cambridge, MA: MIT Press.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Kayne, Richard S. 1976. French relative que. In Marta Luján & Frederick Gerald H. (eds.), *Current Studies in Romance Linguistics*, 255–299. Washington: Georgetown University Press.

Kayne, Richard S. 1981. ECP Extensions. *Linguistic Inquiry* 12(1). 93–133. http://www.jstor.org/stable/4178206.

Kayne, Richard S. 1983. Connectedness. *Linguistic Inquiry* 14. 223–249. https://www.jstor.org/stable/pdf/4178324.pdf.

Keenan, Edward L. & Bernard Comrie. 1977. Noun Phrase Accessibility and Universal Grammar. *Linguistic Inquiry* 8(1). 63–99. http://www.jstor.org/stable/4177973 (19 March, 2017).

Keller, Frank. 2000. *Gradience in Grammar: Experimental and Computational Aspects of Degrees of Grammaticality*. University of Edinburgh. (Ph.D. Thesis).

Keller, Frank. 2001. Experimental evidence for constraint competition in gapping constructions. In Gereon Müller & Wolfgang Sternefeld (eds.), *Competition in syntax*, 211–248. Berlin & New York: Mouton de Gruyter.

Kemper, Susan. 1986. Imitation of complex syntactic constructions by elderly adults. *Applied Psycholinguistics* 7(3). 277–287. DOI: 10.1017/S0142716400007578.

Kemper, Susan. 1987. Life-span Changes in Syntactic Complexity. *Journal of Gerontology* 42(3). 323–328. DOI: 10.1093/geronj/42.3.323.

Kenstowicz, Michael J. (ed.). 2001. *Ken Hale: a life in language*, vol. 36 (Current studies in linguistics). Cambridge, MA: MIT Press.

Keshev, Maayan & Aya Meltzer-Asscher. 2019. A processing-based account of subliminal wh-island effects. *Natural Language and Linguistic Theory* 37(2). 621–657.

Kim, Jong-Bok. 2012. On the Syntax of the It-Cleft Construction: A Construction-based Perspective. *Linguistic Research* 29(1). 45–68.

Kim, Jong-Bok & Ivan A. Sag. 2002. Negation without Head-movement. *Natural Language and Linguistic Theory* 20(2). 339–412.

Kiss, Tibor. 2005. Semantic Constraints on Relative Clause Extraposition. *Natural Language and Linguistic Theory* 23(2). 281–334.

Kitagawa, Yoshi. 1986. *Subjects in Japanese and English*. University of Massachusetts. (Ph.D. Thesis).

Kluender, Robert. 1991. *Cognitive constraint on variables in syntax*. San Diego: University of California. (Ph.D. Thesis).

Kluender, Robert. 1998. On the distinction between strong and weak islands: A processing perspective. In Peter W. Culicover & Louise McNally (eds.), *The Limits of Syntax*, 241–279. New York: Academic Press.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Kluender, Robert. 2004. Are subject islands subject to a processing account? In Vineeta Chand, Ann Kelleher, Angelo J. Rodríguez & Benjamin Schmeiser (eds.), *Proceedings of the 23rd West Coast Conference on Formal Linguistics*, vol. 23, 101–125. Somerville, MA: Cascadilla Press.

Kluender, Robert & Marta Kutas. 1993a. Bridging the Gap: Evidence from ERPs on the Processing of Unbounded Dependencies. *Journal of Cognitive Neuroscience* 5(2). 196–214.

Kluender, Robert & Marta Kutas. 1993b. Subjacency as a processing phenomenon. *Language and Cognitive Processes* 8. 573–633.

Kobzeva, Anastasia, Charlotte Sant, Parker T. Robbins, Myrte Vos, Terje Lohndal & Dave Kush. 2022. Comparing Island Effects for Different Dependency Types in Norwegian. en. *Languages* 7(3). Number: 3 Publisher: Multidisciplinary Digital Publishing Institute, 197. DOI: 10.3390/languages7030197. https://www.mdpi.com/2226-471X/7/3/197 (7 March, 2023).

Kolliakou, Dimitra. 1999. De-Phrase Extractability and Individual/Property Denotation. *Natural Language and Linguistic Theory* 17. 713–781.

König, Esther & Wolfgang Lezius. 2003. *The TIGER language - A Description Language for Syntax Graphs, Formal Definition.* Technical report IMS. Stuttgart: Universität Stuttgart.

Koopman, Hilda & Dominique Sportiche. 1991. The position of subjects. *Lingua* 85. 211–258.

Koopman, Hilda & Dominique Sportiche. 2014. The que/qui Alternation. In Peter Svenonius (ed.), *Functional Structure from Top to Toe*, 46–96. Oxford, UK & New York: Oxford University Press. DOI: 10.1093/acprof:oso/9780199740390.003.0003.

Kratzer, Angelika. 1996. Severing the External Argument from its Verb. en. In Johan Rooryck & Laurie Zaring (eds.), *Phrase Structure and the Lexicon* (Studies in Natural Language and Linguistic Theory), 109–137. Dordrecht: Springer Netherlands. DOI: 10.1007/978-94-015-8617-7_5. https://doi.org/10.1007/978-94-015-8617-7_5 (17 June, 2023).

Krifka, Manfred. 1992. A compositional semantics for multiple focus constructions. In Joachim Jacobs (ed.), *Informationsstruktur und Grammatik*, 17–53. Opladen: Westdeutscher Verlag.

Krifka, Manfred. 2007. Basic Notions of Information Structure. In Gisbert Fanselow Caroline Féry & Manfred Krifka (eds.), *The notions of information structure*, vol. 6 (Working Papers of the SFB632, Interdisciplinary Studies on Information Structure (ISIS)), 13–56. Potsdam: Universitätsverlag Potsdam.

Kuno, Susumo. 1972. Functional sentence perspective: a case study from Japanese and English. *Linguistic Inquiry* 3. 269–320.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Kuno, Susumu. 1976. Subject, theme, and the speaker's empathy – a reexamination of relativization phenomena. In Charles N. Li (ed.), *Subject and Topic*, 417–444. New York: Academic Press.

Kuno, Susumu. 1987. *Functional syntax – anaphora, discourse and empathy*. Chicago & London: The University of Chicago Press.

Kuroda, Sige-Yuki. 1976. Subject. In Masayoshi Shibatani (ed.), *Japanese Generative Grammar* (Syntax and Semantics 5), 1–16. New York: Academic Press.

Kush, Dave & Anne Dahl. 2022. L2 transfer of L1 island-insensitivity: The case of Norwegian. en. *Second Language Research* 38(2). Publisher: SAGE Publications Ltd, 315–346. DOI: 10.1177/0267658320956704. https://doi.org/10.1177/0267658320956704 (24 June, 2023).

Kush, Dave, Terje Lohndal & Jon Sprouse. 2018. Investigating variation in island effects. *Natural Language & Linguistic Theory* 36(3). 743–779. DOI: 10.1007/s11049-017-9390-z.

Kush, Dave, Terje Lohndal & Jon Sprouse. 2019. On the Island Sensitivity of Topicalization in Norwegian: an Experimental Investigation. *Language* 95(3). 393–420.

Kynette, Donna & Susan Kemper. 1986. Aging and the loss of grammatical forms: a cross-sectional study of language performance. *Language & Communication* 6(1). 65–72. DOI: 10.1016/0271-5309(86)90006-6.

Labelle, Marie. 1992. Change of state and valency. *Journal of Linguistics* 28. 375–414.

Ladusaw, William A. 1994. Thetic and categorical, stage and individual, weak and strong. In Mandy Harvey & Lynn Santelmann (eds.), *Proceedings of SALT IV*, 220–229. Ithaca, NY: Cornell U. DMLL.

Lahousse, Karen. 2011. *Quand passent les cigognes : le sujet nominal postverbal en français moderne*. fre (Sciences du langage). Vincennes: Presses Univ. de Vincennes.

Lakoff, George. 1973. Fuzzy grammar and the performance/competence terminology game. In Claudia T. Corum, Cedric Smith-Stark & Ann Weiser (eds.), *Papers from the Ninth Regional Meeting of the Chicago Linguistic Society*, 271–291. Chicago: Chicago Linguistic Society.

Lambrecht, Knud. 1994. *Information structure and sentence form: topic, focus, and the mental representations of discourse referents* (Cambridge studies in linguistics 71). Cambridge, UK: Cambridge University Press.

Landau, Idan. 2010. *The locative syntax of experiencers* (Linguistic inquiry monographs 53). Cambridge, MA: MIT Press.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Larrivée, Pierre. 2016. *Les interrogatives in-situ sont-elles pragmatiquement marquées en français vernaculaire? investigation synchronique et historique.* Ludwig Maximilians Universität München.

Lascarides, Alex & Ann Copestake. 1999. Default representation in constraint-based frameworks. *Computational Linguistics* 25(1). 55–105.

Lasnik, Howard & Mamoru Saito. 1992. *Move α: conditions on its applications and output* (Current studies in linguistics 22). Cambridge, MA: MIT Press.

Le Goffic, Pierre. 2007. Les mots qu- entre interrogation, indéfinition et subordination : quelques repères. *Lexique* 18. 13–46.

Lee, Seung Han. 2018. English Sentential Subject Extraposition: A Constraint-Based Approach. *The Linguistic Association of Korea Journal* 26(3). 71–87. http://www.kci.go.kr/kciportal/landing/article.kci?arti%5C_id=ART002394400 (12 August, 2020).

Legendre, Géraldine. 1989. Inversion with Certain French Experiencer Verbs. *Language* 65(4). 752–782.

Legendre, Geraldine & Antonella Sorace. 2003. Auxiliaires et intransitivité en français et dans les langues romanes. In Danièle Godard (ed.), *Les langues romanes*, 185–233. Paris: CNRS Editions.

Levine, Robert D. & Ivan A. Sag. 2003. Some Empirical Issues in the Grammar of Extraction. In Stefan Müller (ed.), *The Proceedings of the 10th International Conference on Head-Driven Phrase Structure Grammar*, 236–256. Stanford, CA: CSLI Publications. http://web.stanford.edu/group/cslipublications/cslipublications/HPSG/2003/levine-sag.pdf.

Lewis, Richard L. & Shravan Vasishth. 2005. An activation-based model of sentence processing as skilled memory retrieval. *Cognitive Science* 29. 375–419.

Liu, Haitao. 2008. Dependency Distance as a Metric of Language Comprehension Difficulty. *Journal of Cognitive Science* 9(2). 159–191. DOI: 10.17791/JCS.2008.9.2.159.

Liu, Haitao, Richard Hudson & Zhiwei Feng. 2009. Using a Chinese treebank to measure dependency distance. *Corpus Linguistics and Linguistic Theory* 5(2). 161–175.

Liu, Yingtong, Rachel Ryskin, Richerd Futrell & Edward Gibson. 2019. Verb Frequency Explains the Unacceptability of Factive and Manner-of-speaking Islands in English. In *COGSCI'19*, 686–691. Montreal.

Liu, Yingtong, Elodie Winckel, Anne Abeillé, Barbara Hemforth & Edward Gibson. 2022. Structural, functional and processing perspectives on linguistic island effects. *Annual Review of Linguistics* 8. 1089391248. DOI: 10.1146/annurev-linguistics-011619-030319.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Longobardi, G. 1985. Connectedness, Scope, and C-command. *Linguistic Inquiry* 16/2. 163–192.

Longobardi, Guiseppe. 1984. Some remarks on connectedness and c-command. In *Sentential Complementation*, 151–164. Berlin & New York: Mouton de Gruyter.

Lu, Jiayi, Cynthia K. Thompson & Masaya Yoshida. 2020. Chinese Wh-in-Situ and Islands: A Formal Judgment Study. *Linguistic Inquiry* 51(3). Publisher: The MIT Press, 611–623. https://muse.jhu.edu/pub/6/article/760257 (16 May, 2023).

Machicao y Priemer, Antonio & Elodie Winckel. 2015. *Adjectives within Spanish and French NPs: Position and Interpretation*. Poster at the 22nd International Conference on Head-Driven Phrase Structure Grammar in Nanyang Technological University. Singapore.

Marandin, Jean-Marie. 2008. The Exclamative Clause Type in French. In Stefan Müller (ed.), *The Proceedings of the 15th International Conference on Head-Driven Phrase Structure Grammar*, 436–456. Stanford: CSLI Publications. http://cslipublications.stanford.edu/HPSG/9/.

Marandin, Jean-Marie. 2011. Subject Inversion in French. The Limits of Information Structure. In Stefan Müller (ed.), *The Proceedings of the 18th International Conference on Head-Driven Phrase Structure Grammar*, 327–347. Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/HPSG/2011/.

Marandin, Jean-Marie, Danièle Godard, Laurent Roussarie & Francis Corblin. 2007. Thème de Phrase. In Danièle Godard, Laurent Roussarie & Francis Corblin (eds.), *Sémanticlopédie*. GDR Sémantique et Modélisation. http://www.semantique-gdr.net/dico/index.php/Th%5C%C3%5C%A8me%5C_de%5C_phrase.

Melis, Ludo. 1988. Les propositions enchevêtrées, des complétives ou des relatives-interrogatives? *Neuphilologische Mitteilungen* 67. 189–196. https://www.jstor.org/stable/43343855.

Mensching, Guido. 2000. *Infinitive constructions with specified subjects: a syntactic analysis of the Romance languages* (Oxford studies in comparative syntax). Oxford, UK & New York: Oxford University Press.

Mensching, Guido, Stefan Müller, Franziska Werner & Elodie Winckel. 2018. *Asymmetries in long distance dependencies in French*. Talk at the 40. Jahrestagung der Deutschen Gesellschaft für Sprachwissenschaft in Stüttgart.

Miles, Walter R. 1930. Ocular Dominance in Human Adults. en. *The Journal of General Psychology* 3(3). 412–430. DOI: 10.1080/00221309.1930.9918218.

Miller, Philip. 2001. Discourse constraints on (non)extraposition from subject in English. *Linguistics* 39(4). 683–701. DOI: 10.1515/ling.2001.028.

Miller, Philip & Ivan A. Sag. 1997. French Clitic Movement without Clitics or Movement. *Natural Language and Linguistic Theory* 15. 573–639.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Milner, Jean Claude. 1978. *De la syntaxe à l'interprétation: quantités, insultes, exclamations*. Paris: Seuil.

Momma, Shota & Colin Phillips. 2018. The relationship between parsing and generation. *Annual Review of Linguistics* 4. 233–254.

Momma, Shota, Masaya Yoshida & Victor Ferreira. 2019. *Structure before content: Long-distance dependency in sentence production*. Talk. Talk at the 32nd annual CUNY conference on human sentence processing in Boulder, CO. Boulder, CO. https://www.colorado.edu/event/cuny2019/sites/default/files/attached-files/talk2%5C_momma%5C_etal.pdf (18 March, 2020).

Müller, Gereon. 1998. *Incomplete Category Fronting: A Derivational Approach to Remnant Movement in German* (Studies in Natural Language and Linguistic Theory 42). Dordrecht: Kluwer.

Müller, Stefan. 2015. The CoreGram Project: Theoretical linguistics, Theory Development and Verification. *Journal of Language Modelling* 3(1). 21–86.

Müller, Stefan. 2016. *Grammatical Theory: From Transformational Grammar to Constraint-Based Approaches* (Textbooks in Language Sciences 1). Berlin: Language Science Press. DOI: 10.17169/langsci.b25.167.

Müller, Stefan. 2017. Head-Driven Phrase Structure Grammar, Sign-Based Construction Grammar, and Fluid Construction Grammar: Commonalities and differences. en. *Constructions and Frames* 9(1). 139–173. DOI: 10.1075/cf.9.1.05mul.

Müller, Stefan, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.). 2020. *Head-Driven Phrase Structure Grammar: The handbook* (Empirically Oriented Theoretical Morphology and Syntax). To appear. Language Science Press.

Müller, Stefan, Felix Bildhauer & Philippa Cook. 2020. Chapter 5: Information structure constraints on multiple frontings. In *German clause structure: An analysis with special consideration of so-called multiple fronting* (Empirically Oriented Theoretical Morphology and Syntax). manuscript. Berlin: Language Science Press.

Müller, Stefan & Walter Kasper. 2000. HPSG Analysis of German. In Wolfgang Wahlster (ed.), *Verbmobil: Foundations of Speech-to-Speech Translation*, 238–253. Berlin Heidelberg New York: Springer-Verlag. http://hpsg.fu-berlin.de/%20stefan/Pub/vm-gram.html.

Norman, Suzanne, Susan Kemper & Donna Kynette. 1992. Adults' Reading Comprehension: Effects of Syntactic Complexity and Working Memory. *Journal of Gerontology* 47(4). 258–265. DOI: 10.1093/geronj/47.4.P258.

Nunes, Jairo & Juan Uriagereka. 2000. Cyclicity and extraction domains. *Syntax* 3. 20–43.

Obenauer, Hans-Georg. 1976. *Etudes de syntaxe interrogative du français* (Linguistische Arbeiten 34). Berlin & New York: Mouton de Gruyter.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Osborne, Timothy. 2019. *A Dependency Grammar of English: an Introduction and Beyond*. Amsterdam & Philadelphia: John Benjamins. DOI: doi.org/10.1075/z.224.

Pañeda, Claudia, Sol Lago, Elena Vares, João Veríssimo & Claudia Felser. 2020. Island effects in Spanish comprehension. en. *Glossa: a journal of general linguistics* 5(1). Number: 1 Publisher: Open Library of Humanities. DOI: 10.5334/gjgl.1058. https://www.glossa-journal.org/article/id/5269/ (24 June, 2023).

Pechmann, Thomas, Hans Uszkoreit, Johannes Engelkamp & Dieter Zerbst. 1994. Word order in the German middle field: linguistic theory and psycholinguistic evidence. *CLAUS Report* 43. Department of Computational Linguistics, Saarland University.

Perlmutter, David M. 1978. Impersonal passives and the unaccusative hypothesis. In *Proceedings of the Fourth Annual Meeting of the Berkeley Linguistics Society*, 157–189. Berkeley: Berkeley Linguistics Society.

Pesetsky, David. 1982. Complementizer-trace Phenomena and the nominative island condition. *The Linguistic Review* 1. 297–343.

Pesetsky, David. 1987. Wh-in situ: Movement and unselective binding. In Eric J. Reuland & Alice G. B. ter Meulen (eds.), *The Representation of (in)definiteness* (Current studies in linguistics series 14). Cambridge, MA: MIT Press.

Phillips, Colin. 2006. The Real-Time Status of Island Phenomena. *Language* 82(4). 795–823.

Pickering, Martin J. & Guy Barry. 1991. Sentence processing without empty categories. *Language and Cognitive Processes* 6(3). 229–259. DOI: 10.1080/01690969108406944.

Polinsky, Maria, Carlos G. Gallo, Peter Graff, Ekaterina Kravtchenko, Adam Milton Morgan & Anne Sturgeon. 2013. Chapter 13: Subject islands are different. In Jon Sprouse & Norbert Hornstein (eds.), *Experimental Syntax and Island Effects*, 286–309. Cambridge, UK: Cambridge University Press.

Pollard, Carl J. 1984. *Generalized Phrase Structure Grammars, head Grammars, and natural language*. Stanford University. (Ph.D. Thesis).

Pollard, Carl J. & Andrew M. Moshier. 1990. Unifying Partial Descriptions of Sets. In Philip P. Hanson (ed.), *Information, Language and Cognition* (Vancouver Studies in Cognitive Science 1), 285–322. Vancouver: University of British Columbia Press.

Pollard, Carl J. & Ivan A. Sag. 1994. *Head-driven Phrase Structure Grammar*. Stanford, CA: CSLI Publications. 440.

Portner, Paul & Katsuhiko Yabushita. 1998. The Semantics and Pragmatics of Topic Phrases. en. *Linguistics and Philosophy* 21(2). 117–157. DOI: 10.1023/A:1005311504497.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Pozniak, Céline & Barbara Hemforth. 2015. *Processing subject and object relative clauses in French and Mandarin Chinese*. Poster at the 28th Annual CUNY Sentence Processing Conference in Los Angeles.

Prince, Ellen. 1978. A comparison of wh-clefts and it-clefts in discourse. *Language* 54. 883–906.

Przepiórkowski, Adam. 2016. How *not* to distinguish arguments from adjuncts in LFG. In Doug Arnold, Miriam Butt, Berthold Crysmann, Tracy Holloway King & Stefan Müller (eds.), *Proceedings of the Joint 2016 Conference on Head-driven Phrase Structure Grammar and Lexical Functional Grammar, Polish Academy of Sciences, Warsaw, Poland*, 560–580. Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/HPSG/2016/headlex2016-przepiorkowski.pdf.

R Core Team. 2018. *R: A Language and Environment for Statistical Computing*. R Foundation for Statistical Computing. Vienna, Austria. https://www.R-project.org/.

Radford, Andrew. 2009. *Analysing English Sentences: A Minimalist Approach*. Cambridge, UK: Cambridge University Press. DOI: 10.1017/CBO9780511801617.

Rayner, Keith & Susan A. Duffy. 1986. Lexical complexity and fixation times in reading: Effects of word frequency, verb complexity, and lexical ambiguity. en. *Memory & Cognition* 14(3). 191–201. DOI: 10.3758/BF03197692.

Rayner, Keith, Gary E. Raney & Alexander Pollatsek. 1995. Eye movements and discourse processing. In Robert Frederick Lorch Jr. & Edward J. O'Brien (eds.), *Sources of coherence in reading*, Erlbaum, 9–35. Hillsdale, NJ: Routledge.

Reinhart, Tanya. 1982. Pragmatics and linguistics. An analysis of sentence topics. *Philosophica* 27. 53–94.

Reinhart, Tanya. 1997. Wh-in-situ in the Framework of the Minimalist Program. *Natural Language Semantics* 6(1). 29–56. DOI: 10.1023/A:1008240014550.

Richter, Frank. 2000. *A Mathematical Formalism for Linguistic Theories with an Application in Head-Driven Phrase Structure Grammar*. Eberhard-Karls-Universität Tübingen. (Ph.D. Thesis). http://w210.ub.uni-tuebingen.de/dbt/volltexte/2004/1203/.

Riou, Etienne & Barbara Hemforth. 2018. Contrainte du doublage clitique et détachement de l'objet à gauche. fr. *6e Congrès Mondial de Linguistique Française* (46). 01005. DOI: 10.1051/shsconf/20184601005.

Rizzi, Luigi. 1982. *Issues in Italian syntax* (Studies in generative grammar 11). Dordrecht: Foris.

Rizzi, Luigi. 1990. *Relativized minimality* (Linguistic inquiry monographs 16). Cambridge, MA: MIT Press.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Robin, Xavier, Natacha Turck, Alexandre Hainard, Natalia Tiberti, Frédérique Lisacek, Jean-Charles Sanchez & Markus Müller. 2011. pROC: an open-source package for R and S+ to analyze and compare ROC curves. *BMC Bioinformatics* 12. 77.

Rooth, Mats. 1992. A Theory of Focus Interpretation. *Natural Language Semantics* 1. 75–116.

Ross, Haj. 1987. Islands and Syntactic Prototypes. In Anna Bosch, Barbara Need & Eric Schiller (eds.), *Papers from the Twenty-Third Regional Meeting of the Chicago Linguistic Society*, 309–320. Chicago: Chicago Linguistic Society.

Ross, John Robert. 1967. *Constraints on variables in syntax*. Cambridge, MA: MIT Press. (Ph.D. Thesis). https://babel.ucsc.edu/~hank/ross67.pdf.

Sag, Ivan A. 1997. English Relative Clause Constructions. *Journal of Linguistics* 33(2). 431–484.

Sag, Ivan A. 2010. English filler-gap constructions. *Language* 86(3). 486–545.

Sag, Ivan A. & Janet D. Fodor. 1994. Extraction Without Traces. In Raul Aranovich, William Byrne, Susanne Preuss & Martha Senturia (eds.), *Proceedings of the Thirteenth West Coast Conference on Formal Linguistics*, 365–384. Stanford: CSLI Publications.

Sag, Ivan A. & Janet D. Fodor. 1996. Une analyse sans catégorie vide des phénomènes d'extraction. *Langages* 122. 8–31. DOI: https://doi.org/10.3406/lgge.1996.1747.

Sag, Ivan A. & Danièle Godard. 1994. Extraction of *De*-Phrases from the French NP. In *Proceedings of the North East Linguistic Society 24*, 519–541. Amherst, MA: GLSA. http://lingo.stanford.edu/sag/papers/is-dg-nelspaper.pdf.

Sag, Ivan A., Philip Hofmeister & Neal Snider. 2007. Processing complexity in Subjacency violations: the complex noun phrase constraint. In *Proceedings of the 43rd Annual Meeting of the Chicago Linguistic Society*, vol. 43, 215–229. Chicago: Chicago Linguistic Society.

Santorini, Beatrice. 2017. *(Un?)expected movement*. Homepage. http://www.ling.upenn.edu/~beatrice/examples/movement.html.

Schlonsky, Ur. 2012. Notes on wh in situ in French. In Laura Brugè, Anna Cardinaletti, Giuliana Giusti, Nicola Munar & Cecilia Poletto (eds.), *Functional heads* (The cartography of syntactic structures 7), 242–252. Oxford, UK & New York: Oxford University Press.

Schlueter, Zoe, Dan Parker & Ellen Lau. 2019. Error-Driven Retrieval in Agreement Attraction Rarely Leads to Misinterpretation. *Frontiers in Psychology* 10. DOI: 10.3389/fpsyg.2019.01002. (11 July, 2020).

Schneider, Walter, Amy Eschman & Anthony Zuccolotto. 2012. *E-Prime Reference Guide*. Pittsburgh.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Schütze, Carson T. 2016. *The empirical base of linguistics: grammaticality judgements and linguistic methodology*. eng (Classics in linguistics 2). Berlin: Language Science Press.

Simonenko, Alexandra. 2015. Semantics of DP islands: The case of questions. *Journal of Semantics* 32(3).

Song, Sanghoun. 2016. A multilingual grammar model of honorification: using the HPSG and MRS formalism. *Language and Information* 20(1). 25–49.

Song, Sanghoun. 2017. *Modeling Information Structure in a cross-linguistic perspective* (Topics at the Grammar-Discourse Interface 1). Berlin: Language Science Press. http://langsci-press.org/catalog/book/111.

Song, Sanghoun & Emily M. Bender. 2012. Individual Constraints for Information Structure. In Stefan Müller (ed.), *The Proceedings of the 19th International Conference on Head-Driven Phrase Structure Grammar*, 329–347. http://cslipublications.stanford.edu/HPSG/2012/song-bender.pdf.

Sorace, Antonella & Frank Keller. 2005. Gradience in linguistic data. en. *Lingua* 115(11). 1497–1524. DOI: 10.1016/j.lingua.2004.07.002.

Sportiche, Dominique. 1981. Bounding nodes in French. *The Linguistic Review* 1(2). 219–246.

Sportiche, Dominique. 1998. *Partitions and atoms of clause structure: subjects, agreement, case, and clitics* (Routledge Leading Linguists 2). London & New York: Routledge.

Sprouse, Jon. 2007a. *A program for Experimental Syntax: Finding the relationship between acceptability and grammatical knowledge*. University of Maryland. (Ph.D. Thesis).

Sprouse, Jon. 2007b. Continuous Acceptability, Categorical Grammaticality, and Experimental Syntax. *Biolinguistics* 1. 118–129.

Sprouse, Jon. 2009. Revisiting Satiation: Evidence for an Equalization Response Strategy. *Linguistic Inquiry* 40(2). 329–341. DOI: 10.1162/ling.2009.40.2.329. https://doi.org/10.1162/ling.2009.40.2.329 (18 June, 2023).

Sprouse, Jon & Diego Almeida. 2017. Design sensitivity and statistical power in acceptability judgment experiments. *Glossa: A Journal of General Linguistics* 2. 14. DOI: 10.5334/gjgl.236.

Sprouse, Jon, Ivano Caponigro, Ciro Greco & Carlo Cecchetto. 2016. Experimental syntax and the variation of island effects in English and Italian. *Natural Language and Linguistic Theory* 34(1). 307–344.

Sprouse, Jon, Shin Fukuda, Hajime Ono & Robert Kluender. 2011. Reverse Island Effects and the Backward Search for a Licensor in Multiple Wh-Questions: Reverse Island Effects in Multiple Wh-Questions. en. *Syntax* 14(2). 179–203. DOI: 10.1111/j.1467-9612.2011.00153.x.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Sprouse, Jon, Matt Wagers & Colin Phillips. 2012. A test of the relation between working-memory capacity and syntactic island effects. *Language* 88. 82–123.

Stalnaker, Robert C. 1978. Assertion. In *Pragmatics* (Syntax and Semantics 9), 315–322. New York: Academic Press.

Staub, Adrian & Keith Rayner. 2007. Eye movements and on-line comprehension processes. In M. Gareth Gaskell (ed.), *The Oxford Handbook of Psycholinguistics*, 326–342. Oxford, UK & New York: Oxford University Press. DOI: 10.1093/oxfordhb/9780198568971.013.0019.

Stepanov, Arthur. 2007. The end of CED? Minimalism and extraction domains. *Syntax* 10(1). 80–126.

Stowe, Laurie A. 1986. Parsing WH-constructions: Evidence for on-line gap location. en. *Language and Cognitive Processes* 1(3). 227–245. DOI: 10.1080/01690968608407062.

Svartvik, Jan & Randolph Quirk. 1980. *A Corpus of English conversation* (Lund studies in English 56). Lund: C.W.K. Gleerup. 893 pp.

Szabolcsi, Anna. 2006. Strong versus weak islands. In Martin Everaert & Henk C. van Riemsdijk (eds.), *The Blackwell companion to syntax*, 480–531. Oxford, UK: Blackwell.

Szabolcsi, Anna & Frans Zwarts. 1990. Semantic properties of composed functions and the distribution of wh-phrases. English (US). In Martin Stokhof & Leen Torenvliet (eds.), *Proceedings of the Seventh Amsterdam Colloquium*, 529–555. Institute for Language, Logic, & Information.

Takahashi, Daiko. 1994. *Minimality of movement*. Storrs: University of Connecticut. (Ph.D. Thesis).

Tanenhaus, Michael K., James S. Magnuson, Delphine Dahan & Craig Chambers. 2000. Eye Movements and Lexical Access in Spoken-Language Comprehension: Evaluating a Linking Hypothesis between Fixations and Linguistic Processing. *Journal of Psycholinguistic Research,* 29(6). 557–580. https://www.sas.upenn.edu/psych/dahanlab/PDFFiles/tanenhaus_JPR00.pdf.

Tanenhaus, Michael K., Laurie A. Stowe & Greg N. Carlson. 1985. The interactions of lexical expectation and pragmatics in parsing filler-gap constructions. In *Proceedings of the Seventh Annual Cognitive Science Society Meeting*. London: Lawrence Eribaum Associates.

Tellier, Christine. 1990. Subjacency and Subject Condition violations in French. *Linguistic Inquiry* 21(2). 306–311. http://www.jstor.org/stable/4178676.

Tellier, Christine. 1991. *Licensing theory and French parasitic gaps* (Studies in natural language and linguistic theory 26). Dordrecht, The Netherlands & Boston: Kluwer Academic Publishers.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Thiberge, Gabriel. 2018. Position du syntagme Wh- en français : réelle optionnalité ou biais sociolinguistique ? *ELIS – Echanges de linguistique en Sorbonne*. https://halshs.archives-ouvertes.fr/halshs-01802590.

Tonhauser, Judith & Lisa Matthewson. 2015. Empirical evidence in research on meaning. manuscript. https://semanticsarchive.net/Archive/TVhYTk0Z/Tonhauser-Matthewson-evidence.pdf (10 July, 2020).

Traxler, Matthew J., Robin K. Morris & Rachel E. Seely. 2002. Processing Subject and Object Relative Clauses: Evidence from Eye Movements. en. *Journal of Memory and Language* 47(1). 69–90. DOI: 10.1006/jmla.2001.2836.

Traxler, Matthew J. & Martin J. Pickering. 1996. Plausibility and the processing of unbounded dependencies: an eye-tracking study. *Journal of Memory and Language* 35. 454–475.

Truswell, Robert. 2011. *Events, Phrases and Questions*. Oxford, UK & New York: Oxford University Press.

Tuller, Laurice A. 1986. *Bijective Relations in Universal Grammar and the Syntax of Hausa*. UCLA. (Ph.D. Thesis).

Ueno, Mieko & Maria Polinsky. 2009. Does headedness affect processing? A new look at the VO–OV contrast. *Journal of Linguistics* 45(3). 675–710. DOI: 10.1017/S0022226709990065.

Uriagereka, Juan. 2012. *Spell-Out and the Minimalist Program*. Oxford: Oxford Scholarship Online.

Vallduví, Enric. 1992. *The informational component*. New York: Garland.

Vasishth, Shravan & Richard L. Lewis. 2006. Argument-head distance and processing complexity: explaining both locality and antilocality effects. *Language* 82(4). 767–794.

Vries, Mark de. 2002. *The Syntax of Relativization*. LOT dissertation series 53. Amsterdam: University of Amsterdam. (Ph.D. Thesis).

Wanner, Eric & Michael Maratsos. 1978. An ATN approach to comprehension. In Morris Halle, Joan Bresnan & George A. Miller (eds.), *Linguistic theory and psychological reality*, 119–161. Cambridge, MA: MIT Press.

Watanabe, Akira. 1992. *Wh-In-Situ, Subjacency, and Chain Formation*. Tech. rep. Cambridge, MA: MIT.

Webelhuth, Gert. 2007. Complex Topic-Comment Structures in HPSG. In Stefan Müller (ed.), *The Proceedings of the 14th International Conference on Head-Driven Phrase Structure Grammar*, 306–322. Stanford, CA: CSLI Publications. http://cslipublications.stanford.edu/HPSG/8/.

Webelhuth, Gert. 2012. The Distribution of that-clauses in English: An SBCG Account. In Hans C. Boas & Ivan A. Sag (eds.), *Sign-Based Construction Grammar*, 203–227. Stanford: CSLI Publications.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Wexler, Kenneth & Peter W. Culicover. 1980. *Formal Principles of Language Acquisition*. Cambridge, MA: MIT Press.

Wickham, Hadley. 2016. *Ggplot2: Elegant Graphics for Data Analysis*. Springer-Verlag New York. https://ggplot2.tidyverse.org.

Winckel, Elodie & Anne Abeillé. 2020. French subject island constraint? A discourse-based HPSG account. *Lingvisticæ Investigationes* 43(1). 94–127.

Winckel, Elodie, Anne Abeillé, Barbara Hemforth & Edward Gibson. In preparation. *Discourse-based constraints on long-distance dependencies generalize across constructions and languages*.

Yoshida, Masaya, Nina Kazanina, Leticia Pablos & Patrick Sturt. 2014. On the origin of islands. en. *Language, Cognition and Neuroscience* 29(7). 761–770. DOI: 10.1080/01690965.2013.788196.

Zaenen, Annie. 1983. On Syntactic Binding. *Linguistic Inquiry* 14. 469–504.

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

Proofreading version. Do not quote. Final version available from http://www.langsci-press.org

French subject islands

This book examines extractions out of the subject, which is traditionally considered to be an island for extraction. There is a debate among linguists regarding whether the "subject island constraint" is a syntactic phenomenon or an illusion caused by cognitive or pragmatic factors. The book focusses on French, that provides an interesting case study because it allows certain extractions out of the subject despite not being a typical null-subject language. The book takes a discourse-based approach and introduces the "Focus-Background Conflict Constraint", which posits that a focused element cannot be part of a backgrounded constituent due to a pragmatic contradiction. The major novelty of this proposal is that it predicts a distinction between extractions out of the subject in focalizing and non-focalizing constructions.

The central contribution of this book is to offer the detailed results of a series of empirical studies (corpus studies and experiments) on extractions out of the subject is French. These studies offer evidence for the possibility of extraction out of the subject in French. But they also reveal a clear distinction between constructions. While extractions out of the subject are common and highly acceptable in relative clauses, this is not the case for interrogatives and clefts.

Finally, the book proposes a Head-Driven Phrase Structure Grammar (HPSG) analysis of subject islands. It demonstrates the interaction between information structure and syntax using a representation of information structure based on Minimal Recursion Semantics (MRS).