UC San Diego

Gap-filler dependencies are sensitive to islands: The case of Japanese relative clauses

Maho Takahashi and Grant Goodall

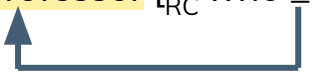
4th **CA**lifornia **M**eeting on **P**sycholinguistics

March 22, 2021

Background

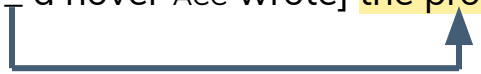
- Relative clauses (RCs) in a head-initial language tend to result in a **filler-gap dependency**, with the head preceding the RC

  The professor [$_{RC}$ who _ wrote a novel] is very proud.



- In head-final languages like Japanese, the head follows the RC, exemplifying a **gap-filler dependency**

  [$_{RC}$ _ 小説を書いた] 教授はとても誇らしげだ。
  [$_{RC}$ _ a novel-ACC wrote] the professor-TOP is very proud.



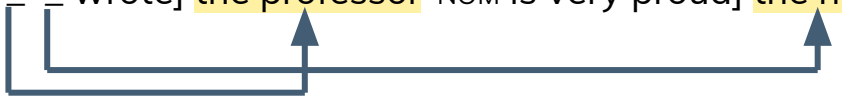
Background

- Filler-gap dependency is well-known to be sensitive to **island constraints** (e.g., Ross 1967)

  *This is the novel [$_{RC2}$ that the professor [$_{RC1}$ who _ wrote _]] is very proud.

- If gap-filler dependencies are also sensitive to islands, then relativization out of another RC should be disallowed here too

- It has been long assumed that such a structure (**double-gap RC**) is, in fact, acceptable (Sakai 1994, Ishizuka 2009)
  これは[$_{RC2}$[$_{RC1}$ _ _ 書いた]教授がとても誇らしげな]小説だ。
  This is [$_{RC2}$ [$_{RC1}$ _ _ wrote] the professor-NOM is very proud] the novel.



Background

The professor [$_{RC}$ who _ wrote a novel]

filler *gap*

Processing involves predicting the gap upon seeing a filler

[$_{RC}$ _ a novel wrote] the professor

gap *filler*

Processing involves predicting the filler upon seeing a gap

Background

- Processing similarity of filler-gap and gap-filler dependencies
    - Incremental gap filling (Stowe 1986, Aoshima et al. 2004)

a. My brother wanted to know **if** Ruth will bring <u>us</u> home to Mom at Christmas.
b. My brother wanted to know **who** Ruth will bring <u>us</u> home to __ at Christmas.

(Stowe 1986)

    - Parser slows down upon seeing ‘us’ in (b) (filled-gap effect)

Background

- Incremental *filler* filling (Lin 2006, Kwon 2008, Kahraman et al. 2010, 2011)

a. __ Giin-o hihanshita-no-wa kisha-da. *subject cleft*
senator-ACC criticize-C-TOP reporter-COP
'It was the reporter who criticized the senator.'

b. Giin-ga __ hihanshita-no-wa kisha-da. *object cleft*
senator-NOM criticize-C-TOP reporter-COP
'It was the reporter who the senator criticized.'

  - Parser slows down processing the embedded verb position in (a)

Given some similarity in processing mechanism between the two dependencies, should they also be similar in terms of island sensitivity?

Two acceptability experiments

EXPERIMENT 1

Are gap-filler dependencies sensitive to islands?

EXPERIMENT 2

Does island sensitivity extend to all dependency types?

Experiment 1

- Design: 2 × 2
  - Extraction (relativization) out of an embedded clause (+ vs. -)
  - Type of embedded clause (RC vs. non-island complex NP)
- A complex NP headed by 事 *koto* “the fact (that)” has been shown to be a non-island in Japanese (Fukuda & Sprouse 2017; Omaki et al. 2020)
- Example:
  [$_{koto}$ 教授が小説を書いたという]事
  ‘The fact that the professor wrote a novel’

36 subjects (post-exclusion)
20 lexicalization sets
5 items per conditions
4 lists
40 fillers with various acceptability

Experiment 1

	-*koto* CNP	RC
No long-distance extraction	(1)	(3)
Long-distance extraction	(2)	(4) (double-gap RC)

(1) [$_{koto}$ 学者が SF小説を 書いた**事**が] 最近 書店で
professor-NOM Sci-Fi novel-ACC write-PST-**fact**-NOM recently bookstore-at
特集された。
tokusyu-sa-re-ta.
feature-do-PASS-PST
'**The fact** that [$_{koto}$ a professor wrote a sci-fi novel] was recently featured in a bookstore.'

(2) [$_{RC}$ [$_{koto}$ _ SF小説を 書いた**事**が] 最近 書店で
Sci-Fi novel-ACC write-PST-**fact**-NOM recently bookstore-at
特集された] 学者は 誇らしげだ。
feature-do-PASS-PST professor-TOP looks.proud-COP
'The professor who [$_{RC}$ **the fact** that [$_{koto}$ _ wrote a sci-fi novel] was featured in a bookstore] looks proud.'

Experiment 1

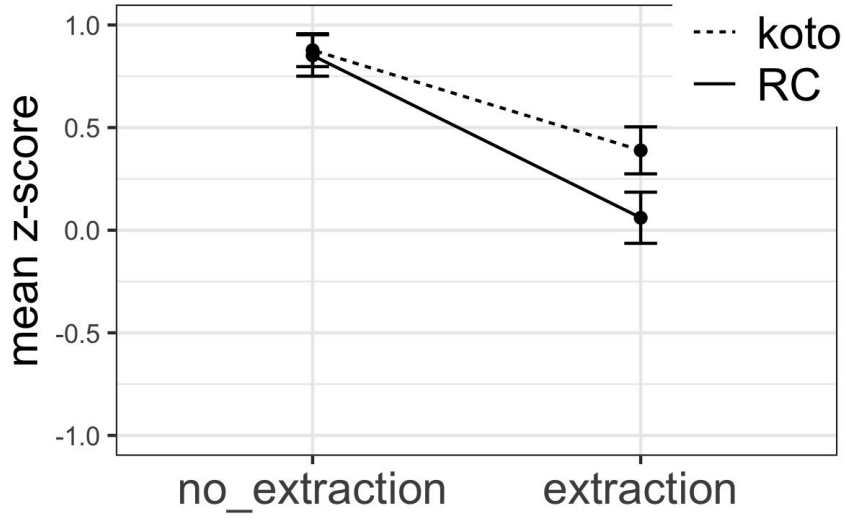
	-koto CNP	RC
No long-distance extraction	(1)	(3)
Long-distance extraction	(2)	(4) (double-gap RC)

(3) [$_{RC}$ 学者が _ 書いた] SF小説が 最近 書店で
professor-NOM write-PST Sci-Fi novel-NOM recently bookstore-at
特集された。
feature-do-PASS-PST
'The sci-fi novel that [$_{RC}$ the professor wrote _] was featured in a bookstore.'

(4) [$_{RC2}$ [$_{RC1}$ _ _ 書いた] SF小説が 最近 書店で
write-PST Sci-Fi novel-NOM recently bookstore-at
特集された] 学者は 誇らしげだ。
feature-do-PASS-PST professor-TOP looks.proud-COP
'The professor who [$_{RC2}$ the sci-fi novel that [$_{RC1}$ _ wrote _] was recently featured in a bookstore] looks proud.'

Experiment 1

- Results



- A linear mixed-effects model with random effects of subject and item
- Significant main effect of long-distance extraction (**$p < 0.001$**)
- Significant interaction between the type of embedded clause and extraction (**$p = 0.002$**)
- Small effect size (**DD score = 0.3**)

Two acceptability experiments

EXPERIMENT 1

Are gap-filler dependencies sensitive to islands?

YES*

EXPERIMENT 2

Does island sensitivity extend to all dependency types?

** with a small effect size*

Experiment 2

- Design: 2 × 2
  - Backwards anaphora dependency (which should not be island-sensitive) between *zibun* '(lit.) self' and its referent (+ vs. -)

    a. *__Who__ did Josh wonder [whether Lisa featured __ in a magazine]?
    b. Did __Josh__ wonder [whether Lisa featured __him__ in a magazine]?

  - Type of embedded clause (RC vs. non-island complex NP)

36 subjects (post-exclusion)
20 lexicalization sets
5 items per conditions
4 lists
40 fillers with various acceptability

Experiment 2

	-koto CNP	RC
No long-distance dependency	(1)	(3)
Long-distance dependency	(2)	(4)

(1) [$_{koto}$ 学者が SF小説を 書いた**事**が] 最近 書店で
professor-NOM Sci-Fi novel-ACC write-PST-**fact**-NOM recently bookstore-at
特集された。
tokusyu-sa-re-ta.
feature-do-PASS-PST
'**The fact** that [$_{koto}$ a professor wrote a sci-fi novel] was recently featured in a bookstore.'

(2) [$_{RC}$ [$_{koto}$ 自分が SF小説を 書いた**事**が] 最近 書店で
self-NOM Sci-Fi novel-ACC write-PST-**fact**-NOM recently bookstore-at
特集された] 学者は 誇らしげだ。
feature-do-PASS-PST professor-TOP looks.proud-COP
'The professor who [$_{RC}$ **the fact** that [$_{koto}$ self wrote a sci-fi novel] was featured in a bookstore] looks proud.'

Experiment 2

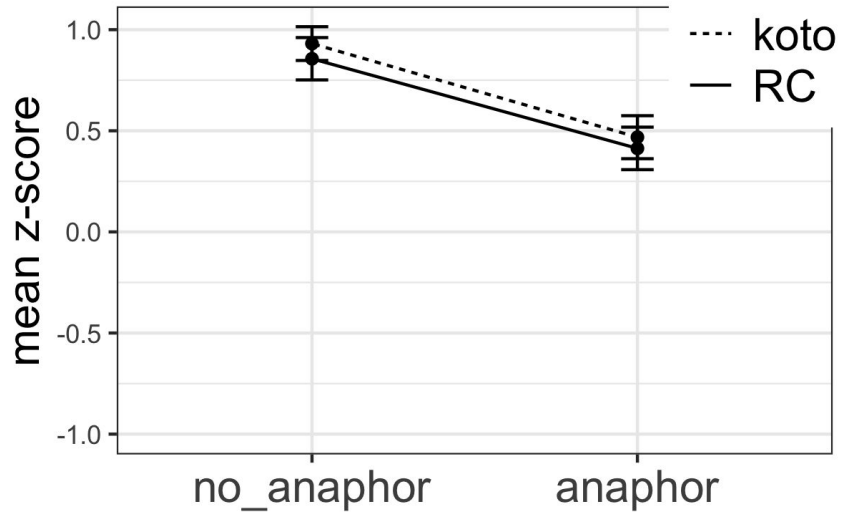
	-koto CNP	RC
No long-distance dependency	(1)	(3)
Long-distance dependency	(2)	(4)

(3) [$_{RC}$ 学者が _ 書いた] SF小説が 最近 書店で
professor-NOM write-PST Sci-Fi novel-NOM recently bookstore-at
特集された。
feature-do-PASS-PST
'The sci-fi novel that [$_{RC}$ the professor wrote _] was featured in a bookstore.'

(4) [$_{RC2}$ [$_{RC1}$ 自分が _ 書いた] SF小説が 最近 書店で
self-NOM write-PST Sci-Fi novel-NOM recently bookstore-at
特集された] 学者は 誇らしげだ。
feature-do-PASS-PST professor-TOP looks.proud-COP
'The professor who [$_{RC2}$ the sci-fi novel that [$_{RC1}$ self wrote _] was recently featured in a bookstore] looks proud.'

Experiment 2

- Results



- A linear mixed-effects model with random effects of subject and item
- Significant main effect of a backwards anaphor (**$p < 0.001$**)
- **No** significant interaction between the type of embedded clause and dependency (**$p = 0.78$**)

Two acceptability experiments

EXPERIMENT 1

Are gap-filler dependencies sensitive to islands?

YES*

EXPERIMENT 2

Does island sensitivity extend to all dependency types?

NO!

** with a small effect size*

Discussion

- Summary
  - **Experiment 1**: Super-additivity signals an island effect with gap-filler dependency
  - **Experiment 2**: Super-additivity does not occur with backwards anaphora

- Implications for the syntax of head-final RCs
  - Non-movement analysis (involving a null pronoun) of Japanese RCs (e.g., Kuno 1973, Murasugi 2000) as well as double-gap RCs (Sakai 1994, Ishizuka 2009) may need to be revised

- Implications for general sentence processing
  - Further evidence for the similarity between filler-gap and gap-filler dependencies

Discussion

- Implications for the theories of islands

Grammatical constraint-based framework of islands (Huang 1982; Chomsky 1986; Rizzi 1990, 2013)

- Island constraints applicable regardless of head/movement directionality
- Small effect size of the interaction in Experiment 1 could be the evidence for **subliminal island effect** (Almeida 2014)

Working memory-based framework of islands (Kluender & Kutas 1993; Kluender 1998; Hofmeister & Sag 2010)

- Island effects not limited to maintaining the info of the filler in WM
- Effect of an intervening element?
- Why would a gap-filler dependency result in less cognitive cost?

Thanks!

mtakahas@ucsd.edu

Acknowledgements: We thank Shuto Kato for the help with developing experimental stimuli, and Michelle Yuan, Robert Kluender, and the members of the UCSD Experimental Syntax Lab for feedback on this project.

References

Almeida, D. (2014). Subliminal wh-islands in brazilian portuguese and the consequences for syntactic theory. *Revista da ABRALIN*,13(2).

Chomsky, N. (1986). Barriers (Vol. 13). Cambridge, MA: MIT Press.

Fukuda, S., & Sprouse, J. (2019). Islandhood of Japanese Complex NPs and the Factorial Definition of Island Effects. Unpublished manuscript.

Huang, C.-T. J. (1982). *Logical relations in Chinese and the theory of grammar*. Ph.D. Dissertation, MIT, Cambridge, MA.

Kahraman, B., Sato, A., Ono, H., & Sakai, H. (2011). Incremental processing of gap-filler dependencies: Evidence from the processing of subject and object clefts in Japanese. In the Proceeding of the Twelfth Tokyo Conference on Psycholinguistics.

Kluender, R., & Kutas, M. (1993). Bridging the gap: Evidence from ERPs on the processing of unbounded dependencies. *Journal of cognitive neuroscience*, 5(2), 196-214.

Kluender, R. (1998). On the distinction between strong and weak islands: A processing perspective. *The limits of syntax*, 241-279.

Kuno, S. (1973). The structure of the Japanese language. MIT Press (MA).

References

Kwon, N. (2008). *Processing of syntactic and anaphoric gap-filler dependencies in Korean: Evidence from self-paced reading time, ERP and eye-tracking experiments*. Ph.D. Dissertation, University of California, San Diego, La Jolla, CA.

Lin, C.J.C. (2006) *Grammar and parsing: A typological investigation of relative-clause processing*. Ph.D. Dissertation, University of Arizona, Tucson, AZ.

Murasugi, K. (2000). An antisymmetry analysis of Japanese relative clauses. In A. Alexiadou, P. Law, A. Meinunger, & C. Wilder (eds.), *The syntax of relative clauses*, 231-263. John Benjamins Publishing.

Omaki, A., Fukuda, S., Nakao, C., & Polinsky, M. (2020). Subextraction in Japanese and subject-object symmetry. *Natural Language & Linguistic Theory*, 38(2), 627-669.

Rizzi, L. (1990). *Relativized minimality*. Cambridge, MA: MIT Press.

Rizzi, L. (2013). Locality. *Lingua*, 130, 169-186.

Sakai, H. (1994). Complex NP constraint and case-conversions in Japanese. *Current topics in English and Japanese*, 179-200.

Stowe, L. A. (1986). Parsing WH-constructions: Evidence for on-line gap location. *Language and cognitive processes*, 1(3), 227-245.