

Empirical modelling of translation and interpreting

Edited by

Silvia Hansen-Schirra

Oliver Czulo

Sascha Hofmann

Translation and Multilingual Natural
Language Processing 7



Translation and Multilingual Natural Language Processing

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Introduction

According to Black (1999), empirical research is carried out in a cyclic way: approaching a research area bottom-up, data lead to interpretations and ideally to the abstraction of laws, on the basis of which a theory can be derived. Deductive research is based on a theory, on the basis of which hypotheses can be formulated and tested against the background of empirical data. Looking at the state-of-the-art in translation studies, either theories/models are designed or empirical data are collected and interpreted. However, the completion of a scientific circle by deriving hypotheses from existing theories or by drafting models and testing them on the basis of empirical data, which can then be generalized and fed back into the theoretical framework, can only rarely be found in translation studies. First exceptions are for instance De Sutter et al. (2017) who link new empirical methods to theoretical traditions, or Alves & Gonçalves (2013) who investigate translation units on the basis of relevance theoretical considerations. Another example would be PACTE (2014) who operationalize their competence model and test it with empirical insights. In the area of translation process research, the comprehensive operationalization in terms of the scientific circle is still lacking.

From a methodological point of view, using empirical methods for the investigation of translation and interpreting phenomena has been an issue for quite some time with a surge of research over the last two decades. While example-based analyses of small numbers of source texts and their translations are still used to generate hypotheses, many studies profit from empirical data in order to test hypotheses, quantify findings and generalize interpretations. Finally, the following questions have to be dealt with having the comprehensiveness of the scientific circle in mind: how can we systematically operationalize a translation model or theory in terms of testable variables, i.e. how can we assess a theory or a model by means of data? Or the other way around: how can empirical data be integrated in such a way that they result in a model or theory? Concerning these questions, methods and techniques from translation process research can be applied, as well as from product-oriented research, or combinations of both.

So far, product-oriented translation research has provided us with quantifications of translation phenomena without giving insights into explanatory back-

Introduction

grounds. Process-based research allows drawing conclusions on explanations but in most cases lacks empirical evidence in form of significance testing. Therefore, the integration of product- and process-based translation research seems a promising goal in translation studies – including offline methods (retrospective interviews, comprehensibility ratings, etc.) as well as online methods (key-logging, eyetracking, thinking aloud, etc., see e.g. Krings 2005). Gyde Hansen (2002) as well as Fabio Alves (2003) were among the first to propose empirically-based approaches tackling some of the challenges posed by dealing with both process and product data. This kind of data triangulation has to be further elaborated in order to yield further insights into the cognitive processes involved in translation.

However, some problems have to be coped with: We have to face the consequence that multi-method approaches, which are necessary as a basis for data triangulation, produce a huge amount of data, which cannot straightforwardly be interpreted in terms of previously formulated hypotheses. Therefore, models have to be found on the basis of data that can be investigated and interpreted in a systematical and comprehensive way. As another consequence, statistical tests have to be carried out in order to differentiate incidental findings from significant results. The different kinds of data have to be mapped onto each other. When dealing with translation corpora, alignment units are, for instance, not trivial to define: compounds, contractions, differing tense systems, etc. lead to segmentation problems across languages. The more annotation layers are included, the more complex this mapping problem becomes. If, for example, eye-tracking and key-logging data have to be mapped, time stamps might help to parallelize the different processing units. If, however, eye-tracking and key-logging are to be combined with linguistic annotation layers (e.g. on semantic relations or syntactic functions), the time stamps have to be mapped onto word indexes or vice versa, which is not trivial at all.

This volume consists of papers selected from contributions to the 2013 conference of the *European Society for Translation Studies* (EST 2013) and the 2015 edition of the Translation in Transition conference (TiT 2015), both held at the Faculty for Translation Studies, Linguistics and Cultural Studies of the University of Mainz in Germersheim, Germany. It addresses the above-mentioned issues from several perspectives: multi-method product- as well as process-based research gives insights into translation as well as interpreting phenomena. These phenomena may include cognitive and organizational processes, procedures and strategies, competence and performance, translation properties and universals, etc. Empirical findings about the deeper structures of translation and interpret-

ing will reduce the gap between translation and interpreting data and model and theory building. Furthermore, the availability of more large-scale empirical testing triggers the development of models and theories concerning translation and interpreting phenomena and behavior based on quantifiable, replicable and transparent data.

Germersheim and Leipzig, November 2017
Silvia Hansen-Schirra, Oliver Czulo, Sascha Hofmann

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Part I

Predictors for modelling

Chapter 1

Predicting cognate translation

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Empirically-based translation research has so far been developed within two major self-standing approaches: corpus-based work on properties of translated texts or translation universals (product) and experimental studies of translators' expert performance (process). Recently, advances in corpus architecture and multi-level corpus querying are combined with methods from psycholinguistics and cognitive science in order to determine predictors for translation candidate probabilities, which in turn may range from free to literal translation solutions. In the corpus-based realm, free translations lead to normalization effects, whereas literal ones trigger shining-through. Speaking from a cognitive point of view, shining-through can be related to the literal translation hypothesis, while normalization may occur due to monitoring processes.

This paper investigates the conditions under which cognates are translated into more literal or free translation candidates. Some of the influential factors are text internal (e.g. context) or external (e.g. language status); others are translation inherent, such as the expertise of the translator and the translation mode. The former are discussed from a product-based perspective, the latter are analyzed in a more process-oriented manner. Multi-method approaches including translation corpora and experimental data are used for predicting the probability of cognate variation in translation. As a consequence, the predictors are discussed against the background of the monitor model.



1 Cognition meets translation constraints

Toury (1995) identifies two laws of translational behavior: he explains that there is a law of growing standardization, i.e., that “in translation, textual relations obtaining in the original are often modified, sometimes to the point of being totally ignored, in favour of (more) habitual options offered by a target repertoire” (Toury 1995: 268). However, Toury also suggests that translators tend to produce a translated utterance not by retrieving the target language via their own linguistic knowledge, but directly from the source utterance itself. The universality of discourse transfer is expressed through another translational law, the law of interference: “in translation, phenomena pertaining to the make-up of the source text tend to be transferred to the target text” (Toury 1995: 275).

From a corpus-based perspective, the first law is also reflected in Baker (1996) universal feature of normalization: Normalization (or conservatism) means that translators tend to conform to the typical patterns of the target language or even to exaggerate their use. This universal feature also includes the tendency to normalize marked and ungrammatical structures. But if the status of the source language is significantly higher than the status of the target language (for example, English compared with other languages in the field of software), normalization in translations is weakened or the opposite tendency might even be observed. If this is the case, the typical patterns of the source language are still visible in the translations, which Teich (2003) calls shining-through.

The continuum between foreignization and domestication is also reflected in the choice of literal vs. more or less free translation strategies and procedures as well as formal vs. dynamic equivalence (Vinay & Darbelnet 1995; Newmark 1988). However, Tirkkonen-Condit (2005b) argues that literal translation is a default translation procedure, which is cognitively preferred to others. Chesterman (2011) and Halverson (2015) reintroduce the concept of literal translation, assuming that entrenchment effects strengthen the co-activation of linguistic patterns and thus reduce the cognitive load during translation for literal renderings (see Schaeffer & Carl (2014) for an empirical operationalization).

From a cognitive perspective, literal translation can be explained by the priming effect. When a translator reads a source text element, a specific element in the target language is primed due to close memory links. It can then be more easily produced than other translation solutions. These close memory links might exist on different linguistic levels. Elements of similar form, similar word class and similar meaning have strong links across language borders.

The monitor model was proposed by Tirkkonen-Condit (2005a). She assumes

that translators follow a predefined translation root, which is the easiest way to translate a text. But they constantly monitor production and as soon as a problem is encountered in this default translation root, they stop the literal translation process and try to find a better solution. This model has been tested by Carl & Dragsted (2012).

The continuum between monitoring and priming/literal translation could be another way to perceive Toury's laws of standardization and interference. The monitor model, however, still exhibits some shortcomings. It is, for example, not precise enough to determine which factors influence priming. As priming might exist on several linguistic levels, what determines its strength? Finding answers to these questions and thus creating a more elaborate monitor model could help to predict translational behavior.

For this purpose, we will investigate cognates (translation equivalents which share a similar form). Several studies have shown that the number of cognates in translations varies significantly depending on other factors such as language status of the respective languages (Vintar & Hansen-Schirra 2005) and translation mode (Oster 2017 [this volume]). Cognates are relatively easy to manage in experimental settings and can be investigated in many language pairs. We thus believe that they are a good basis for the investigation of the different priming roots.

In the following, we will examine different factors that might influence the production of cognates. Some are text internal, such as context or external such as language status of the respective languages, as well as historical developments. These constraints will be investigated from a product-based perspective. However, other factors are translation inherent, such as the expertise of the translator and the translation mode, which will be analyzed from a more process-oriented perspective. We will show how the translation of cognates can be predicted within the context of the different constraints and finally discuss how the predictors can be implemented into the monitor model.

2 Cultural-political predictors

Our hypothesis is that cultural-political predictors influence translation choices. In the following, we introduce two external factors that predict translation behavior: language status and socio-historical influences.

2.1 Language status

The first study deals with two language pairs for which we assume that the relation between the source and target languages and cultures differ: English-German and English-Slovene. Since 1945, German has seemed to be susceptible to influences from the English language (Carstensen 1965). In contrast, Slovene is less influenced and exhibits language protectionism on a political level (Vintar & Hansen-Schirra 2005).

The results discussed here were published in Vintar & Hansen-Schirra (2005), which includes English-German and English-Slovene translations as well as German and Slovene original comparable texts. The authors fully automatically extracted the cognate pairs from the parallel corpora compiled for the study from popular scientific texts using an implementation of the Levenshtein's edit distance algorithm in the Perl String::Approx module (for details see *ibid.*). The original comparable texts were used as a tertium comparationis for the cognate frequencies.

For the comparison of the cognate frequencies, a parallel English-German and English-Slovene subcorpus and a comparable German and Slovene subcorpus were created. These had to be as comparable as possible in terms of corpus size and register. For this reason, all subcorpora comprised 10,000 tokens of popular scientific texts. Following Biber (1995), each subcorpus was composed of ten text samples consisting of roughly 1000 tokens. This guarantees that the sub-corpora is as well-balanced as possible. The COSMAS corpus was used as a monolingual reference corpora for German, and the FIDA was used for Slovene (Vintar & Hansen-Schirra 2005).

The comparison of the cognate frequencies in Slovene and German translations and Slovene and German originals shows that, in general, German has more cognates than Slovene, and more specifically German translations exhibit the highest cognate frequency (see 1; $\chi^2 = 60.33, df = 1, p > .001$).

Table 1: Cognate frequencies normalized to a corpus size of 10,000 words

	Slovene	German
Original	254	356
Translation	189	652

These results illustrate that German is more susceptible to cognate use than Slovene, and this is even more prominent in translations. However, a contrary tendency can be observed for Slovene translations which have fewer cognates than Slovene original texts. This might be interpreted as a slight aversion towards the use of cognates in Slovene translations.

On the one hand, it can be said that the context of a word is very important for the choice between cognate and native word. For instance, the English word *action* was not only translated with its Slovene cognate *akcija*, but a series of non-cognate translations (*delovanje, tehnika, ukrepanje, aktivnost, izvedba, operacija, udejstvovanje*) could also be found in the corpus depending on the context of the word. On the other hand, repetitions in translations are avoided by using the cognate as well as the native words for stylistic purposes (e.g. English *volcanic activity*, German *vulkanische Aktivität, vulkanische Tätigkeit, vulkanische Ausbrüche, vulkanische Bewegung*).

Nevertheless, it seems that German is more receptive to the use of cognates than Slovene. The preference of cognates in German might be explained by two different tendencies: first, it might mirror the use of Anglicisms in German, which in turn reflects the strong influence English nowadays has on the German language (especially as lingua franca of science, Ammon (2001)). On the other hand, the cognate use might be an indicator of the susceptibility of the German language towards internationalisms rooted in a common etymological history (Braun et al. 2003). In contrast, it might be the case that Slovene as a ‘minor language’ tries to avoid foreign language material by using only native words to protect itself from language change. The tendency for or against cognates might therefore be related to the overall language – and translation – policy in the target society. Thus, avoiding cognates might be a strategy of linguistic purism and protectionism.

2.1.1 Socio-historical influences

Social-historical factors might influence the use of cognates, as well. In the following, we will compare the development of cognates in different languages over the course of time with a bottom-up methodology using the Google Books *Ngram Viewer*.¹ This tool shows the frequency of words and phrases used in the selected book corpora and over the course of the selected years (between 1500 and 2008).

¹<https://books.google.com/ngrams>, last accessed 13th August 2016

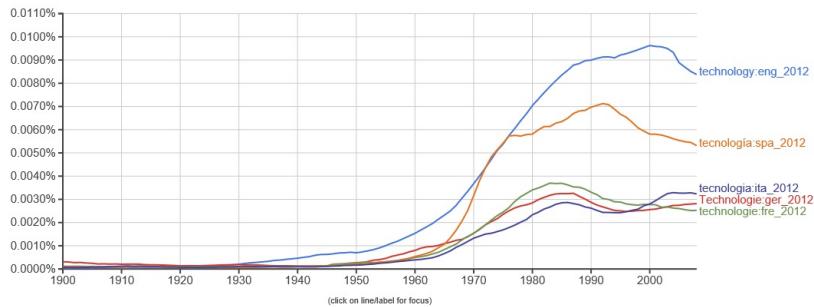


Figure 1: Diachronic development of *technology* and its cognate versions in German, Spanish, Italian, and French from 1900 to 2008.

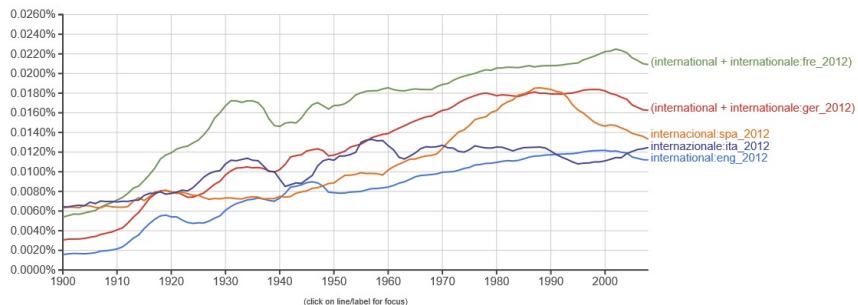


Figure 2: Diachronic development of *international* and its cognate versions in German, Spanish, Italian, and French from 1900 to 2008.

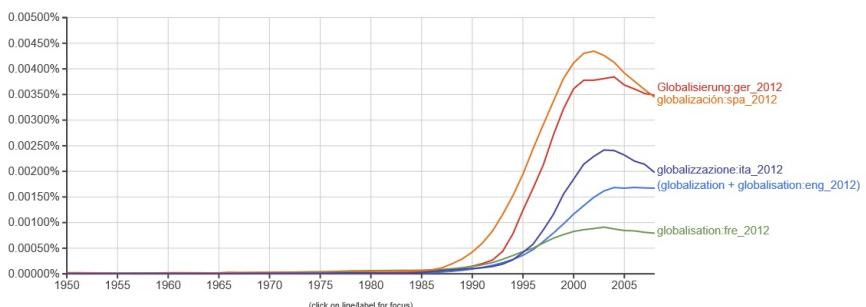


Figure 3: Diachronic development of *globalization* (*globalisation*) and its cognate versions in German, Spanish, Italian, and French from 1950 to 2008.

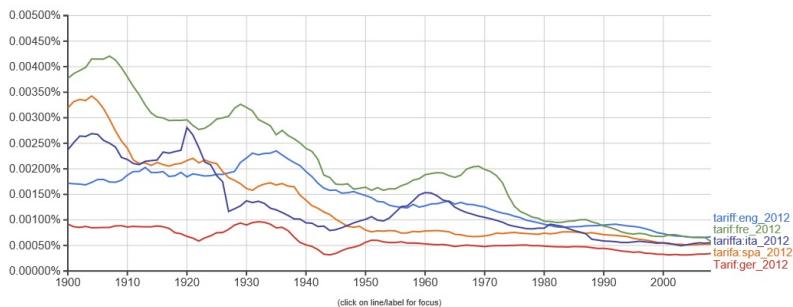


Figure 4: Diachronic development of *tariff* and its cognate versions in German, Spanish, Italian, and French from 1900 to 2008.

Figures 1-4 show the diachronic development of four cognate words in five different languages (English, French, German, Italian, Spanish) from 1900 to 2008 (apart from *globalization* – Figure 3 – because the word did not occur in the first half of the 20th century). All figures show similar developments of the presented words in the different languages over the course of time.

Technology and its multilingual cognate representations (Figure 1) hardly occurred in the corpora before the mid-60s, when the frequency of the words started to increase rapidly for the next decades. Although the term *technology* has existed since 1910 in the English language and originates from the Greek *tekhnologia*, the term *high technology* was coined only in 1964, which might also characterize the beginning of this linguistic development.²

The use of *international* and its multilingual cognate representations (Figure 2) increases steadily, but is not bound to a specific date or event. This indicates that international relations and economics – well known social developments – have become more important in our societies in the last century and hence affected the languages as well. In contrast to *technology*, *international* has English roots and was coined by the English social philosopher and solicitor J. Bentham.³ However, the components of *international* (*inter*⁴ and *national*⁵) have Latin roots, a language that influenced all examined languages. Hence, this might have promoted the inclusion and acceptance of the English word in the other languages.

²http://www.etymonline.com/index.php?allowed_in_frame=0&search=technology, last accessed 13th August 2016

³<http://www.duden.de/rechtschreibung/international> and http://www.etymonline.com/index.php?allowed_in_frame=0&search=international, last accessed 13th August 2016

⁴http://www.duden.de/rechtschreibung/inter_, last accessed 13th August 2016

⁵<http://dwds.de/?view=1&qu=national>, last accessed 13th August 2016

Globalization and its equivalents (Figure 3) show a similar development to *technology*, but the increase is more rapid and much later. The word *globalization* only emerged in 1961, although the verb *globalize* was first recorded in 1953, but not in the sense that refers to global economic systems.⁶ Here, we can observe an interesting finding since the German and Spanish cognates appeared more frequently and earlier in time. This development cannot be attributed to the influence of English as lingua franca but rather to the fact that this internationalism derived from the Latin word “*globus*”. This clearly shows that common etymological roots might trigger cognate usage as well.

In contrast to the other example, the use of *tariff* and its cognates decreases in the last decade in all five languages, albeit to different degrees. This might be caused by a restriction of meaning because the word *tariff* used to have an extended meaning, namely “prices” in general, whereas today it is mainly used within the context of taxes and wages.⁷

The examples discussed here indicate that the usage of cognates varies according to societal and technological development. The word might have popped up in one language, but due to common language roots it might be more easily accepted in other languages as well. Furthermore, language change, like extending or narrowing down the meaning of a word may also have an influence (Koselleck 1979).

3 Linguistic predictors

3.1 Linguistic context

The context, in which the words are embedded, is a very important factor for translation and translation choices – a phenomenon also known as intra-lingual communication. A *table* can, for example, be either furniture or a chart and the context in which the word is used usually clearly specifies which table is meant. We hypothesize that cognates are more frequently translated with a cognate when the translators are asked to translate a single word than when the cognate is integrated in a complete text.

To test this hypothesis, we ran a study with 67 participants, who had to translate single words in a list (with information on the word class) and a complete text

⁶http://www.etymonline.com/index.php?term=globalize&allowed_in_frame=0, last accessed 13th August 2016

⁷<http://dwds.de/?qu=Tarif>, last accessed 13th August 2016

that contained numerous cognates.⁸ Both settings contained the same cognates. For the study, two political texts were chosen (190 and 186 words, respectively). A total of 20 cognates were isolated in each text and used to compose the cognate list. The participants were German native speakers who studied English and translation and were asked to translate one word list and one text. In addition, we set a time limit of three minutes for the list and 14 minutes for the texts, because we wanted the participants to first prepare a translation draft to ensure that they used the words first activated in their mental lexicon. The results are presented in Table 2.⁹

Table 2: Percentage of translations with cognates, with non-cognates, or no translation at all depending on an existing context

	Cognate	non-cognate	no translation
without context	57,39	32,24	10,37
with context	37,27	54,91	7,82

While cognates in the list are translated as cognates in over 57% of the cases, they were only translated with cognates in around 37% when they were presented in context. The picture is reversed for non-cognates translations (32% without context, 55% with context). In some instances, the translators were not able to produce a translation or chose to omit the word in the target text.

If we compare the translations of the same word with and without context, different patterns can be observed: Some words were translated by most participants with a cognate in the list condition, but were translated less often with a cognate in the text condition. For example, *priorities* was translated with a cognate in 93.6% of cases when it was only presented as a single word, or it was not translated at all (no participant translated the word with a non-cognate). In the text condition, however, *priorities* was translated as a cognate in only 52.9 % of cases, and 41.2 % of the participants chose a non-cognate translation. As another example, *shield* was mainly translated as a cognate (80.6 %) in the list condition

⁸The experiments in Section 3.1 and 4.1 were carried out at the FTSK. Translation students participated during a lecture in the different experiments. Since the experiments were part of their course, they did not receive any further credit for participation. The participants were informed that the results were treated anonymously and that they were only used for scientific purposes. The students were further informed that their participation had no influence on their grades and that they could withdraw from the experiment at any time.

⁹Thanks to Jan Skawski and Kai Schuhmacher who conducted the experiment and came up with first results in the context of a seminar paper.

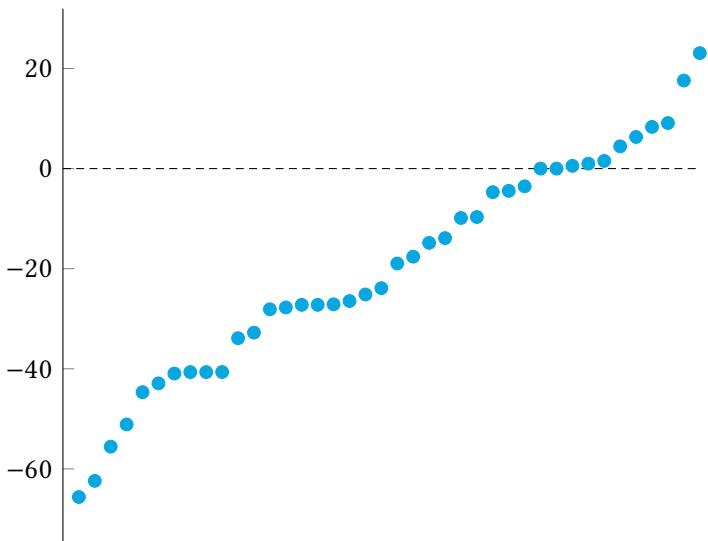


Figure 5: Distribution of decline (below zero) and increase (above zero) of cognate translation with context.

and never as a non-cognate, but it was only translated as a cognate in a quarter of the cases in the condition with context and as a non-cognate in 60 %. A point in Figure 5 represents one word of our texts/lists and the ratio of its decrease or increase (in percent) when translated in context compared to the single word translation. There were also instances for which it was the other way around (see Figure 5 and 6). For example, *diversity* was hardly translated with its cognate in the list task (3.6%), but the frequency increased considerably in the text task (26.3%). However, this is rather the exception than the rule, as can be seen in Figure 6, which shows how often the cognate use radically increased (> 10%), only slightly changed ($\pm 10\%$), or radically decreased (> 10%).

The analysis shows that the use of cognates in translations is dependent on the context of the translation. In general, the participants chose a cognate less frequently, when they were translating a whole text than when they only had to find German equivalents in a word list. This might indicate that the cognate translation is the “safest” without context, because the cognate is not only similar in meaning, but also in form. When a cognate is embedded in context, however, the translators are more secure about which translation choice to select.

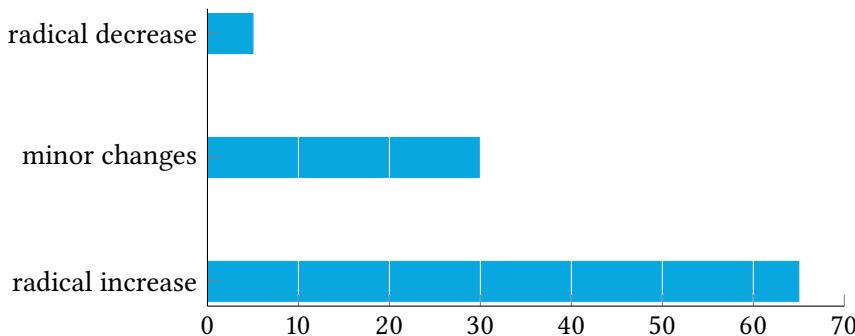


Figure 6: Change in translation strategy with context in percentage

3.2 Text type

As shown in the preceding section, context has an influence on cognate use. But why would e.g. *diversity* be translated more often as a cognate in a political text than in a list of single words? We assume that this behavior was triggered by the text type. Maybe the participants thought that the use of the cognate translation is more natural in the political context, although they are aware of a non-cognate alternative. Hence, we hypothesize that text types influence the use of cognates.

In the following, we used the statistics component of the online tool DWDS¹⁰ to observe the intralingual influence of different text types on the use of cognates. We used the following pairs of cognates and non-cognates, and compared them for two different text types, namely newspapers (NP) vs. academic texts (AT). We chose the following example because we assumed that they might be used differently in the two text types. Further, we wanted to cover different word classes¹¹:

- *komplex* (cognate), *kompliziert* (cognate) vs. *schwierig* (non-cognate)
- *original* (cognate) vs. *echt* (non-cognate)
- *publizieren/ Publikation* (cognate) vs. *veröffentlichen/Veröffentlichung* (non-cognate)
- *Maschine* (cognate), *Apparat* (cognate) vs. *Gerät* (non-cognate)

¹⁰ „Digitales Wörterbuch der deutschen Sprache“ (Digital Dictionary of the German language), www.dwds.de

¹¹We chose the most frequent non-cognates of the translation test in Section 3.1 to come up with these pairs. We neglected translations which only occurred once or twice.

- *spezifisch* (cognate), *charakteristisch* (cognate), *typisch* (cognate) vs. *besonders* (non-cognate), *deutlich* (non-cognate)

The results in Figure 7 show that, in general, there is no clear preference for cognates or non-cognates. However, when comparing different text types, we can see that cognates are preferred in academic texts compared to newspapers for the same cognate/non-cognate pair. This holds true for all our examples displayed in Figure 7, although the difference for the pair *komplex*, *kompliziert* (cognates) vs. *schwierig* (non-cognate) is only very small.

The interpretation of these results may be twofold:

First, it is possible to assume that German academic writing might be influenced by the lingua franca of science, which is English (Ammon 2001). Language contact might result in a higher frequency of Anglicisms, internationalisms and cognates in German academic writing. In addition, academic texts convey a high frequency of technical terms such as Latinisms, Grecisms and Anglicisms (Braun et al. 2003). At same time, these are the roots of cognates because they have typically been introduced into and established in different languages and language families.

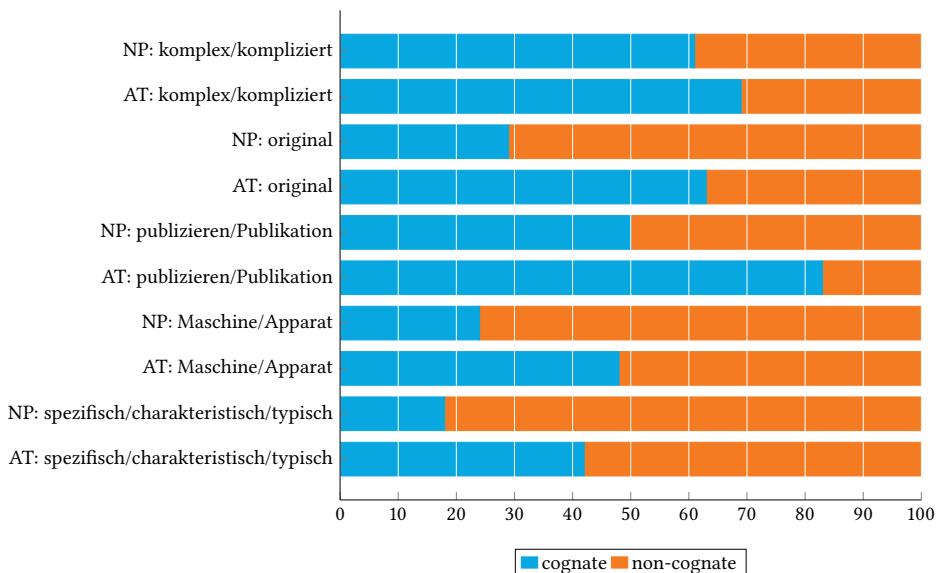


Figure 7: Examples for cognates and non-cognates in academic texts (AT) vs. newspapers (NP)

Secondly, the preference for non-cognates in newspaper texts might reflect a protectionary strategy of journalists towards their own language. They try to avoid cognates, which commonly have their routes in foreign languages, in favor of German synonyms (Liesem 2014). At the same time, shining-through effects of English constructions or internationalisms can also be found in popular-scientific texts translated from English to German (Hansen-Schirra et al. 2012) conveying a certain degree of technicality, which might be comparable to the academic text type under investigation.

In summary, typical preferences in terms of cognate usage can be identified for different text types. Further, we assume that a more in depth study might complete the picture. It seems, for example, reasonable that legal or technical texts – or in general very domain-specific texts – contain more cognates than newspaper texts or other general language texts.

4 Translation-inherent predictors

In the last part of the paper, we investigate characteristics of translators and the translation environments that might influence cognate use. These predictors can again be characterized as external.

4.1 Expertise

In the following study, we investigated whether cognate production changes during the translators' training. As Vandepitte et al. (2015) showed with respect to metonymic language, translation competence influences processing time and translation strategies. It can therefore be assumed that translation competence might also have an impact on cognate translation: with increasing translation experience, cognates might be used more consciously, because the translator is more aware of the potential meaning. If training and experience influence the number of cognates in translations, we take the factor experience as a variable for the processing of cognates in the translator's mind.

In total, 43 students of the FTSK in Germersheim participated in the experiment. They were all German native speakers and students of English. The text was taken from a news platform.¹² It dealt with home affairs in the United States¹³ and was shortened in order to obtain a higher cognate density. The final text was

¹²<http://www.foxnews.com/>, last accessed 13th August 2016

¹³<http://www.foxnews.com/politics/2013/03/03/obama-to-nominate-walmart-sylvia-matthews-burwell-for-budget-chief.html>, last accessed 13th August 2016

187 words long and contained 49 English-German cognates which were analyzed in the target texts. The students translated the text in a lecture at the FTSK (see footnote 8).

We counted the number of cases in which participants decided to translate a source language cognate with a target language cognate. The number of cognates in the translations correlated significantly with the number of semesters (see also Figure 8): $r(41) = -0.42, p = 0.005$.

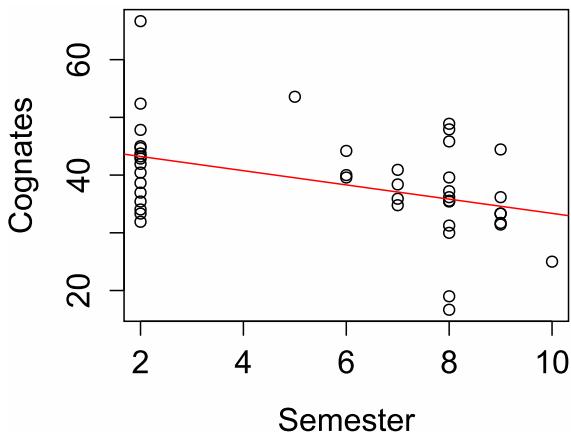


Figure 8: Usage of cognate correlates with expertise

These results suggest that a mechanism in the translator's mind develops during the translator training. This could be the mental lexicon, since it was shown that new words can also be easily learned in adulthood, and connections can be strengthened or weakened in its network-like structure (Aitchison 2012). But the reason could also be due to increased monitoring (see (Oster 2017 [this volume]) for the impact of monitoring and mental lexicon on the lexis of the target text). However, several studies concluded that monitoring does not develop anymore after childhood (Wiersema et al. 2007). It depends, however, on the mental resources available: motivation (Ganushchak & Schiller 2008) and time pressure (Ganushchak & Schiller 2006).

Our hypothesis is thus that the mental lexicon changes. It is reorganized; the connections between non-cognates become stronger since cognates are constantly filtered out by the monitoring process. Monitoring itself does not change. But as the translator needs less mental resources to activate non-cognates (their threshold is lowered over time), more mental resources are available for monitoring. This means that monitoring becomes stronger in translation tasks but not in

general settings. We have to keep in mind, however, that the results might not only be due to the translator training but also to increased expertise in the respective languages. This expertise goes hand in hand with the expertise in translation. But it could be worth investigating this factor in future studies.

4.2 Computer-aided translation

In the last decades, translation technologies have become more and more important as they make translations more consistent and the process more efficient. Translation memory systems and software for terminology management have been developed and established in most translation environments. A recent trend is the post-editing of a machine translated source text “by a human translator according to specific guidelines and quality criteria”. (O’Brien 2011: 197) In this study, we hypothesize that the processing mode in which the translation is produced influences cognate use. We therefore compare human translation output and post-edited output. We hypothesize that machine translation generates more cognate translations and that the translator tends to adhere to the machine translation.

The experiments are part of the CRITT-TPR database¹⁴ that collects translation process data for different tasks and in different languages. A total of 24 participants took part in the study used for this analysis: twelve professional and twelve semi-professional translators (students of the university with only little professional work experience). The texts were newspaper articles and sociology-related texts with different complexity levels. The length of the texts varies between 100 and 148 words. The participants were asked to translate two texts from scratch, post-edit two machine translated texts and monolingually edit two machine translated texts – from English to German respectively. For this study, we only looked at the post-edited and human translated target texts.

The tasks were conducted in Translog II,¹⁵, a program used for recording mouse activity, key strokes and gaze data with the help of the Tobii eye-tracker, which also records the sessions, mouse activity, key-strokes and gaze data in Tobii Studio. There were no time restrictions and the participants could use the Internet freely as a research tool.

We determined the cognates from the source texts (58 cognates in all six source texts – some occurred more than once in one text or in a few texts) and extracted

¹⁴<https://sites.google.com/site/centretranslationinnovation/tpr-db>, last accessed 13th August 2016

¹⁵<https://sites.google.com/site/centretranslationinnovation/translog-ii> last accessed 13th August 2016

the realizations of these cognates in the MT output and in the target texts (human translation and post-editing). We differentiated between non-cognate and cognate translations. Further, we analyzed the varieties in the cognate realizations in the different translation modes.

Table 3 and 4 present the results of the cognate analysis. While Table 3 presents total numbers (e. g. 321 cognates were realized with a cognate translation in the translation from scratch mode), Table 4 shows the amount of variation in the different translations modes, independent of how often they occurred. Let us specify the counting procedure for Table 4 with some examples:

- The English cognate *motive* was realized as *Motiv* both in the translation from scratch and in the post-editing tasks. Hence, it was counted as TfS – Cognate: 1; TfS – Non-Cognate: 0; PE – Cognate: 1; PE – Non-Cognate: 0.
- The cognate *minimized* was realized as *minimieren, reduzieren, gering halten*, and *verringern* in the translation from scratch tasks and as *Minimierung, minimeren, Reduzierung*, and *Reduktion* in the post-editing tasks. It was counted as TfS – Cognate: 1; TfS – Non-Cognate: 3; PE – Cognate: 2; PE – Non-Cognate: 2.
- The cognate *analysts* was realized as *Analysten, Analytiker, Analysen*, and *Finanzexperten* in the translation from scratch tasks and as *Analysten* and *Experten* in the post-editing tasks. It was counted as TfS – Cognate: 3; TfS – Non-Cognate: 1; PE – Cognate: 1; PE – Non-Cognate: 1.

Table 3: Translation of Cognates in translation from scratch (TfS) and post-editing (PE) task.

	Cognate	Non-Cognate
TfS	321	127
PE	325	118

Table 3 shows that the distribution of English cognates realized as the German cognate-equivalent is quite similar in both translation modes: 71.7% in the translation from scratch task and 73.4% in the post-editing task. The chi-square test did not show significant differences between the two translation modes and the cognate realization: $\chi^2 = 0.2471, df = 1, p = 0.62$.

Table 4: Variations in translation from scratch (TfS) and post-editing (PE) task

	Cognate	Non-Cognate
TfS	59	91
PE	50	49

In the next step, we examined the variety in which the cognates were translated. While cognate variety is quite similar, the difference is remarkable in non-cognate variety. For the whole set-up, the chi-square test did not prove significance between the two translation modes and cognate realization: $\chi^2 = 2.59, df = 1, p = 0.11$. Next, we conducted Wilcoxon rank sum tests (the data was not distributed normally) for the differences in the variation in the cognate group and in the non-cognate group. The test did not prove significant for the cognate group ($W = 1883, p = 0.19$), but significant for the non-cognate group ($W = 2157.5, p = 0.005$).

Translations from scratch and post-edited target texts show a similar cognate and non-cognate usage, which is not in line with our hypothesis. By implication, this indicates that post-editing and human translation are very similar in this aspect. The machine translated cognate was not changed in 88.3% of instances (391 of 443) in the post-editing task. Interestingly, 67.9% (301 of 443) of the human translated cognates were congruent with the machine translation output. Hence, we assume that cognate/non-cognate translations are chosen in statistical MT system quite similar to human translation. The variety within non-cognate choices, however, is statistically higher in translations from scratch than in post-edited texts. When we take a closer look at the data, it turns out that the participants choose the MT in 87% of cases, and only 11% changed the MT. This explains why there is much more variety in human translations than in post-editing.

5 Enhancing the monitor model with translation predictors

The predictors presented in this study are not exclusive. Other translation-inherent constraints that influence the usage of cognates in translation can be skopos, time constraints, translation mode (Oster 2017; Gieshoff 2017 [this volume]), etc.

The results suggest that different mechanisms are responsible for the translation of cognates. When considering, for example, Levelt's speech production model (1989) as a basis for the processing of language during translation, the translation of words in general can be influenced by different steps. During the conceptualization phase, speakers adapt messages according to cultural and pragmatic norms. During formulation, the lexical selection in the mental lexicon can be primed by context and can depend on expertise.

When considering the translation of cognates, we can assume that according to the literal translation hypothesis (Halverson 2015), the translator always chooses the easiest path (the cognate translation). However, when considering cultural predictors for cognate translation, specific cultural norms are present at a translator's conceptual level causing monitoring (Tirkkonen-Condit 2005a). The same holds true for pragmatics. On a lexical level, the context pre-activates certain words (cognates or non-cognates). It causes thus less processing effort for the translator to choose the co-activated words than to look for alternatives. The mechanisms of controlling lexical choices might change with expertise according to Halverson (2015) gravitational pull hypothesis and thus lead to more pre-activation of non-cognates in experienced translators.

The findings related to the translation of cognates suggest that different priming roots exist and that the monitor model proposed by Tirkkonen-Condit should be adapted to these findings. The studies we presented are, however, pilot studies which were conducted in very natural settings. If we want to further explore the predictors of translations, we will need to conduct more controlled experiments in order to isolate different factors. However, the studies we presented in this paper can provide an overview of the different processes that might be involved. Future research might also consider other linguistic aspects such as syntax or pragmatics, and investigate how these features can be influenced by different conditions. This might help us to predict how a certain translator will translate a text in a certain situation.

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Chapter 2

The influence of self-monitoring on the translation of cognates

Katharina Oster

In some translations, the source text influences the syntactic structures or the lexis of the target text (shining-through), while other translations contain fewer traces of language transfer than original texts in the target language (normalization). On the lexical level, this can be seen in the number of cognates. There is no definite answer to the question of how these phenomena can be linked to mental processes yet. However, psycholinguistic literature shows that the shining-through effect can be explained by the structure of the mental lexicon as well as the mechanisms for accessing words: the cognate-facilitation-effect. The aim of this study is to provide an explanation for normalization. The hypothesis was that verbal self-monitoring, after the first activation of words but before articulation, filters out cognates. For this purpose, written and oral translations were compared. Written translations, which are monitored more strongly, contained fewer cognates than oral translations. Accordingly, the interpretation of this study was that self-monitoring filters out cognates before the translator starts writing and that it is therefore an important factor for normalization.

1 Introduction

Translations differ from original texts. In some translations, the influence of the source text on syntactic structures or the lexis of the target text is visible (shining through; Teich 2003) while other translations contain fewer traces of language transfer than original texts in the target language – the translator seems to exaggerate the norms of the target language (normalization; Baker 1996). So far, we do not know the exact mental causes of these phenomena. This study is therefore an attempt to find answers to this question.



1.1 Cognates, shining through and normalization

Cognates are words which share both form and meaning in the source and target languages – e.g. the English word *system* and the German word *System* (Stamenov et al. 2010). In corpus linguistics, cognates have been used to identify normalization and shining-through on the lexical level: in comparison to the originals, shining through can be observed in the use of more cognates and normalization in the use of fewer cognates – provided that language preserving tendencies exist in the respective language (e.g. in Slovene – Vintar & Hansen-Schirra 2005).

Several external factors can lead to normalization or shining-through in translations. These include, for example, the language pair but also the text type: the language pair English-German, for example, has been shown to be quite prone to shining-through while the language pair English-Slovene leans towards normalization (Vintar & Hansen-Schirra 2005).

Shining-through and normalization are especially interesting with regard to the question of how translators deal with language contact and language control in their mind. These processes might not only be interesting in regard to translations but also in terms of language change. Although there may be other factors that influence languages such as German for example Hansen-Schirra (2012), a study by Becher et al. (2009) suggests that translations have an influence on the lexical features in the target language. Understanding the mental mechanisms that result in shining-through and normalization is therefore not only interesting with regard to modeling the translation process but also when it comes to understanding how the human mind can cause and control language changes.

1.2 The translation process

Different models have been proposed to describe the mental processes during translation. However, many models in the field of translation studies do not concentrate on pure language processing but on other factors, such as problem solving and the integration of different types of information (e.g. Höning 1997, Kiraly 1995, Krings 1986). Other models are very simple and do not integrate different language processing steps, such as the processing of words (e.g. Kautz 2000, Steiner 2001). These models can therefore not be used to explain the processing of cognates during translation. For the purpose of the present study, I will thus suggest a model that concentrates on the mental processing of words during translation.

In the field of psycholinguistics, many researchers have presented speech process models that concentrate on the processing of words. Levelt (1989) described

one of the first complete speech process models which served as a foundation for further monolingual and bilingual models (de Groot 2011). He distinguishes between a reception and a production phase. During reception, a person hears spoken speech or reads a text. During comprehension, he then maps phonological and orthographical information to lexical entries and grammatical information stored in his long term memory. He finally accesses meaning by linking this linguistic information to abstract concepts. During production, a speaker first creates a preverbal message. He chooses, for example, the overall idea, the perspective and the language of his message. In Levelt's model, this step is called conceptualization. The speaker then accesses lexical entries, morphology and grammatical structures during the formulation phase in order to give his message a verbal structure. The stage during which all linguistic information necessary for producing speech is accessed is called *inner speech*. The final step is the physical act of speaking or writing.

Levelt's model has been modified by many researchers (for reviews see de Groot 2011; Plieger 2006). Several components have been added in order to make it suitable for bilinguals and for interaction with other speakers. It has also been discussed in which order the components are accessed and whether the process is only top-down, like in Levelt's model, or whether the different stages might interact, occur more or less simultaneously and whether the conceptual level might be influenced by the language chosen for production (Dell & O'Seaghda 1992). But most complete speech process models contain the five steps listed above: hearing, comprehension, conceptualization, formulation and speaking (cf. Plieger 2006).

Levelt's model could also be a good foundation for a translation process model. Kautz (2000) and Steiner (2001), for example, also divided their translation process models into a reception and a production phase. And even though some researchers argue that translators do not always access meaning (the conceptual level) (cf. de Groot 2011), but instead sometimes just transcribe messages, some studies (e.g. Francis & Gallard 2005) have given reason to believe that translators always pass through the different steps described above and access the conceptual level.

For the purpose of this study, I suggest the translation process model in Figure 1 which is based on Levelt's model and which assumes that translators always access meaning. Translators read the text, then link the orthographical and phonological information to lexical and grammatical information, and access meaning. Next, translators might change the message before they choose lexical and grammatical information in the target language in order to verbalize

the message. They finally articulate the message or write it down. This model does not aim to explain all language processing steps during translation or how the translator deals with information during conceptualization, but rather seeks to locate the processing of words during translation because this is the step which could be responsible for shining-through and normalization. In the model proposed in Figure 1, the translator accesses words in the mental lexicon during the comprehension phase (reception) and during the formulation phase (production) (see also Levelt 1989). Although, the different steps are clear cut and unidirectional in Figure 1, we must assume that there is interaction between the different components and that the different processing steps might overlap or take place simultaneously.

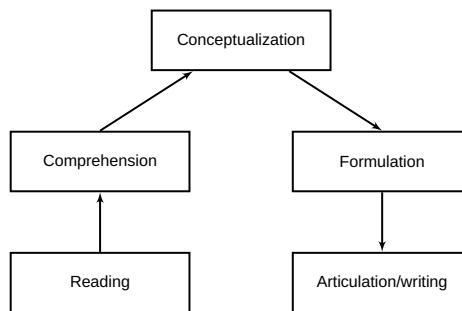


Figure 1: Basic translation process model

1.3 Lexical access and the mental lexicon

The most important step in speech processing in regard to the question of how cognates are processed is access to lexical information in the mental lexicon, which can be located between sensory/physical processing and the conceptual level (Levelt 1989; see also Figure 1).

Lexical information is stored as two components – word meaning and word form – in the mental lexicon (Aitchison 2012, De Bot & Schreuder 1993, de Groot 2011). Word meaning and form are closely linked and both categories are organized in network-like structures which enable easy access. Word meanings are linked according to semantic fields and word classes, and word forms are organized according to formal aspects such as orthography and phonology. The more features they share, the closer they are linked (Aitchison 2012).

When we access lexical information for reception or production, we do not just activate one entry in the mental lexicon, but activation spreads throughout

the network. Word meanings and word forms are activated in parallel. The mind finally controls this activation and narrows down the choice by inhibiting activated words that do not match the concept to be verbalized or the sounds which are heard. This model is therefore called interactive activation model (Dell 1986). Paradis (2004) assumes that words require different amounts of activation in order to be accessed. Every entry has an activation threshold and the more often a word is used, the lower the threshold is and the easier the word can be accessed. In addition, words can be more easily accessed during reception and when they are closely linked to other words in the mental lexicon because they are activated due to activation spreading from their neighbors, which helps to lower the activation threshold.

The interactive activation model and the activation threshold hypothesis seem to be very probable because they can explain many, if not all, lexical errors that occur during production, such as slips of the tongue or blends: In these cases, entries next to the target word are also activated. Due to a lower threshold, they receive more activation and are thus produced instead of the target word (slips of the tongue) or mixed with the target word (blends) (Aitchison 2012).

Regarding the bilingual lexicon, we must assume that there is not a separate lexicon for each language but that there is only one multilingual lexicon with closer links within a language than between languages (Paradis 2004). In bilinguals, lexical access therefore leads to spreading activation across language borders. This can cause interferences when a speaker uses L1 but a word in L2 is activated more strongly than the equivalent in L1 (Plieger 2006).

Although bilinguals activate both languages in parallel when they try to formulate a message (Christoffels et al. 2007), there are relatively few cases of code-switching and blends across language borders (de Groot 2011). It must therefore be possible to control the languages. Balanced bilinguals (speaker with a native like proficiency in both languages) seem to choose one language for production and to ignore the other language without actively inhibiting it (e.g. Costa & Caramaizza 1999; Costa et al. 2005); language learners and unbalanced bilinguals seem to actively inhibit every language they do not need for production (e.g. Costa et al. 2005; Paradis 2004).

These mechanisms have been observed in bilinguals; but translators might not be bilingual in the classical sense. They often acquire their second language after early childhood. Recent studies show, however, that translators do, in many ways, behave like balanced bilinguals (e.g. Ibáñez et al. 2010). Ibáñez and colleagues therefore assume that language control and lexical access in translators follow the same mechanisms as those found in bilinguals and not those of language learners or unbalanced bilinguals.

Hence, for the purpose of the present study, I assume that the mechanisms concerning language production, language control and the structure of the mental lexicon investigated in bilinguals also apply to translators.

1.4 The cognate facilitation effect

Cognates reflect how translators deal with language contact on a lexical level during translation. Their frequency in translations compared to their frequency in original texts has been categorized as shining-through and normalization (see §1.1). But cognates have not only been studied in translation studies. In psycholinguistics, the processing of cognates has been investigated because they seem to differ from other words (non-cognates).

Several studies have shown a faster and more accurate production of cognates compared to non-cognates during picture naming (e.g. Costa et al. 2000). Bilingual participants named pictures with cognate names faster than pictures with non-cognate names. Costa and colleagues (2000) call this phenomenon the *cognate-facilitation-effect*. They argue that cognates, which share both meaning and form, are closely linked in the bilingual mental lexicon (see Figure 2). Due to spreading activation during production, cognates receive activation from each other; non-cognates receive less activation because they have a less dense neighborhood in the mental lexicon. The authors argue that the more activation a word receives, the faster and more accurately it can be produced.

This facilitation effect has also been observed during the translation of single words, so-called word-translation-tests (Christoffels et al. 2006). Cognates were translated faster than non-cognates by novices as well as by professional translators. The mechanisms of spreading activation during production within the bilingual lexicon also apply during this task. But in addition, priming also takes place during reception. When a cognate is activated during reception, the target language cognate is also activated due to the close links in the mental lexicon and the fact that activation is spreading. Its activation threshold is then lowered and remains that way for some time. During production, cognates are still pre-activated. They have more available activation and can be more easily produced than non-cognates (Christoffels et al. 2006, see also de Groot 2011).

The cognate-facilitation-effect and priming might also occur during the translation of texts. As in picture-naming-tasks and word-translation-tests, cognates receive more activation in natural translation settings due to their formal similarities and can thus be more easily produced than non-cognate synonyms during translation. This could explain the higher number of cognates in translations compared to original texts and could be a reason for shining-through.

2 The influence of self-monitoring on the translation of cognates

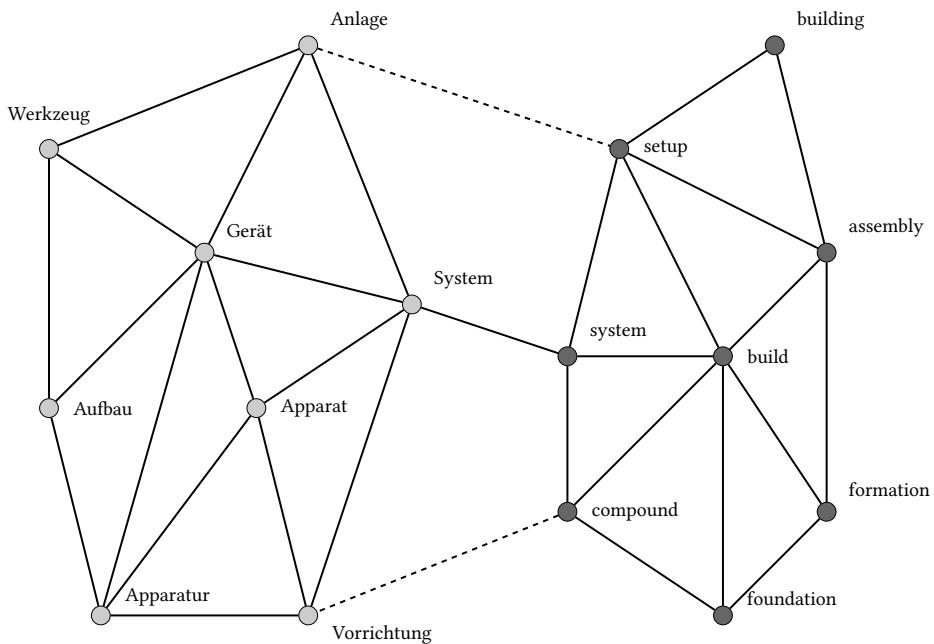


Figure 2: Mental lexicon

1.5 Monitoring

As explained above, the cognate-facilitation-effect may be an explanation for shining-through. But the source language does not always shine through. Depending on text type and language pair, translators sometimes use fewer cognates in their translations than we see in originals (Vintar & Hansen-Schirra 2005) – and even in translations with a tendency for shining-through, not all source language cognates are translated by target language cognates. Normalization in particular therefore requires a mechanism to control the production of cognates despite priming and the cognate-facilitation-effect. This mechanism might be attributed to monitoring of inner speech.

The monitoring mechanism is an important part of executive control (Ganushchak & Schiller 2006). It is responsible for controlling movements and speech production in order to filter out errors and adjust behavior. Monitoring is thus not a static capacity; it is influenced by, for example, motivation (Ganushchak & Schiller 2008), age (Wiersema et al. 2007) and time pressure (Ganushchak & Schiller 2006). There is also empirical evidence that monitoring has an effect on the number of wrong motor responses a participant exhibits in an experiment

– the stronger the monitoring response, the fewer mistakes a participant makes (Hajcak et al. 2003).

In the field of psycholinguistics, several authors assume that the monitoring mechanism also has an impact on speech output (Aitchison 2012, de Groot 2011, Levelt 1999). Levelt (1999) assumes for example that speakers make many more mistakes, especially on a lexical level, if their production is not monitored. According to his theory, monitoring of the production of words takes place after the first activation of words, during inner speech.

Verbal self-monitoring has also been taken into consideration in the field of translation studies (e.g. Carl & Dragsted 2012, Tirkkonen-Condit 2005, Toury 1995). According to Tirkkonen-Condit (2005), translators use the easiest elements available for translation – they transcribe the source text into the target language. But they constantly monitor their formulation and when they encounter problems while transcribing, they can, thanks to self-monitoring, go back in order to find better solutions for their translation.

In contrast to the translation process model proposed for the purpose of this study (see Figure 1), the model by Tirkkonen-Condit assumes that translators transcribe whenever possible. But as Francis & Gallard (2005) proved in an empirical study, translators seem to always access the conceptual level. For the purpose of this study, I will therefore not adapt Tirkkonen-Condit's model, but adjust the translation process model presented in Figure 1. A monitoring component will be added after formulation in accordance with Levelt (1999) (see Figure 3). I thus assume that monitoring of the production of words takes place after the first activation of words in the mental lexicon, but that it already has an impact on the production before the first articulation occurs.

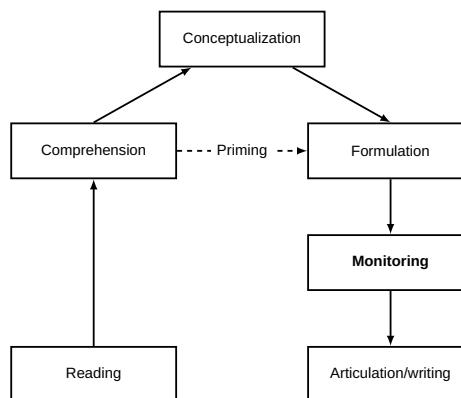


Figure 3: Translation process with monitoring

There has not yet been any evidence that self-monitoring has an influence on the production of cognates, which are not necessarily real mistakes. A study by Kußmaul (1989), however, can provide a first hint that the number of cognates is indeed reduced by the monitoring mechanism. Kußmaul discovered that translation students often use cognates in their translations first, but then decide to replace them with non-cognates. He calls this phenomenon *Interferenzphobie* (fear of interferences). Kußmaul focused on the best way to verbalize a concept and not on quantitative characteristics of a text, which is what I investigated in the present study. However, Kußmaul's study provides us with sufficient reasons to take self-monitoring into consideration when investigating mechanisms leading to normalization.

How can self-monitoring be investigated during translation of whole texts? It is widely accepted that the oral and the written production mode mainly differ in the degree of monitoring – the capacity to monitor is stronger in written production than in oral production (Treiman et al. 2003). This could be due to the time available for production. As Ganushchak & Schiller (2006) showed, the more time participants have to answer, the stronger their monitoring is. And more time is usually available for writing than for speaking tasks. In this study, I applied this mechanism and compared oral and written translations in regard to the translation of cognates. The hypothesis I tested is that self-monitoring has an influence on the number of cognates in translations and that written translations therefore contain fewer cognates than oral translations.

2 Method

The only difference between oral and written production regarding the different steps of the language processing model and the processing of words is the degree of monitoring. It is lower for the oral than for the written production mode (Treiman et al. 2003). In order to investigate the influence of self-monitoring on the number of cognates in translations, I compared written and oral translations.

2.1 Experiment 1

In a first experiment, translation students translated a written text with a high cognate-density from English into German. Although this language pair shows a tendency towards shining-through (Vintar & Hansen-Schirra 2005), not all source language cognates are translated by using target language cognates. The control mechanism must therefore also be present when working with these two

languages. The translations from this experiment were later compared to oral translations.

The source text was taken from the American news platform foxnews.com. The text on foreign affairs was presented in American English; the topic was also being discussed in the German media at the time of the experiment. The text was slightly modified in order to fit the requirements of the study: the participants had to translate the text without any translation aids and in a reasonable time-frame. Terms that were deemed too difficult for this purpose were replaced by easier expressions (e.g. *threatened to retaliate* by *threatened revenge*). The text was also shortened to enable a reduced translation time and to increase the cognate density. For this purpose, direct citations of an interview conducted for the article were removed. These citations were also discussed again in the text and were therefore not essential in order to understand the text. The final version of the source text was 190 words long and contained 21 English-German cognates. The cognates were defined as words which shared form and approximate meaning in English and German. Words, which were not found in the German dictionary *Duden*, were defined as borrowings and thus not analyzed for the purpose of this study. I did not distinguish between true cognates and false friends (Stamenov et al. 2010), since this study concentrated on form and not on meaning.

A group of 39 participants performed a written translation at the Faculty of Translation Studies, Linguistics and Cultural Studies in Germersheim. The participants were translation students who already had some experience in translating; they were in their 2nd year or higher. English was their first or second foreign language. They were all German native speakers. The experiment was carried out in the course of a lecture the participants attended, but they participated voluntarily and could withdraw from the experiment at any time. They were informed that their translations would be treated anonymously and would not be evaluated except for the purpose of the present study.

The participants were instructed to translate the text without making any changes once it was written down. They were not allowed to use any translation aids such as dictionaries or online resources. They were told that the translation should not take more than 30 minutes, but no definite limits were communicated and every participant was able to finish the translation when he or she wanted.

2.2 Experiment 2

In a second experiment, a group of 18 participants completed an oral translation. These texts were then compared to the written translations in experiment 1.

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The participants were chosen under the same conditions as in experiment 1. They read the written source text of experiment 1 and spoke the translation. The experiment was performed in private. The participants used their own computers and audio registration software to record their voice: Whyatt (2010) argues that self-recording causes fewer interferences and leads to a more natural setting, which was also the case in experiment 1. The participants were asked to verbalize every word that crossed their minds, in order to reveal further monitoring steps before the final version was chosen. As in experiment 1, the participants were asked not to use any translation aids.

3 Results

The written and oral translations were analyzed with a focus on the translation of the previously defined cognates and on a qualitative and a quantitative level. For the quantitative analysis, the number of source text cognates translated into target language cognates was counted in both the oral and written translations. For the qualitative analysis, I investigated how the translators dealt with cognates during the oral translation in experiment 2.

3.1 Quantitative results

Since not all of the participants verbalized all source text cognates and sometimes left out phrases, sentences or whole paragraphs, I computed the percentage of cognates translated with cognates compared to all cognates translated. Thereby, the non-verbalized cognates were not taken into consideration and incomplete translations could be considered for the analysis as well. Cognate production was analyzed in three different phases and modes (see Figure 4): the written production of experiment 1, the first production of experiment 2 (oral production) and the final production of experiment 2. The number of cognates was lower in the final oral production (60.56 %) compared to the first oral production (65.53 %) and the lowest number of cognates was found in the written translations (56.56 %).

For the statistical analysis, a Wilcoxon Signed-Rank Test was performed on the results of the two dependent samples of the oral production phases. The number of cognates was significantly lower in the final oral production phase ($M = 60.56$, $SD = 7.41$) compared to the first oral production phase ($M = 65.53$, $SD = 9.19$); $V = 90.5$, $p = .009$.

A Wilcoxon-Mann-Whitney test was performed on the independent samples of the final version of experiment 2 and the written production. The number of

cognates was significantly lower in the written production ($M = 56.56$, $SD = 9.19$) compared to the final oral production ($M = 60.56$, $SD = 7.41$); $W= 479$, $p= .014$.

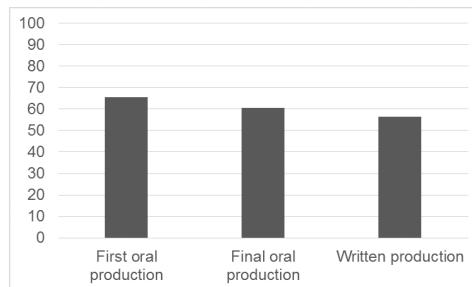


Figure 4: The number of cognates in different translation modes and phases¹

3.2 Qualitative results

In addition to the quantitative analysis, a qualitative analysis was performed on the translations in experiment 2. I investigated how the participants dealt with the cognates during verbalization of their translation; whether they directly chose one word as an adequate translation or whether they first chose one expression which was then replaced by another word they thought was better.

Twelve of the 18 participants chose a target language cognate at least once first in order to verbalize the meaning of a cognate in the source text (ST) before replacing it with a non-cognate in the target text (TT). This replacement was performed in 26 cases in total.

Examples 1 to 3 show how these cognate-non-cognate replacements were performed during the verbalization process. In Example 1, the participant initially decided to translate the English word *meeting* with the German cognate *Meeting*, but then chose to replace it with *Versammlung* and finally chose *Konferenz* as the best translation. This replacement of a cognate by a non-cognate can also be seen in Example 2. The participant first translated the English word *guarantees* with the German cognate *Garantien*, but then decided to replace it with *Zusicherungen*. Example 3 shows how the participant gradually moved away from the cognate. He first translated *undermine* with *unterminieren*, then changed it to *unterwandern* which still shares some formal aspects, the prefix, with the English word *undermine*. The participant finally used a word that does not share any formal aspects with the cognate, by using the German word *einzuschränken*.

¹See §4 for discussion.

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- (1) ST: Medvedev told in a meeting [...]
TT: Medwedew sagte in einem Meeting ...sagte in einer Versammlung
...in einer Konferenz [...]
- (2) ST: [...] Medvedev has sought guarantees from the U.S. [...]
TT: [...] wollte Medwedew Garantien ...Zusicherungen ...eine
Zusicherung von der US-amerikanischen Regierung haben [...]
- (3) ST: [...] powerful enough to undermine Russia's Power.
TT: [...] mächtig genug sein wird, um Russlands Macht zu unterminieren
...zu unterwandern ...um Russlands eigene Macht einzuschränken.

Changes after the first verbalization were not always cognate-non-cognate replacements. In one instance, three participants first chose a non-cognate and then replaced it with a cognate. One of these non-cognate-cognate replacements can be seen in Example 4

- (4) ST: Without a NATO-Russia cooperation *deal* [...]
TT: Ohne eine Absprache ...einen *Deal* zwischen der NATO und Russland
[...]

Although some participants replaced non-cognates with cognates, the cognate-non-cognate replacements outweigh reverse changes. The qualitative analysis thus supports the quantitative results. Cognates are often the words initially chosen for translation. But when translators have more time available, they replace some cognates with non-cognates.

4 Discussion

The quantitative analysis of experiments 1 and 2 showed that the number of cognates decreased with the time available for production. During the first production during oral translation, participants used more cognates than during the final production phase which still contained more cognates than the written production. Since the difference in production time (Ganushchak & Schiller 2006), as well as the different production modes (Treiman et al. 2003) can be linked to stronger monitoring, the decreased number of cognates can be explained by stronger self-monitoring during production.

This interpretation is supported by the qualitative analysis of experiment 2. In most cases, changes that were made to the translation of cognates were cognate-non-cognate replacements. Although non-cognates were replaced by cognates in some cases, the number of cognate-non-cognate replacements outweighs the number of non-cognate-cognate replacements: difficulties in verbalizing every word and thought that comes to mind could have caused the few non-cognate-cognate replacements. The cognate-non-cognate replacements thus suggest that it might be easier for the translator to translate source text cognates with target language cognates. This can be explained by the cognate-facilitation-effect and priming. The translator then tries to control production by filtering out the cognates. These results thus support the hypothesis that cognates are indeed activated first and then filtered out with the help of self-monitoring.

The aim of this study was to investigate the mechanisms which lead to shining-through and normalization. Psycholinguistic literature shows that the structure and functions of the mental lexicon can explain facilitated access to cognates compared to non-cognates. The cognate-facilitation-effect and priming can therefore explain the shining-through effect. The hypothesis tested in the present study was therefore that shining-through occurs naturally but that cognates are filtered out by self-monitoring. This was investigated by comparing written and oral translations of a written English text into German by translation students due to the differences in magnitude in terms of the monitoring mechanism. The results support the hypothesis that self-monitoring after the first activation of words has an impact on the number of cognates in translations and enables translators to control their production despite the cognate-facilitation-effect.

I may thus conclude that verbal self-monitoring not only has an effect on the number of real mistakes as Levelt (1999) suggested but also on minor tendencies in the text such as the number of cognates. Verbal self-monitoring might therefore be an important factor regarding normalization and play an important part in the translation process. The results of the present study support recent translation process models (e.g. Tirkkonen-Condit 2005) and could lead to the conclusion that verbal self-monitoring after the first activation of words, but before articulation and writing, should be taken into consideration when investigating and modeling the translation process.

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Chapter 3

Modelling the analysis of translation memory use and post-editing of raw machine translation output: A pilot study of trainee translators' perceptions of difficulty and time effectiveness

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This paper describes a pilot study undertaken to propose a model for the analysis of the respective impact of translation memory (TM) use and full post-editing (PE) of raw machine translation (MT) output on the level of difficulty perceived and on the time needed by trainee translators. Six Italian MA-level translation students were asked to produce high-quality target texts when translating semi-specialised material from English into their native Italian. For this experiment, we proposed a model of data triangulation in which we measured the time taken to complete the tasks and we collected data on their translation with TM software and PE processes by means of think-aloud protocols (TAPs) and retrospective interviews.

We studied the extent to which the number of translation solutions regarded as correct influenced, on the one hand, the perception of difficulty associated with the translation strategies employed and, on the other, the duration of the translation and PE tasks. Using a TM led to a reduction of the difficulty perceived and of the time employed by the participants as a result of the increased correct translation solutions provided. In contrast, a reduction was not observed when participants post-edited raw MT output. Further factors were assumed to influence the translation and PE processes of the students, especially their attitudes towards the translation technologies being used.



1 Motivations and objectives of the study

This paper presents a pilot study whose aim is to propose a model for the investigation of the respective impact of translation memory (TM) use and full post-editing (PE) of raw machine translation (MT) output on trainee translators' time effectiveness and perceptions of the difficulty of the translation strategies adopted. More precisely, the proposed model aims to determine the extent to which these two dependent variables are influenced by the number of correct translation solutions provided by the TM software and the raw MT output respectively. In order to achieve this goal, we employed data triangulation of think-aloud protocols (TAPs), retrospective interviews and time measurement. TAPs were used to gather evidence on the number of translation problems and corresponding correct translation solutions provided by the TM and the raw MT output. They were also used to identify the translation strategies adopted by the participants. Retrospective interviews were conducted with the aim of collecting data on the participants' perceptions of the difficulty of the translation strategies employed during the translation and the PE processes. Finally, time measurement allowed the comparison of the duration of the translation and the PE tasks. In this way, we could investigate whether variations in the number of correct solutions within the two working scenarios influenced the perceived difficulty and the duration of the translation and PE tasks. MT is increasingly used for dissemination purposes, and PE is becoming a much sought-after skill in professional translation (O'Brien & Moorkens 2014). Therefore, both TM use and PE of raw output might in principle represent viable options to obtain high-quality, publishable texts. However, either choice intuitively entails specific effects in terms of perceived difficulty and time required.

The small number of participants involved in our experiment (§3.1) and the brevity of the texts provided (§3.2) resulted in a small-scale pilot project. Nonetheless, we feel that the data triangulation model presented here has potential for larger experiments investigating the relationship between the duration and perceived difficulty of translation and PE processes. In addition, the model may also have important pedagogical implications when it comes to identifying effective methods of instruction in the use of translation tools, e.g. in academic programmes devoted to the training of technical and specialised translators. In a broader sense, it may find further applications in less formal training settings, e.g. for the continuing professional development of practising in-house and freelance translators, localisation professionals and translation project managers, who are always keen to optimise their workflows. Finally, insights into the decision-

making processes of (student) translators using TM or post-editing MT output collected with a composite data gathering model can also be relevant to translation theory, especially in terms of modelling micro- and macro-level translation strategies and phenomena.

2 Related work

Over the last thirty years, research focusing on translation and PE processes has constantly evolved, both in terms of the methodologies adopted and the objects of study. With regard to the former, TAPs, namely the verbalisations of mental processes while performing a task, were used as the primary research method in order to shed light on the translator's and post-editor's "black box" (Lörscher 1991). However, the shortcomings of this technique – e.g. its slow-down effect, as observed in Jakobsen (2003) – have led researchers to employ other methods, often in combination with each other and/or with TAPs (Angelone 2010). These further methods include retrospective interviews, collaborative protocols, keystroke logging, screen recording and eye-tracking. To give just a few examples, Translog (Jakobsen 1999; Carl 2012), a computer program which records the keyboard and mouse activity involved in producing a target text as well as eye movements, has been used to gather data on translation and PE processes. O'Brien (2007) demonstrated that eye-tracking is an effective methodology for the investigation of translators' interactions with translation technology, and also underlined the usefulness of retrospective interviews. Carl & Jakobsen (2009) presented a method for the gathering and analysis of User Activity Data (UAD) from translators: they focused on keystrokes, eye movements and the alignment units between source and target texts.

As far as the specific objects of study in translation process research are concerned, a variety of aspects have been considered, such as decision criteria (Tirkkonen-Condit 1989), subject profiling (Muñoz Martín 2010), effort in translation (Alves et al. 2012), translation strategies (Gerloff 1986; Krings 1986) and interaction with translation technologies (O'Brien et al. 2010), especially TM and MT systems. Seewald-Heeg (2005) provided an overview of the design and functionalities of TM systems and described their impact on the translation profession. Alves & Liparini Campos (2009) analysed the impact of both TM use and time pressure on the types of support employed by professional translators. O'Brien et al. (2010) investigated specifically the usefulness of the Concordance feature within a TM interface and reported that, according to translators' opinions, this facility was useful for checking terminology and context. Reinke (2013) discussed,

among other things, the relation between TM and MT, with a special focus on the level and type of intervention that is required of translators.

As for the PE process, its most extensive analysis dates back to Krings (2001), who identified three levels of PE effort, i.e. temporal, technical and cognitive effort. Temporal effort refers to the time required to post-edit a given output; technical effort consists of the keystrokes and cut-and-paste operations needed to produce a post-edited version; and, finally, cognitive effort refers to the mental processes aimed at identifying and correcting the errors found in the raw output. Much of the subsequent work dealing with the PE process has adopted this classification of PE effort proposed by Krings (2001). It should also be noted that there can be different levels of PE. Within the outbound approach, Allen (2003) made a distinction between minimal PE – which is obtained by making the least amount of revisions possible for producing an understandable working document – and full PE, which aims at obtaining high-quality texts.

Tatsumi & Roturier (2010) focused on the relation between source text characteristics and temporal and technical PE effort, while O'Brien (2011) investigated correlations between two automatic metrics for MT quality evaluation – general text matcher and translation edit rate – and PE productivity – measured via processing speed and cognitive effort. Her results showed that processing speed, average fixation time and fixation count per word correlated well with these automatic metrics; therefore, these could be employed to indicate PE productivity. Specia (2011) used three different annotation types – i.e. PE time, PE distance and PE effort scores – in order to experiment with confidence estimation models, used to filter low-quality segments which would require more effort on the part of the post-editors than translating from scratch. Koponen et al. (2012) suggested that PE time might be used to assess the cognitive effort involved in PE, while Popović et al. (2014) investigated five types of PE operations – i.e. correcting word form, correcting word order, adding omission, deleting addition, correcting lexical choice – and their relation with both cognitive PE effort and PE time. Carl et al. (2014) described the dataset CFT13, which was added to the CRITT database: it contains product and process UAD collected during a series of PE tasks using the second prototype of the CasMaCat workbench.

Finally, it is worth noting that there is a growing body of research comparing translation and PE processes. Čulo et al. (2014), in particular, described a pilot study designed to determine whether the very nature of the PE process interferes with the strategies translators usually apply. They involved both professional translators and translation students and compared their post-edited and human-translated texts. Their results indicated various points at which PE interfered

with the habitual use of translation strategies. Carl et al. (2015) used keylogging, eye-tracking and retrospective interviews to observe the (un)conscious cognitive problems characterising the three tasks of translation from scratch, PE with the source text and PE without the source text. They found that the overall rating of the MT output provided negative feedback as the participants agreed on the necessity to change the majority of it, despite the fact that PE took less time than translation from scratch and that it was more efficient in terms of the processing of the source text.

To the best of our knowledge, for the language combination English–Italian, there are no previous studies which triangulate data gathered using TAPs, retrospective interviews and time measurements to analyse the impact of the translation solutions provided by TMs and MT output on trainee translators' time effectiveness and difficulty perceptions. The main aim of this pilot study, then, is to fill this gap by proposing a model for the investigation of these aspects.

3 Experimental set-up and methodology

3.1 Participants

The pilot study on which this paper is based was conducted with six Italian trainee translators while they were enrolled in their final year of the two-year *MA Programme in Specialised Translation* at the *University of Bologna* at Forlì, Italy. These participants were chosen for three main reasons. First of all, in addition to being all native speakers of Italian, the students who accepted to participate in the study had very similar translation and language skills in English since, in order to be admitted to the programme, they had passed an entrance test. In addition, over the previous 18 months, they had been attending the same lessons on translation technologies, thus becoming similarly familiar with both the use of CAT tools – in particular *SDL Trados Studio 2011* – and MT PE.

In contrast, had the participants been professional translators, it would have been more problematic to match them by translation and language skills, since it would have been necessary to control a number of interrelated variables, such as their training, qualifications, years and areas of work experience, specialisations, etc. (Jääskeläinen 2000). Secondly, it might have been more difficult for professionals to verbalise their thoughts during the performance of the tasks assigned, as they might have internalised some standard routines and procedures. It has been noted that subjects stop verbalising when they have little thinking to do, especially when they have automatised problem-solving strategies (Ericsson &

Simon 1993). Finally, it would have been more difficult to recruit professional translators.

3.2 Materials

The texts used were three very similar extracts, of approximately 100 words each, taken from English press releases and their corresponding Italian raw MT output generated using the freely available MT service Google Translate¹ – an example and its MT output are available in Appendices A-B. These semi-specialised texts, which contained data on the quarterly economic performance of a well-established package delivery company, were selected because they represented realistic assignments for trainee translators and were potential candidates for translation with either TM software or MT post-editing, without necessarily requiring in-depth domain expertise.² The decision to use brief passages was made to prevent the drop in motivation and commitment that would be caused by a long task. Nonetheless, in order to provide the subjects with realistic source texts, the chunks selected from each press release were the first two or three paragraphs, kept in the original sequence.

Each of the three passages selected referred to a different quarter: the choice of three different texts was intended to broaden the set of possible translation problems and the range of translation strategies that could be observed. However, in spite of slight inevitable differences, the passages were very similar in terms of terminology, syntactic structures, stylistic features and rhetorical structure. For example, with regard to terminology, all three texts contained terms such as “dividend”, “Class A and Class B shares”, and “shareholders of record”. As for syntactic structures, compare the following three sentences, each belonging to a different text: “The NAME (NYSE: NAME) Board of Directors today increased the regular quarterly dividend by 9.6 percent to \$0.57 per share from \$0.52 on all outstanding Class A and Class B shares”, “The NAME (NYSE: NAME) Board of Directors today declared a regular quarterly dividend of \$0.52 per share on all outstanding Class A and Class B shares” and “The NAME (NYSE: NAME) Board of Directors today increased the regular quarterly dividend by 11% to \$0.52 per share from \$0.47 on all outstanding Class A and Class B shares”.

¹This online MT system is available at: <https://translate.google.com/> [last accessed on 21st March 2016].

²Although the students were given the full unedited source texts, including the actual names of the company and its managers, the excerpts given in the paper have been anonymised, removing both the name of the company and those of its senior executives.

As far as stylistic features and rhetorical structure are concerned, all three texts use a formal style at the beginning, when presenting economic data. Nonetheless, they are all characterised by plainer language in the final sentences. Compare the following three sentences, each belonging to a different text and corresponding to the final part: “NAME turned in a great performance in 2011 despite a volatile global operating environment,’ said NAME Chairman and CEO NAME SURNAME”, “The company has either increased or maintained its dividend every year for more than four decades” and “We believe that 2011 is going to be a great year for NAME and we’re committed to significantly increasing distributions to shareowners,” said NAME Chairman and CEO NAME SURNAME”. These common features were fundamental in retaining the same overall level of difficulty, thus controlling this crucial variable.

3.3 Experimental protocol

At the beginning of each experimental session, the participants were given written instructions on the task. In particular, they were told that no time limit had been set and that their final texts would not be evaluated to prevent any potential assessment-related anxiety. As far as the translation task was concerned, the participants had to work within SDL Trados Studio 2011, by employing a TM which had been previously populated with matches from similar press releases and their corresponding human translations. The fuzzy match threshold was set at 75% in order to increase the usefulness of the matches which were automatically inserted in the target text. If 100% or context matches were found in the TM database and the subjects accepted them without making any change, they were told that there was no need to verbalise any thought, although they were not prevented from doing so. In cases in which the TM did not provide any match or provided a fuzzy match which had to be checked, the subjects were expected to search for possible translations by firstly using the Concordance Search, after verbalising the portion of text for which they were performing searches. If the Concordance Search facility proved to be useless, they were then allowed to consult any website of their choice; in this case, they were asked to verbalise some specific types of information, such as the words for which they were searching and their opinions on the translation in the TM – when present, e.g. in the case of a fuzzy match to be checked – the websites which they were consulting, the potential translation solutions and equivalents contained in the webpages, their considerations on the quality of such solutions, etc. Furthermore, the participants using the TM database were instructed to update it as they translated.

As far as the full MT PE was concerned, the subjects were asked to activate Word’s Track Changes function before starting the PE task on the raw output generated using Google Translate. If the subjects considered the raw output to be correct, they were not required to verbalise any thoughts, although they were not prevented from doing so. Instead, if they had any doubts about a translation or regarded it as incorrect, they were asked to verbalise their thoughts on the correspondent portion of text and check the source text, which was provided in a table column beside the raw output. If, after this check, they did not regard the solution in the raw output as correct or were unsure about it, they could consult any website; in this case, they were expected to verbalise some specific types of information, such as the words for which they were searching and their opinions on the translation available in the raw output, the websites which they were consulting, the potential translation solutions and equivalents contained in the webpages, their opinions on the quality of such solutions, etc.

Both sets of instructions also explained that the participants had to deliver final high-quality, publishable texts. While this was perhaps obvious for the participants who were using TM software, this specific instruction stipulated the need for full PE for the students who were improving the raw output: during their training in MT, they had been exposed to different levels and types of PE, from minimal to full/complete. Finally, since all the participants knew each other and were in regular contact at university, they were asked not to discuss any aspect of the experiment with their colleagues.

3.4 Experimental sessions

Before running the main experiments, it would have been advisable to conduct a warm-up session with the students in order to help them familiarise themselves with the TAP technique (O’Brien 2010). Although this was not possible due to the time constraints under which this research was conducted, it should be noted that the participants were not asked to verbalise every thought occurring to them, but rather focus on some specific actions and considerations – as explained in §3.3 – and this was assumed not to require prior training. The six students were divided into three pairs; then, within each pair, one participant was provided with the English source text to translate into Italian using the TM software, while the other was also given the corresponding Italian raw MT output to post-edit – two examples are available in Appendices A-B. Therefore, the members of each pair worked on the very same extract, but under different experimental conditions. The decision to assign only one task, on one text, to each student was taken to prevent any learning effect.

In order to adhere to good practice in experimental protocols and comply with ethical requirements, the participants signed an informed consent form and were made aware up-front that their verbalisations would be recorded (O'Brien 2010); the voice recorder used was also made visible to participants during the experimental sessions. The transcriptions and analyses of the verbalisations were performed at a later stage. With the exception of time tracking, no objective data gathering method – such as eye-tracking or keystroke logging – was used. This decision was taken for two main reasons. First of all, we wanted to create a (near-)natural situation (Li 2004): participants had been trained to use SDL Trados Studio's work pane when translating and Microsoft Word when post-editing. The use of a keystroke logging programme would have compelled them to work in an unfamiliar environment. Secondly, by resorting to TAPs, the participants retained control over the amount and type of information being recorded. The use of eye tracking or keylogging programmes, on the contrary, might have led the subjects to alter their normal behaviour, as a result of their awareness of being constantly observed (Hansen 2008). Each of the subjects could work at his/her normal pace and performed the assigned task within their routine working environment. The interaction between the researcher and the subjects was reduced to a minimum: it consisted solely of prompts to resume verbalisation when the subjects kept silent for more than one minute.

4 First set of results: Correct translation solutions

TAPs allowed the identification of the translation problems encountered by the participants: as stated in §3.3, participants were asked to indicate the portions of text for which they were performing searches with the Concordance Search – in the case of the TM – or checking the raw output – in the case of the PE process. These portions of text were treated as translation problems. Once translation problems had been identified, the recorded verbalisations of the participants were also used to determine whether the TM database – via the Concordance Search – and the raw MT output provided solutions which were deemed to be correct. It is important to underline that the translation problems identified and verbalised by the participants were quite different: single words, collocations, symbols, and so forth. Tables 1 and 2 contain lists of the translation problems verbalised by the participants in both working scenarios.

As a result of the ongoing updates, the number of translation solutions provided by the TM database and regarded as correct by the subjects steadily increased during the course of the experimental sessions. In the data analysis we

Table 1: Translation problems identified by the participants working within the TM scenario

Translation problems in the TM scenario		
1st participant	2nd participant	3rd participant
Boosts	Declares	Board
Board	Board of Directors	Boosts
Earnings Outlook	Regular quarterly dividend	Per share
Strong Cash flow	Payable	Directors
NYSE	Shareholders of record	Earnings Outlook
Board of Directors	Boosted	We believe
Regular		Distributions
\$		Chairman
Outstanding		
Class A		
Class B		
Payable		
Of record		
Operating environment		

present the contrastive results for all participants, and it should be noted that the number of translation problems identified and of correct translation solutions varies from participant to participant, as it depends on the verbalisations of each individual.

The number of correct translation solutions was only two out of fourteen translation problems – approximately 14% – for the participant using the TM in the first TAP session. It should be noted that this participant did not find any context, 100% or fuzzy matches. On the contrary, in the subsequent sessions, and as a result of the updates, the participants could take advantage of an increasing number of TM matches. Four translation solutions out of six translation problems – approximately 66% – were regarded as correct by the participant using the TM in the second TAP session; finally, eight out of eight – 100% – translation solutions contained in the TM were regarded as correct by the participant in the third TAP session.

With regard to the PE task, it was observed that, in the first TAP session, ten solutions out of seventeen translation problems – approximately 58% – were deemed to be correct; in the second TAP session, this occurred in five out of six cases – approximately 83%; finally, in the third TAP session, two solutions out of four translation problems – namely 50% – were deemed to be correct.

Table 2: Translation problems identified by the participants working within the PE scenario

Translation problems in the PE scenario		
1st participant	2nd participant	3rd participant
NAME Boosts Dividend	Board	Earnings Outlook
Board	Declares	Quarterly
Cites	Regular quarterly dividend	Outstanding shares
Earnings Outlook	Outstanding	Class A
Strong Cash Flow	Dividend is payable	
(NYSE: NAME)	Shareholders of record	
Board of Directors		
Regular quarterly dividend		
Outstanding		
Class A shares		
Dividend is payable		
Shareholders of record		
Turned in a great performance		
Global operating environment		
Volatile		
NAME Chairman and CEO		
That projection		

Figure 1 summarises the data on the percentage of correct translation solutions respectively provided to members of the same pair working in a different scenario, thus allowing a direct comparison of the percentages of translation solutions regarded as correct by the two participants within each pair.

Looking at these data, we can observe that, although the number of correct translation solutions provided by the TM database steadily increased as a result of the updates, in two out of three cases the percentage of correct solutions contained in the TM database was lower than the corresponding percentage contained in the raw MT output: in two out of three cases – i.e. for the first and second pair – post-editing raw MT output represented the most effective option in terms of the incidence of correct translation solutions. Nonetheless, it should be noted that a larger number of correct translation solutions does not necessarily imply a lower level of perceived difficulty, nor a shorter amount of time spent on the task. Therefore, our proposed model investigates these two further aspects in §5 and §6, respectively.

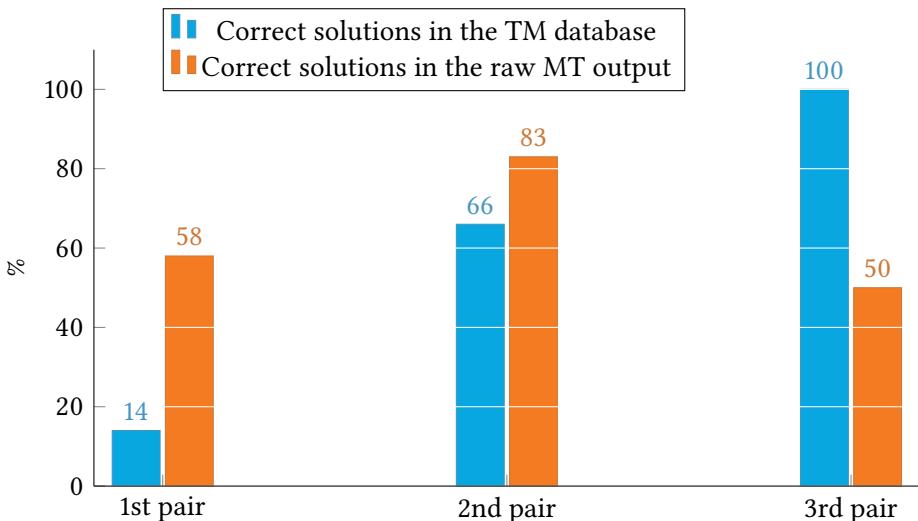


Figure 1: Percentage of correct translation solutions provided by the TM and the raw MT output

5 Second set of results: Perceptions of difficulty

This section deals with the level of difficulty that the participants perceived when working within the two scenarios considered; more precisely, with the perceived difficulty associated with the translation strategies – or Internet searches – that they had to adopt. The data on the type and frequency of translation strategies were collected by means of TAPs, while evidence on perceptions of difficulty was gathered by means of retrospective interviews.

Lörscher (1991: 76) points out that “a translation strategy is a potentially conscious procedure for the solution of a problem which an individual is faced with when translating a text segment from one language into another”. Accordingly, in order to identify the translation strategies employed by the subjects, our analysis started from the translation problems which they verbalised and for which either the TM database or the raw MT output contained translations which needed checking by means of Internet searches. Each Internet search was assigned to a translation strategy on the basis of its purpose.

The classification scheme used to this end was adapted from the categorisations proposed by Krings (1986) and Gerloff (1986); these were partly modified on the basis of the specific phenomena which were observed during the TAP experiments conducted during this work. More precisely, the translation strategies identified were:

- Equivalent retrieval – i.e. search for a translation
- Equivalent monitoring – i.e. check on a potential translation
- Comprehension of the source-language term
- Comprehension of the target-language term
- Contextualisation – i.e. reproduction of stylistic features
- Reduction
- Reformulation

After performing the task assigned to him/her, each of the subjects was provided with his/her source text or raw output – depending on the task assigned – along with the target text he/she had delivered and a list of his/her four most frequent strategies. Next, during individual retrospective interviews, each participant was asked to rank the strategies in the order of the difficulty which he/she had perceived when adopting them, from least difficult – ranking 1 – to most difficult – ranking 4; lists of the strategies most frequently adopted by the participants and their corresponding rankings can be found in Appendices C-H. The decision to focus solely on the four strategies most frequently adopted by each participant was based on the assumption that it would be easier for them to accurately retrieve this type of information, without having to remember strategies used relatively rarely during the experimental sessions.

Since difficulty is an elusive concept, the students were provided with a notion of “difficulty” to use as a guideline: they were asked to think about all those cases in which Internet searches having a specific purpose – i.e. corresponding to a strategy – had to be abandoned because they did not give the expected results. The participants were not allowed to give an equal ranking to two or more strategies. Moreover, although they were asked to rank their four most frequent strategies, the analysis took into consideration only one strategy, namely the one which each subject had adopted most often and that, as a result, corresponded to the relative majority of his/her Internet searches. It was assumed that, by focusing on the strategy which each subject had employed most often in the experimental sessions, it would be possible to gather data on the difficulty perceived during most phases of the translation with TM software or the PE processes. Subsequently, by adopting the model proposed in this pilot study, we could check the extent to which the number of correct solutions impacted on the perception of difficulty.

Table 3: Percentage of correct solutions provided by the TM database, most frequent strategies and their rankings in terms of perceived difficulty

Sessions using TM	Percentage of correct translation solutions – out of the overall translation problems identified	Most frequently adopted strategy	Ranking –out of 4– of perceived difficulty
1 st session	14%	Equivalent retrieval – used 22 out of 49 times	4
2 nd session	66%	Equivalent monitoring – used 4 out of 8 times	3
3 rd session	100%	Equivalent monitoring – used 7 out of 10 times	3

As far as the TM working scenario is concerned, Table 3 shows the data referring to the percentage of correct solutions provided by the TM database in relation to the translation problems verbalised in each of the three sessions, the strategy most frequently adopted by each subject and the corresponding ranking assigned to this strategy on the basis of the level of difficulty perceived when employing it.

The data show that:

- as the sessions took place, there was a change in the type of strategy most frequently adopted by the subjects;
- the ranking of perceived difficulty assigned to the strategy of equivalent retrieval was higher than the ranking assigned to the strategy of equivalent monitoring.

3 Modelling the analysis of translation memory use

Table 4: Percentage of correct solutions provided by the raw MT output, most frequent strategies and their rankings in terms of perceived difficulty

Sessions with full MT PE	Percentage of correct translation solutions – out of the overall translation problems identified	Most frequently adopted strategy	Ranking – out of 4 – of perceived difficulty
1 st session	58%	Contextualisation – used 16 out of 45 times	4
2 nd session	83%	Contextualisation – used 7 out of 15 times	4
3 rd session	50%	Contextualisation – used 4 times out of 13	4

The shift from the strategy of equivalent retrieval – the most used during the first session – to that of equivalent monitoring – the most employed during the second and third sessions – can be assumed to be a result of the steady updating of the TM database: the participants were provided with an ever-increasing number of solutions previously inserted by their colleagues working on similar texts. As a result, even when they were not sure about the correctness of a translation solution, they were led to employ it as a starting point for their searches, instead of looking for equivalents from scratch. This shift led to a decrease in the level of difficulty perceived during the majority of the Internet searches performed, thus reducing the overall difficulty associated with the translation process when using TM software.

With regard to the PE scenario, Table 4 shows data regarding the percentage of correct translation solutions provided by the MT output in relation to the translation problems verbalised within each session, the strategy most frequently adopted by each subject and the corresponding ranking assigned to this strategy on the basis of the level of difficulty perceived when employing it.

The data which were gathered from the three students who worked within the PE scenario show that:

- there is no variation in the type of strategy which each of the participants adopted most often – i.e. contextualisation;
- all three subjects gave an equal ranking to the strategy of contextualisation, which was unanimously regarded as the most difficult.

The fact that the strategy most frequently adopted by all three subjects was that of contextualisation suggests that the type of translation problem for which they were led to perform the highest number of Internet searches was the same. In those cases, they used Internet searches to look for comparable texts so as to determine whether the MT output had respected the stylistic features of the economic press release text type in the target language. Therefore, it can be observed that, even in those cases in which the output provided solutions regarded as correct to more than half the translation problems encountered – such as in the first and second sessions – the solutions provided did not help the participants solve the stylistic problems identified. An in-depth knowledge of both textual and extra-textual features is necessary to reproduce the style of a specific text type – e.g. while in English managers tend to use the pronoun “we” when talking about their companies, impersonal forms are more frequent in Italian. Therefore, this may suggest that the participants were aware of the risk that the style of the MT output could be inconsistent or inadequate, for instance due to processing the text on a sentence-by-sentence basis without taking contextual knowledge or genre-specific features into account. This would explain why, unlike the participants working within the TM scenario, they did not use the stylistic features in the raw output as a starting point – e.g. by checking whether they were correct – but rather looked up comparable press releases written in Italian.

To sum up, our model of data triangulation has so far investigated whether the number of correct solutions provided by the TM and the raw MT output influenced participants’ perceptions of the difficulty of the translation strategies adopted. It was observed that TM use reduced the difficulty perceived by the participants to a larger extent as far as translation strategies were concerned, because it provided the participants with an ever-increasing number of translations which could be checked instead of translated from scratch and which facilitated their Internet searches. On the contrary, with regard to the full PE setting, it was observed that the Internet searches made to enable reproduction of the stylistic features of the press release text type were experienced as the most difficult by all participants, possibly because they did not trust the raw MT output enough to

use its translation solutions as starting points for their Internet search strategies. To complete our model, we also used time measurements to analyse the impact of translation solutions on the duration of the translation and the PE tasks. This part of the analysis will be addressed in the following section.

6 Third set of results: Duration of the tasks

This section compares the duration of the translation tasks using TM software and of the full PE tasks. We used the data gathered by means of TAPs and time measurements in order to check whether the number of correct translation solutions respectively provided by the TM software and the raw MT output had an impact on the time taken by the participants to complete their tasks. Table 5 shows the data regarding the duration of the translation and PE processes and the percentage of correct translation solutions respectively provided by the TM database and the raw MT output to the translation problems verbalised by the participants.

Table 5: Duration of the tasks and percentage of correct translation solutions

pair	Duration of the translation process	Percentage of correct solutions in the TM	Duration of the PE process	Percentage of correct solutions in the raw MT output
1 st	52 min	14%	50 min	58%
2 nd	22 min	66%	24 min	83%
3 rd	17 min	100%	27 min	50%

As can be observed in Table 5, in two out of three cases – i.e. for the second and third pair of participants – using a TM was the most effective option timewise. In addition, these data show that translating using a TM database providing an ever-increasing number of correct translation solutions resulted in a steady reduction in the time employed by the participants. In contrast, a higher number of correct translation solutions did not necessarily imply a shorter duration for the PE task. As a matter of fact, the length of the task did not seem to be affected by the number of correct translation solutions contained in the raw MT output. To give just one example, the participant in the first pair needed more time to post-edit the text than the participant in the third pair, even though the former identified a higher percentage of correct translation solutions than the latter. This may be

due to the fact that, regardless of the number of translation solutions deemed to be correct, for those cases in which the participants had to resort to Internet searches, the searches performed turned out to be time-consuming. Another reason may be the fact that the participants were wary of the solutions in the raw output.

7 Discussion of the findings

As we stated in §1, this work was conducted on a small scale, therefore our results are preliminary in nature. When looking solely at the number of correct translation solutions, it emerged that the TM provided more correct solutions than the raw MT output only after its second update, namely to the participant of the third pair. Nonetheless, within the TM scenario, the steady increase in the number of correct solutions had an impact on the duration of the task, on the translation strategy adopted with the highest frequency and on the level of difficulty associated with it, thus leading the participants to save an increasing amount of time and to perceive a progressively lower level of difficulty. On the contrary, within the PE setting, the variations in the number of correct translation solutions contained in the raw MT output had no impact on the time employed by the participants, on the translation strategy adopted most often and on the level of difficulty assigned to it.

These preliminary findings indicate that, in addition to the number of correct translation solutions, further factors should be taken into account to model the differences in terms of perceived difficulty and time required between the translation assisted by TM software and the PE scenarios. In particular, the subjects' opinions on the translation technology being used may have influenced the dependent variables under investigation. More precisely, the participants post-editing seemed to show a lower sense of trust in the translations contained in the raw MT output: either they did not regard this translation technology as being able to solve specific types of problems – e.g. stylistic ones – and therefore translated from scratch or, even when they just wanted to check whether the solution in the raw output was correct, the searches which they performed were more time-consuming. These preliminary results corroborate the notion that the relation between translators and translation technologies – and, in particular, MT – is very complex, as translators need to feel that they can fully trust the tool that they are using before accepting its solutions. The idea of employing translation solutions which are the result of a machine rather than a colleague's work – who would have used his/her expertise and common sense – may, therefore, involve too much risk for many.

This finding in itself points to the didactic implications of this pilot study. All the trainee translators involved in this experiment had been exposed to hands-on training in both TM software and MT post-editing – with components of their courses also devoted to terminology, localisation, etc. Finally, one further aspect to consider is the fact that, for this pilot study, we asked participants to deliver a publishable, high-quality final text. This requirement is likely to have had an impact on their work. For example, we can safely assume that, if the participants post-editing had been told to use minimal PE – with the final target text to be used for gisting purposes – they would have spent less time and effort on Internet searches aimed at refining the stylistic features of the final target texts. Therefore, these preliminary results should be considered as deeply influenced by the final task assigned to the participants.

8 Conclusions and future work

This paper has presented a pilot study proposing a model of data triangulation for the analysis of the respective impact of TM use and full PE of raw MT output on trainee translators' time effectiveness and perceptions of the difficulty of the translation strategies adopted. The model is based on the combined use of TAPs, retrospective interviews and time measurement: TAPs were used to identify translation problems, the translation solutions provided by the TM and the raw MT output and regarded by the participants as correct, and the translation strategies employed; retrospective interviews were employed to gather data on the participants' perceptions of the difficulty of the translation strategies adopted, while time measurement allowed us to objectively compare the duration of the translation and PE tasks.

A number of limitations can be identified in this pilot study. First of all, the sample of participants was very small, such that individual differences may have influenced the preliminary findings presented here. Secondly, the passages used belonged to only one text type and were very short; therefore, they presented a limited number of linguistic features and potential translation problems. Accordingly, this does not allow us to generalise our findings to other text types or genres. In addition, this pilot study concentrated solely on the language combination English–Italian, and the participants translated and post-edited from English into their native Italian. A further limitation arises from the fact that the TM database was steadily updated as the sessions progressed; therefore, three participants worked within an ever-changing scenario. Nonetheless, translating with the help of a TM database without taking advantage of this distinctive

feature would have created an artificial working scenario. In addition, these preliminary findings are deeply influenced by the segments with which the TM had previously been updated, as well as by the training data used for the statistical MT system employed. A further crucial limitation is connected to the lack of an objective recording tool – such as keystroke logging programmes or eye trackers – which prevented us from analysing whether the subjects actually verbalised all their actions while performing the tasks. Finally, it is worth noting that, although the participants were asked to deliver publishable high-quality texts, their final Italian translations were not evaluated, due to an exclusive focus on the processes, rather than the products, of their translations obtained with the use of TM software or PE.

These limitations reinforce the need to further test the preliminary results obtained in this pilot study and extend this line of research, applying the proposed data triangulation model to analyse translators' activity data in other scenarios. To give just a few examples, it would be helpful to conduct similar experiments with longer texts belonging to different types and/or with a higher number of participants in order to test the wider applicability of our preliminary results. It would also be interesting to involve trainee translators studying in different institutions, in order to determine whether and how the training received in translation technologies might influence the translation process of the participants – indirectly testing the actual effectiveness of such training in translation technologies. Further research should also be conducted to explore the effect of switching around the translation direction, so as to observe variations in time, strategies employed and their perceived difficulty due to the effect of directionality, especially when translating into a second language, which also constitutes an interesting, and challenging, didactic activity.

Furthermore, given the importance of translators' attitudes to translation technologies which emerged from this pilot study, it would be interesting to expand the analytical model proposed here by adding focus groups or interviews to collect data specifically on the participants' opinions on translation tools. Moreover, by combining additional data gathering methodologies, it would be possible to make up for the incompleteness which often characterises the data obtained by means of TAPs and retrospective interviews; as a matter of fact, the model proposed in this initial study may easily incorporate different methodologies. Finally, it would be advisable to extend the present work also by combining the findings of this process-oriented research with an analysis of the quality of the final products. As pointed out by Guerberof (2009), the analysis of translation productivity should be done in relation to an equal level of final quality. In this

study, we relied on the students to possess an a priori notion of publishable quality for their final target texts, and we assumed that they were able to achieve it equally when working with TM and when post-editing MT output.

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Abbreviations

TM	Translation Memory	TAPs	Think-Aloud Protocols
MT	Machine Translation	UAD	User Activity Data
PE	Post-editing		

Appendix

Appendix A: Source text to be translated by the participant of the first pair

NAME Boosts Dividend by 10 Percent

Board Cites Earnings Outlook, Strong Cash Flow

The NAME (NYSE: NAME) Board of Directors today increased the regular quarterly dividend by 9.6 percent to \$0.57 per share from \$0.52 on all outstanding Class A and Class B shares. The dividend is payable March 7, 2012, to shareholders of record on Feb. 21, 2012.

“NAME turned in a great performance in 2011 despite a volatile global operating

environment,” said NAME Chairman and CEO NAME SURNAME. “Cash flow in 2012 is expected to be strong and clearly today’s decision by the Board reflects that projection.”

Appendix B: Raw MT output to be post-edited by the participant of the first pair

NAME Aumenta dividendo del 10 per cento

Consiglio Cites guadagni Outlook, Forte Cash Flow

L’NAME (NYSE: NAME) Consiglio di Amministrazione ha aumentato oggi il dividendo trimestrale regolare del 9,6 per cento a 0,57 dollari per azione da 0,52 dollari su tutte le classi in circolazione azioni di classe A e B. Il dividendo è pagabile 7 marzo 2012, agli azionisti registrati il 21 febbraio 2012.

“NAME ha disputato una grande prestazione nel 2011, nonostante un contesto globale volatile,” ha dichiarato NAME Chairman e CEO NAME SURNAME. “Il flusso di cassa nel 2012 dovrebbe essere forte e chiaramente la decisione odierna del Consiglio che riflette la proiezione.”

Appendix C: Rankings obtained by the participant of the first pair working within the CAT setting³

- 4 - Equivalent retrieval
- 3 - Contextualisation
- 2 - Equivalent monitoring
- 1 - Comprehension of the source-language term

Appendix D: Rankings obtained by the participant of the second pair working within the CAT setting

- 4 - Equivalent retrieval
- 3 - Equivalent monitoring
- 2 - Comprehension of the target-language term
- 1 - Comprehension of the source-language term

³In appendices C-H, strategies are put in order of ranking of perceived difficulty – from more (4) to less difficult (1).

Appendix E: Rankings obtained by the participant of the third pair working within the CAT setting

- 4 - Comprehension of the source-language term
- 3 - Equivalent monitoring
- 2 - Contextualisation
- 1 - Equivalent retrieval

Appendix F: Rankings obtained by the participant of the first pair working within the PE setting

- 4 - Contextualisation
- 3 - Equivalent retrieval
- 2 - Equivalent monitoring
- 1 - Comprehension of the source-language term

Appendix G: Rankings obtained by the participant of the second pair working within the PE setting

- 4 - Contextualisation
- 3 - Equivalent retrieval
- 2 - Comprehension of the source-language term
- 1 - Comprehension of the target-language term

Appendix H: Rankings obtained by the participant of the third pair working within the PE setting

- 4 - Contextualisation
- 3 - Equivalent retrieval
- 2 - Equivalent monitoring
- 1 - Comprehension of the source-language term

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Part II

Focus on the process

Chapter 4

Sketch of a Noisy Channel Model for the translation process

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To advance the state of the art in translation process research, Toury (2004) requests the formulation of “probabilistic explanations in translation studies”. This chapter develops these “conditioned statements” into a Noisy Channel Model of the translation process with the ultimate aim to predict “particular *modes of behavior*” by their observable traces in the user activity data (UAD). We first develop a Noisy Channel Model for the translation process and then present a number of research results that may serve as a basis for the formulation of observable behavioral units and of the latent states in a noisy translation process model. However, a large amount of research has still to be conducted before we might be able to get a complete picture of the various shades and complexities of the translation process.

1 Introduction

The Noisy Channel Model (Shannon & Weaver 1949) has been very productive for solving non-deterministic problems in communication and computational linguistics. It is a mathematical formalization of communicative processes that underlies, among many other things, speech recognition (Huang et al. 1990), statistical machine translation (Brown et al. 1993) and the translation of a text from a source language to a target language. Statistical machine translation (SMT) models translation as a process in which a source text is decoded, thereby eliminating the noise (e.g. adjusting lexical and syntactic divergences) to uncover



the intended message (i.e. the translation). In automatic speech recognition, the speech signal is segmented, analysed and mapped onto a sequence of phones, which represents possible pronunciations of the words to be recognized.

In this chapter we develop a framework of the Noisy Channel Model for the translation process. In analogy with speech recognition, the translation *process* is modeled as a probabilistic sequence of behavioral observations, such as keystrokes and eye movements, which are emitted by underlying hidden processes. The aim of the noisy channel is to anticipate and generate the behavioral user activity data (UAD) and to uncover and understand the underlying hidden translation processes that are involved in the generation of the translation.

Just as for automatic speech recognition, the segmentation and quantification of the stream of events is a precursor also for decoding translation processes. A considerable amount of work has been invested in translation process research to define and investigate various kinds of units, measures and metrics that are suited to structure and quantify processing activities.

On the one hand, the final outcome of the translation process is a text (i.e. the translation) which is defined by the spatial/sequential order of the linguistic items that it constitutes. We may thus approach the translation process from a textual angle and investigate behavioral patterns that are involved in the production of particular words or phrases. Consequently, we will deal with text-based units of investigation, spatial areas of interest (AOIs¹) which accumulate related behavioral UAD.

On the other hand, the translation processes can be considered a temporal sequence of translational events, which may be segmented into coherent chunks or behavioral units. For instance, pauses in the translation production process (i.e. gaps in the typing activities) have been associated with cognitive meta-activity and pause analysis has been proposed as a method to detect the amount of 'cognitive effort' in translation (e.g. Immonen 2006; O'Brien 2006; Lacruz et al. 2012). However, it is unclear what exactly the cognitive processes are that take place during typing pauses and it is an unsolved problem to determine what exactly makes pauses more or less effortful. In addition, recording of gaze data is required to 'fill' the typing pauses and to identify the specific motivation of a particular pause (Kumpulainen 2015: 47).

In both cases, a distinction can be made between early, automatised translation processes and later more time-consuming processes. A number of measures exist that are suited to describe early translation processes; these include fluent typ-

¹This term was coined as a tool for the investigation of eyetracking data. It can be equally used to denote a textual area to accumulate different kinds of UAD.

ing activities and early eye movement measures such as first fixation durations. However, late translation processes are more complex, more difficult to describe and their traces in the process data are more varied and difficult to classify or identify than the early processes.

As suggested by Toury (2004), translation processes and behavioral observations are probabilistic in nature. In this chapter, we suggest a probabilistic framework to assess and integrate several findings from empirical translation process research. We first lay out the general ideas of the Noisy Channel Model in §2 and apply the introduced notions to the translation process research (TPR) terminology. We show that the Noisy Channel Model provides a powerful framework to formalize “probabilistic explanations in translation studies” (Toury 2004).

One of the essential requirements for a noisy translation process model is the fragmentation and quantification of the stream of UAD into meaningful segments. §3 discusses a number of attempts to segment the UAD into meaningful units, including production units, attention units and activity units. In the noisy channel model, these behavioral units are generated by underlying hidden translation states. Drawing on the monitor model, we make a distinction between early and later translation processes and argue that they represent different mental states. §4 provides a number of properties for these earlier and later translation states, the output of which can be measured in the behavioral UAD.

2 The noisy channel model in translation

The Noisy Channel Model conceptualizes communication as a problem of decoding (Shannon & Weaver 1949), in which a transmitter sends a message m through a noisy communication channel. The receiver perceives a signal o as a noisy encoded version of the original message. In order to reconstruct the message m , the Noisy Channel Model assumes two factors: a language model $P(m)$ which indicates the probability of the original message m and the conditional probability $P(o|m)$ which quantifies the probability of the signal o provided we know the message m . The probability $P(o|m)$ accounts for the noise that is added during the communication process. This component analysis can be achieved with the help of Bayes’ theorem, which states that a conditional probability $P(m|o)$ can be decomposed as $P(m|o) = P(o|m) * P(m)/P(o)$. Decoding makes use of the right side of this equation, ignoring the common denominator $P(o)$. The noisy channel model is used to formalize a variety of different communication problems; in automatic speech recognition, o is an acoustic signal and m is the spoken message (Mylonakis et al. 2007). The model is also used for part-of-speech tagging,

in syntactical analyses, and in many other natural language processing (NLP) applications.

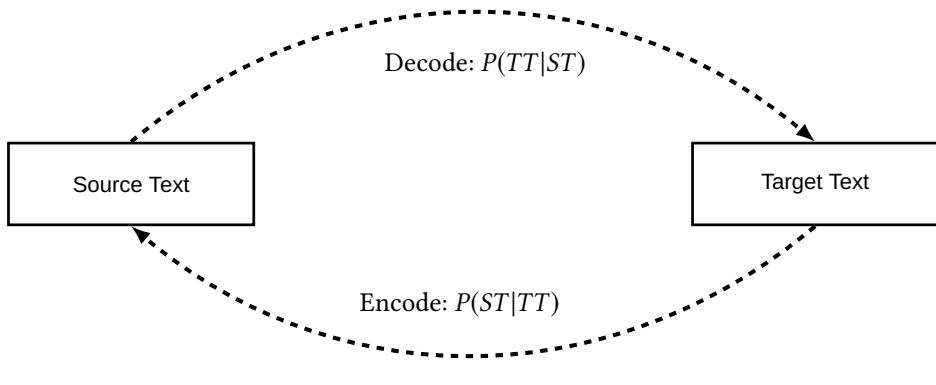


Figure 1: The noisy channel model for translation

In the context of SMT it is assumed that the target text (TT) corresponds to the message m and the source text (ST) is the signal o that we want to decode (see Figure 1). Given we know all the factors that are involved in the encoding process in $P(ST|TT)$ and we know the probabilities with which each single event occurs, we can reverse the encoding process based on Bayes' law as shown in equation 4.1.

$$P(TT|ST) = P(ST|TT) * \frac{P(TT)}{P(ST)} \quad (4.1)$$

As each of the factors that contributes to a translation (i.e. the encoding and decoding) generates a large number of hypotheses, the Noisy Channel Model makes use of a search operator *argmax* to retrieve the most probable translation among the many possible options.

$$\widehat{TT} = \text{argmax } P(TT|ST) * P(TT) \quad (4.2)$$

The *argmax* operator in equation 4.2 takes account of the fact that there can be many possible outcomes, but we are searching only for the most likely translation \widehat{TT} . This operator produces, under optimum circumstances, the best re-

construction of the translation \widehat{TT} based on observed source text (or sentence) ST.

$$P(ST|TT) = \sum_i P(ST|TT, v_i) \quad (4.3)$$

Equation 4.3 demonstrates the possibility of including additional predictor variables v_i in the Noisy Channel. Since the total probability of a sample space always amounts to $1 = \sum_i v_i$ any number of additional variables can be introduced in this manner, so as to provide additional explanatory power to the computations.

Early approaches to SMT modelled the channel as a probabilistic translation dictionary (Brown et al. 1988). More recent SMT systems use many additional resources, such as phrase- or tree-based translation models; they encode sentences as lattices or confusion networks that enhance the noisy channel extensively. In order to integrate a large amount of features that might impact the decoding process, the Noisy Channel Model has been generalized as shown in equation 4.4, which can take into account any number of feature functions $f_k(ST, TT, v_k)$, which are weighted by a factor λ_k (Och et al. 2003). Each feature function $f_k(\cdot)$ may represent a very different aspect in the decoding process and can be trained independent of other features. Its contribution to the overall outcome of the decoding process is ranked by a factor λ_k :

$$\widehat{TT} = \operatorname{argmax} P(TT|ST) \approx \sum_{k=1\dots n} \lambda_k * f_k(ST, TT, v_k) \quad (4.4)$$

We propose an adaptation of the Noisy Channel Model to model human translation and post-editing processes.

2.1 Probabilistic translation processes

In an attempt to define the notion of translation universals, Toury (2004) requests the formulation of conditioned statements which would provide “probabilistic explanations in translation studies”. Conditioned statements would predict “particular modes of behavior (or their observable results) ... [based on] an array of variables, whose capacity to enhance (or reduce) the adoption or avoidance of a particular behavior would be verified empirically” (Toury 2004: 24). The most general format of such a conditioned statement according to Toury would be as

follows:

If 1 and 2, and 3, and ... ∞ , then there is great likelihood that X [...] where the numbers (1, 2, 3, ... ∞) stand for the different variables which may have an effect on the selection of a translational behavior. (p. 26)

In terms of the notion introduced above, Toury's conditioned translation statement can thus equivalently be expressed as a set of conditional probabilities in the form $P(x_i|v_1, v_2, \dots, v_m)$ where x_i stands for a particular predicted translation behavior and the set $V = \{v_1, v_2, \dots, v_m\}$ contains predictor variables which have an effect on and explain – to a certain extent – the observed behaviour x_i in a probabilistic manner. Even though there might be many different modes of translation, we assume that the translation process consists of a finite inventory of behavioral patterns $X = \{x_1, \dots, x_n\}$ and we assume – in contrast to Toury – that for each of the observations $x_i, 1 \leq i \leq n$ there exists only a finite set of predictor variables $v_j \in V$ that has an effect on x_i . The observed translation process X can then be formalized as a sequence of possible behavioral patterns $x_1, x_2 \dots$ that are conditioned by a number of predictor variables $v_1, v_2 \dots$. The most likely (explanation for) translation behaviour \widehat{X} can thus be computed in a similar way as the most likely translation \widehat{T} .

The general idea in this model is that the value of a dependent variable (X) is related to a set of independent variables (V) through a function (F). Given the translation UAD, we learn the function (F) to minimize the error (also known as loss (L)) in prediction (\widehat{X}) of the variable V .

$$\text{minimize } L(X, \widehat{X}), \text{ where } \widehat{X} = F(X, V) \quad (4.5)$$

2.2 Latent translation states

As an illustration of a probabilistic conditioned statement, Toury (2004) discusses a made-up example in which he illustrates a hypothetical effect of experience and fatigue on whether translational processing will be applied to small or low-level textual-linguistic entities. In this example, the level of textual-linguistic entities that a translator works with would be represented by the dependent variable X whereas the explanatory (or predictor) variables V represent the experience and fatigue of the translator which may have an effect on the choice of the translation unit.

Toury is not very consistent in his usage of the terms “translation modes” and “translation behavior”. Surprisingly, for him the translator’s behavior “is not really observable in any direct way” (Toury 2004: 26). He nevertheless mentions possible forms of translational behavior which include all kinds of “regularities [that] can be found on every level, from the individual act of translation [...] to the overall notion of translation”, under which he also subsumes translation universals, i.e. structures in the translation product. We will come back to this issue in the conclusion.

On the one hand, Bernardini (2001: 241) points out, “an understanding of translation [processes] [...] is not derivable solely from an analysis of the final product”. On the other hand keylogging and eye-tracking technologies give us today the possibility to directly observe and investigate translation behavior and empirically assess the granularity of the chunks that a translator works with. Accordingly, we conceptualize the translation process as successive intermediate versions of a text (i.e. the emerging translation), which are the direct consequences of translation behavior. Most important in this process are obviously the keystrokes which are the direct causes for text modifications.

As an extension to Toury’s model, we assume that the behavioral patterns are triggered through internal (latent) states in the translator’s “black-box”. Using EEG and fMRI technologies we may be able to investigate and measure these latent states directly through experimental equipment in the near future (Annoni et al. 2012). Currently however, Think Aloud Protocols (TAPs) and introspection are methods used to assess the hidden (or latent) states in the translation process. Two of the main goals of TAP research are (1) to describe translation problems, and (2) to isolate strategies and translation procedures. According to Lörscher (2005: 599), the “data [that are collected through TAP] are interpreted as (observable) indicators of (unobservable, mental) translation strategies” which, for him, represent the basis for the formation of hypotheses regarding the mental translation process. Based on the collected data, Lörscher (1991) describes five basic translator types which differ with respect to how much the solution of a translation problem is automatized, whether the translator requires search, whether a translation problem is decomposed into smaller parts, and to what extent the translation problems are consciously accessible and can be verbalized. Lörscher (1991: 280) finds that “[w]hen several [translators] are faced with a problem X, many or most of them employ similar or the same types of strategy”.² However, findings like these remain to be quantified and scrutinized for their predic-

²While this looks similar to Toury’s conditioned statement, the “problem X” would here be a predictor variable, while the dependent variable “types of strategy” is a latent translation state.

tive value. For Krings (1986), TAPs have only a restricted validity. He cautions that “although verbal data do give evidence of mental processes, they cannot be claimed to be isomorphic with those processes” (Krings 1986: 264).

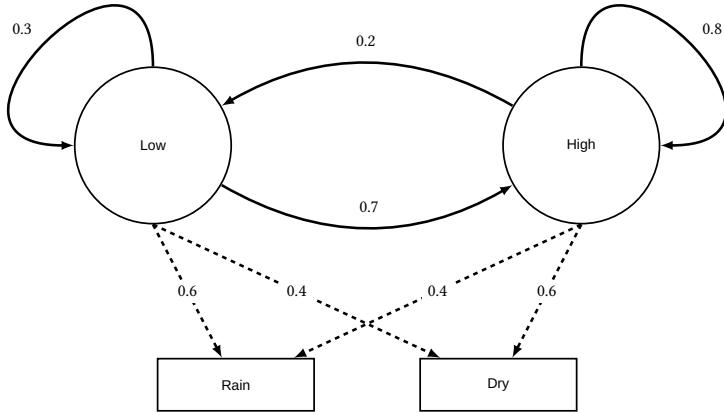


Figure 2: A hidden Markov Model

The translation model suggested by TAP analysis can be formalized as a Hidden Markov Process in which a number of interconnected “hidden” states emit observations with a certain probability. Figure 2 outlines the idea of a hidden Markov model, where the two hidden states (Low and High) emit possible observations (Rain or Dry) with a certain probability. A hidden Markov model can consist of a large number of hidden states and emit many different observations. The hidden states are organized in the form of (possibly completely connected) recursive networks and transition probabilities that indicate the likelihood with which one state follows another. A number of efficient algorithms exist to learn transition and emission probabilities from data and to compute most likely sequences of observations.

2.3 Early and late stages of translation states

de Groot (1992), Hartsuiker et al. (2004), Lopez & Resnik (2009) and Schaeffer & Carl (2013) assume that entries in the mental bilingual dictionary consist of nodes that link the lemmas, concepts, word forms and syntactical information between the two languages. The nodes are linked to all words that exhibit correspond-

4 Sketch of a Noisy Channel Model for the translation process

ing features in a language-independent fashion. They are, however, specific to particular language combinations as not all languages always realize the same morphosyntactic and semantic aspects in the same way.

The models predict that the more nodes overlap between the source and target language words and structures, the less time it takes to retrieve associations and to generate translations. This unchallenged translation process is to a large extent a subliminal process.

The translation model by Schaeffer & Carl (2013) posits that the translation process is *recursive* given that translators often switch back and forth between source and target text in order to examine both texts for interpretive resemblance. In doing so, translators are primed by either the source or the target text, allowing them to register and analyze the resemblances in both texts. This view is in line with the monitor model (Tirkkonen-Condit 2005) according to which an automatic default translation procedure is interrupted when a problem occurs and triggers conscious translation processes.

Figure 3 visualizes an unchallenged translation process. It shows a relatively undisturbed translation progression in which an English source sentence “All of his victims were old weak woman” is translated into Danish “Alle hans ofre var aeldre svagelige kvinder” on the left and right axes respectively. Translation activities are depicted in the graph on a timescale, from ms 206.000 to 215.000. The overall translation of the eight words takes approximately 9 seconds. The figure shows keystrokes (insertions and deletions), gaze fixations on the source text (blue boxes with dots) and gaze fixations on the target text (green boxes with diamonds).

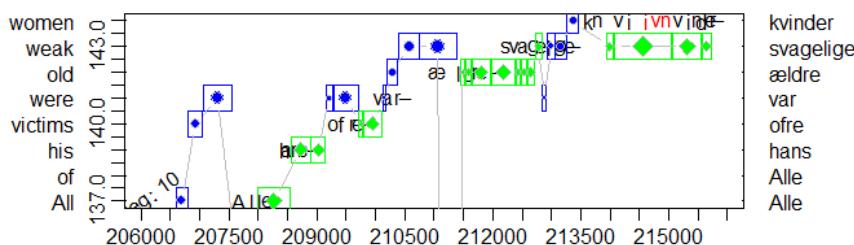


Figure 3: Example of an undisturbed translation progression

Some of the measures for the translation segment in Figure 3 are shown in Table 1 and explained as follows:

- *FFDur*: first fixation duration on the source word (blue rectangle)

- *FixS* and *FixT*: number of fixations on the source text and target words respectively; there are only few fixations (≤ 10) on each single word
- *TrtS* and *TrtT*: total reading time of source text word and its translation, respectively
- *Ins*, *Del* and *Dur*: number of counted insertions, number of counted deletions and total typing duration to produce the translation, respectively
- *Munit*: number of revisions (micro units) of a word (see page 103)
- *HTra*: word translation entropy (cf. literality criteria 3, see page 96)

Table 1: Behavioural measures for smooth translation activities.

SToken	FFDur	FixS	TrtS	FixT	TrtT	Ins	Del	Dur	Munit	HTra
All	60	2	259	1	559	0	0	622	1	0.41
of	0	0	0	1	559	5	0	622	1	0.74
his	0	0	0	3	658	5	0	462	1	0.49
victims	239	1	239	3	1177	5	0	634	1	0.49
were	478	5	1116	1	80	4	0	445	1	0.00
old	179	1	179	7	1136	6	0	1061	1	0.99
weak	159	8	1796	5	1813	10	0	1177	1	1.36
women	59	2	238	1	200	11	3	2234	1	0.24

The segment in Figure 3 is characterized by relatively few fixations on the source and target words and relatively short total reading times. There is a short delay between the reading of a source word and the production of the translation (i.e. the eye-key-span; see Schaeffer & Carl 2016, Schaeffer & Carl 2017 [this volume]). Only the translation of “weak” and “women” required longer reading times, perhaps due to unusual character combinations in the Danish translations.

Figure 4 shows an excerpt from an English → Chinese translation session, with much more complex patterns of ST and TT reading behavior, repeated regressions, re-reading, backtracking, deletions, revisions, etc. The production of this translation segment of 17 words took approximately 100 seconds, which is almost 5 times longer per word than the Danish translation in Figure 3. The ST segment “the extra green mile” was read at least seven times, four times during an orientation phase between seconds 210 and 240 and then again three times during translation drafting.

4 Sketch of a Noisy Channel Model for the translation process

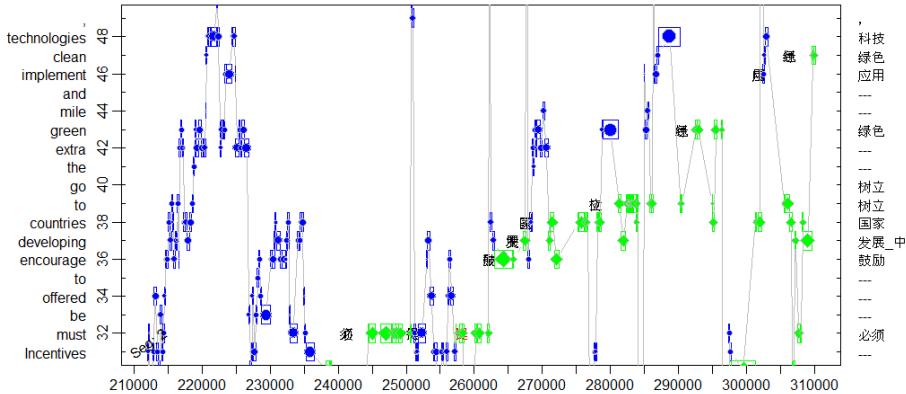


Figure 4: Progression graph with complex patterns of monitoring behavior

Table 2: Measures of challenged translation processes

SToken	FFDur	FixS	TrtS	FixT	TrtT	Ins	Del	Munit	HTra
the	183	2	316	0	0	0	0	0	1.35
extra	234	20	5133	0	0	0	0	0	1.68
green	267	24	8995	13	2683	2	0	1	0.46
mile	250	6	2515	0	0	0	0	0	1.96

Table 2 lists the behavioural measures for the translation segment which was more challenging. In total, there were 20 and 24 fixations on the words “extra” and “green”, respectively. The first fixation durations *FFDur* make up less than 5% and 3%, respectively, of the total reading time for these words, indicating that most of the translation effort is related to later processes, such as source text integration or formulation of a translation hypothesis. In this example it seems that much effort was required to understand and/or formulate a first translation hypothesis for the phrase “extra green mile” since most of the reading occurred before the translation was typed.

The words “the”, “extra” and “miles” remain untranslated (*Munit* = 0); only a Chinese translation of “green” was produced and aligned.³ The relatively higher

³Dashes ‘-’ on the right Y-axes in the translation progression graphs indicate non-translated or non-aligned words for which there are no correspondances in the translation.

HTr_a values indicate that translators have produced more different solutions for these words than for the translation of “green”.

The available eye movement measures seem to be well suited to capture unchallenged translation processes. However, existing measures are not well suited to describe the more complex reading patterns occurring during the later stages of challenged translation, because they either describe early processes (e.g. first fixation duration or first pass reading time) or they do not capture the time course of the late processes and very few measures describe the interrelationship between reading and writing activities (see also Schaeffer & Carl 2017).

Table 3 summarizes some of the existing measures. They will be explored in more detail in §4. A distinction is made between reading measures which capture gaze activities, writing measures which describe typing processes and R&W measures which describe how reading and writing are coordinated. These measures refer to sequences of the source and/or target texts, so-called Areas of Interest (AOI). AOIs are typically single words, phrases or sentences, and are characterized by the accumulated UAD as well as their linguistic and other annotations. The first pass reading time, for instance, is the sum of fixation durations on a word (or another predefined text segment) from the first fixation before the eyes leave the AOI again. The word production time (*Dur*, cf. page 96) is the total time needed to type a word (i.e. a translation), including all its possible revisions. R&W measures shown in Table 3 can take values which may indicate early or late processes.

Table 3: Measures of the translation process

	reading measures	writing measures	R&W measures
earlier processes	first-fixation duration	keystrokes: insertions & deletions	eye-key span
:	first pass reading time	inter-key pauses	:
:	regression path duration	micro units	parallel R&W
later pro- cesses	total reading time	revisions, word produc- tion time	activities

2.4 A noisy translation processes model

A translation process model taking into account hidden states of early and late processes is depicted in Figure 5. The model resembles a Hidden Makov Model (HMM) in Figure 1 which consists of four levels of description. In the center is the *Translator* who is constrained by a number of factors and who produces a sequence of behavioral patterns which lead to the final translation product.

The *Predictors* are a vast number of variables which are likely to play a role in the translation process and which originate from an enormously heterogeneous field, including cognitive, linguistic, cross-linguistic, or textual, communicative and socio-cultural domains (Toury 2004). Other researchers (e.g. Risku 2014) also mention environmental conditions, including physical, geographic, economic, political and demographic aspects which might play a role in the translation process. The *Source Text* is another crucial predictor which will determine the characteristics of the target text.

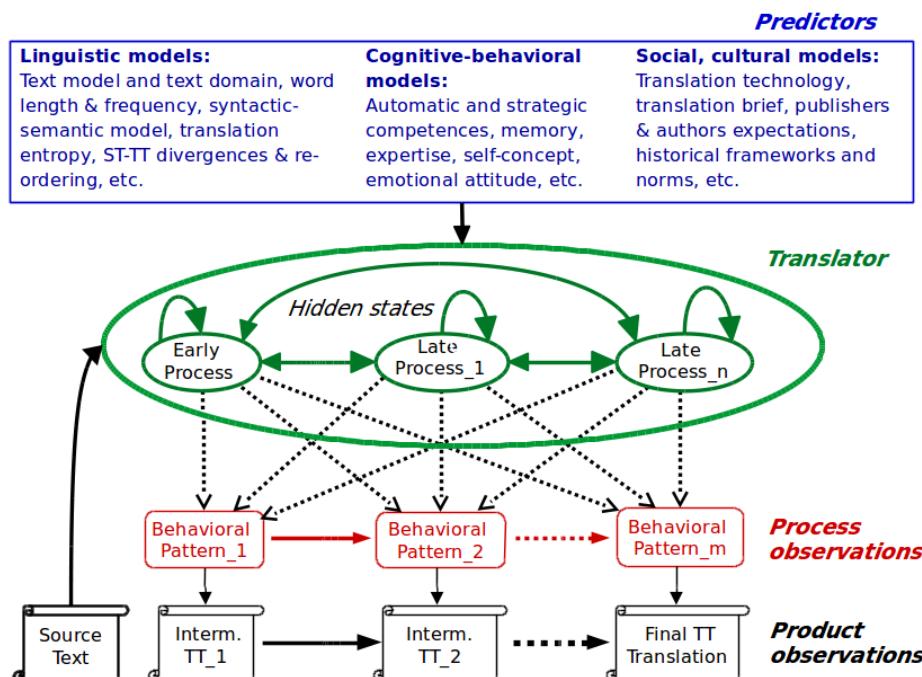


Figure 5: Observations, predictors and hidden variables in the noisy translation process model

The *Translator* is modelled as a network of hidden states which implement the actual translation processes. In contrast to earlier hierarchical-stratification models of translation (Nida 1964; Seleskovitch 1975), it is now generally accepted that there are states of early, automatic processes and states of more deliberate, strategic processing. Höning (1991), for instance, proposes a translation model which establishes a distinction between uncontrolled, associative translation competence (i.e. unconscious early translation processes) and a controlled workspace in which micro and macro strategies are stored. The associative translation competence corresponds to subliminal priming mechanisms, while the monitor processes occur at a later stage as they require extensive conscious effort.

The output of the model in Figure 5 has two levels of observations: *product observations* capture the changes in the translation product, i.e. the sequence of intermediate texts that are produced during the translation process. The final translation product is the final outcome in a series of successive intermediate text snapshots that emerge during the translation process and the translation process can be approximated by comparing the successive intermediate text snapshots. These observable textual changes are direct consequences of translators' activities which can be traced through logging technology.

Objective UAD such as keystrokes, mouse clicks, eye movements and other behavioral data can be recorded with keyloggers, eye-trackers and other tools, but the collected UAD needs be segmented into meaningful *behavioral patterns*. However, it is neither obvious how keystrokes and gaze data should be segmented, nor is it uncontroversial what the latent states are which emit those patterns.

The HMM in Figure 5 suggests that:

- the *Translator* can be in only one state at any given time
- translation processes are driven by a large number of *Predictor* variables
- there are probabilistic transitions between successive hidden states
- each state emits exactly one *behavioral pattern* at each time
- a *behavioral pattern* produces a deterministic modification in the *interim translation*

In §3 we will be concerned with the description and analysis of the behavioral patterns. The stream of UAD can be fragmented into segments of behavioral units which are suited to describe the translation process. A Production Unit (PU), for example, is a coherent sequence of keystrokes where the lapse of time between successive keystrokes is below a given threshold, e.g., 1 sec. A PU can

thus contain a single or a large number of keystrokes irrespectively how many words are produced.

In §4 we argue that different hidden states can be related to different temporal aspects in which they are triggered. We discuss properties of earlier and later translation activities and hidden states in more detail.

3 Patterns of translational behaviour

This section discusses several approaches to fragment the UAD into sequences of behavioral patterns. Such patterns fragment the stream of translation activities on a temporal scale. We discuss units which capture gazing and typing data. In contrast to the behavioral data accumulated in textual AOIs, the UAD within the behavioral patterns may relate to several different textual items that may be at distant locations from each other. While there is a large repository of linguistic terminology to describe textual elements in AOIs — such as PoS tags, linguistic functions etc. — there are only very few approaches which fragment the translation process data and little work has been done to describe these units.

3.1 Production units (PUs)

Carl et al. (2016); Carl & Kay (2011) define Production Units (PUs) as sequences of coherent keystrokes, where the pause between any two successive keystrokes is less than 1 second. A pause of more than 1000ms constitutes a PU boundary. PUs fragment the stream of translator activity data into sequences of coherent typing and pauses that separate them. In contrast to a micro unit (see page 103), a PU may stretch over several words, while a micro unit is defined as the flow of continuous typing that contributes to the production of one target word. A PU that stretches over m words would thus be split into m micro unit, where each produced word $1 \dots m$ is assigned its share of keystrokes. A word can be associated with several micro and production units, depending on how often it has been revised. A PU contains, among other things, the following information:

- duration of the unit
- duration of the preceding pause
- number of insertions and deletions,
- tokens involved in the source text and target text

- average *Cross* values
- percentage of parallel source and target text reading activity during unit production
- degree of linear editing

Singla et al. (2014) investigate to what extent post-editor profiles can be identified based on the information contained in PUs. They use data from five post-editors producing together 120 translations sessions which is contained in the LS14 study⁴. They test several machine learning techniques but find that “multilayer perceptron” and “classification via regression” perform best for this task. Using 10-fold cross validation for classification, they achieve 46.48% accuracy to identify post-editors which exceeds by far the baseline accuracy of 20% which is based on guessing a post-editor by equal chance among the five participants.

Aziz et al. (2014) analyze PUs of post-edited texts, to investigate whether and how the properties of PUs are related to features of the sentences they appear in. Their investigation uses the CFT13 dataset⁵ that was generated with the CAS-MACAT workbench (Alabau et al. 2013). PUs contain post-editing information about number of insertions, deletions post-editing time etc. Aziz et al. (2014) add further information to generate high dimensional feature spaces with nearly 100 features. The additional information included POS tags, named entities, chunk labels, and labels of semantic roles. The information was separated into PU level features and sentence level features “such as the number of tokens in the sentence, the number of different phrases or the number of predicates and their arguments, which could indicate that the overall sentence is complex” (179).

The authors use Principal Component Analysis (PCA) to visualize the high dimensional feature space and provide a detailed analysis of the data. Aziz et al. (2014) find that a correlation between sentence length and post-editing time can be observed mainly in cases of low post-editing activities. They find, for instance, that “PUs involving verbs are slightly more time-consuming, while PUs related to nouns require slightly more typing” (Aziz et al. 2014: 189). On the one hand, it is therefore “possible to decouple sentence length from the difficulty of each PU in terms of how time-consuming and how many edits (character level insertions and deletions) it requires.” (Aziz et al. 2014: 189) On the other hand, a pause analysis becomes difficult, since “the pause prior to editing correlates very poorly to the character-level edits performed.” (Aziz et al. 2014: 187) It is unclear

⁴The data can be downloaded from <http://sourceforge.net/p/tprdb/svn/HEAD/tree/LS14/>

⁵The data can be downloaded from <http://sourceforge.net/p/tprdb/svn/HEAD/tree/CFT13/>

why a pause occurs and whether it is related to the successive typing events, as manifested in the PUs. This is supported by their finding that “HTER correlates better with time and typing related to individual PUs than to cumulative sentence level indicators” (Aziz et al. 2014: 187)

With respect to editing times, the authors find the following relations:

- there is a stronger correlation between insertions and duration than between deletions and duration
- modal verbs, adverbs and coordinating conjunctions are more time consuming than gerunds and other non-finite verbs
- pronouns take longer to post-edit than sequences of nouns and named-entities
- consecutive NPs have a strong correlation with editing duration and the preceding pause
- the number of arguments in a sentence has an impact on its post-editing duration

(Aziz et al. 2014: 188) further find that “there is very little correlation between the length of a sentence and how time-consuming individual PUs are”. In other words, post-editors process sentences in smaller units so that the post-editing duration does not necessarily depend on properties of the whole sentence, and hence sub-sentence features may provide more informative cues about actual editing effort than, for instance, sentence length. It is unclear whether and to what extent the findings for post-editing carry over to from-scratch translation.

Schaeffer & Carl (2016) attempt to predict concurrent ST reading and TT typing during from-scratch translation production. Their investigation is based on the assumption that “instances of concurrent reading and writing during translation are indicative of automatic processes and shared representations”. They investigate concurrent activities in PUs using several possible predictor variables. They find that:

- the longer the PUs the more likely is concurrent reading activity
- less concurrent reading is observed towards the end of the text
- similarity of syntax in the ST and the TT facilitates concurrent activities

- more experienced translators are more likely to show concurrent R&W activities

The strong impact of the syntactic similarity on concurrent processing underpins their initial hypothesis that processes are likely to be more automatic when the ST and TT word order is similar, as in this case primed, shared syntactic representations may more easily serve as the basis for TT production.

3.2 Attention units (AUs)

In order to compare the cognitive flexibility and processing automaticity of professional and student translators, Hvelplund Jensen (2016) suggests to segment the translation activity data into attention units (AU).

Following Baddeley (2007), Hvelplund Jensen (2016) argues that, on the one hand, cognitive flexibility is linked to planning, problem solving and decision making and involves the ability to focus and switch attention, or to divide attention simultaneously into several subtasks. Hvelplund further states that a translator with good cognitive flexibility will “focus attention for precisely as long or short a period of time as is necessary only to those subtasks which are relevant to the successful execution of the translation task” (Hvelplund Jensen 2016: 153).

On the other hand, based on TAP studies (e.g. Jääskeläinen & Tirkkonen-Condit 1991) it has been suggested that professional translators rely more on automatic processing than students. Translators’ automaticity is, thus, closely related to experience.

In order to assess these hypotheses on the basis of translators’ UAD, Hvelplund Jensen (2016: 157) operationalizes the notion of *attention unit* (AU) in the following way:

an AU is defined as uninterrupted processing activity allocated either to the ST (ST gaze activity), the TT (TT gaze activity and/or typing activity) or to the ST while typing (ST gaze activity and concurrent typing). Transitions to and from an AU indicate shifts in processing activity, and the point in time at which the transition occurs is used to identify the end of one AU and the beginning of the next AU.

He thus defines five AUs based on the following activities:

AU1: ST reading

AU2: ST reading + typing

AU3: TT reading

AU4: TT reading + typing

AU5: Typing

While the cognitive flexibility is computed based on the durations of the AUs, the automaticity of the process is reflected in the pupil size where smaller pupil sizes indicate relatively less cognitive load than larger ones. The pupil size for a AU was calculated as an average of all its gaze samples and a latency effect of 120 ms was factored into the calculation.

Based on an evaluation of the KTHJ08 data as shown in Table 4 (see page 97), Hvelplund Jensen (2016) finds that:

1. experienced translators spend more time on target text than less experienced translators.
2. a higher variability in AU duration by professional translators as compared to student translator indicating more flexibility and adaptability for the former group.
3. pupils are significantly larger for less experienced translators than for experienced translators.

Further, in order to assess the translation process flow, Hvelplund counts all the transitions between any two successive AU labels, separately for professional and student translators, and stores them in a 5×5 transition matrix. He compares the two matrixes and observes that experienced translators shift from AU1 (ST reading) in 65.5% of the cases to typing activity (either of AU2, AU4 or AU5) while student translators do this only in 52.2% of the cases. Student translators switch to AU3 more often than professionals, which suggests that students aim more often at confirming meaning hypotheses (reflecting some kind of uncertainty), rather than allocating the cognitive resources directly to TT typing once a meaning hypothesis has been established.

3.3 Activity units

Not unlike Hvelplund Jensen (2016) AUs, Carl et al. (2016) suggest to fragment the activity data into seven different types of segments with the following labels:

Type1: Reading the source text (ST)

Type2: Reading the target text (TT)

Type4: Typing activity

Type5: Typing while reading ST

Type6: Typing while reading TT

Type7: Typing while reading ST and TT⁶

Type8: No activity recorded

Type1, Type2 and Type4 are basic translation activities. Type5 to Type7 take into account that source and target text reading can occur concurrently with typing, and a Type 8 is assigned to segments if no activity is logged for longer than a given threshold. Figure 6 shows the segmentation of a translation segment into AU units. The data is identical to that in Figure 3 5 but AU boundaries are marked.

Figure 6 shows a long ST reading activity (Type1, in blue) of approximately 30 seconds, between seconds 208 and 238, followed by a number of shorter pauses (Type8, in black), TT reading (Type2, in green) and typing activities (Type4, in pink) etc. These segments describe exhaustively the translation process and the properties of the sequence might be significant for certain types of translators and/or translation strategies.

In order to assess to what extent the profiles of machine-translation post-editors can be detected from the labels of the AU, Singla et al. (2014) investigate units of Type4 and Type8 (i.e. typing and pauses) of five post-editors with different amounts of experience. They use data from 120 translations sessions which are extracted from the LS14 study⁷ and subdivide Type 4 and Type 8 units into five categories based on their durations. They compute a trigram language model of activity sequences for each post-editor and compute a transition matrix which is filled with the perplexity scores of each post-editor's language model on the

⁶In more recent work, this type of unit is decomposed into units of type 1,2,4,5,6 or 8

⁷The data can be downloaded from <http://sourceforge.net/p/tprdb/svn/HEAD/tree/LS14/>

4 Sketch of a Noisy Channel Model for the translation process

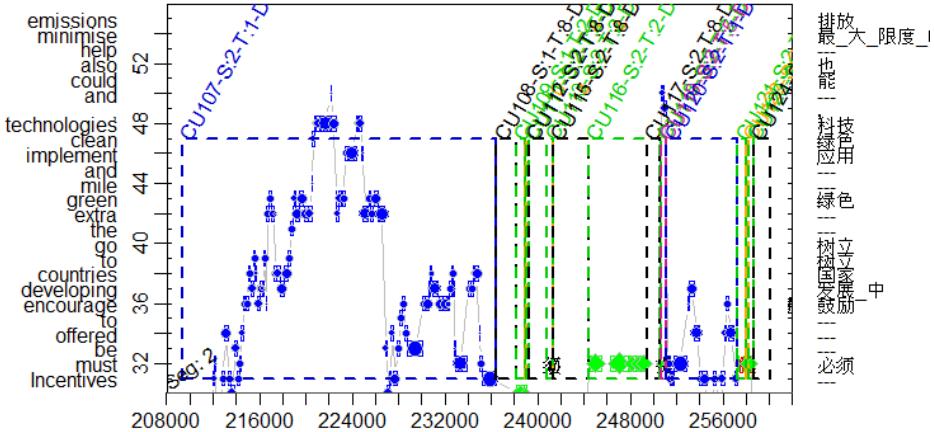


Figure 6: Translation session fragmented into CU units

other post-editor's activity sequences. A discriminative classifier is then used to cluster post-editors into two classes on the assumption that the events that make up the translation process provide enough information for the individualization of post-editor profiles.

Singla et al. (2014: 56) find that “experienced post-editors produce similar kinds of activity sequences in contrast with the activity sequences of inexperienced post-editors”. They also notice that post-editors with a similarly negative attitude towards post-editing tend to have similar activity patterns.

Martínez-Gómez, Aizawa, et al. (2014) use a subset of 204 sessions from the data shown in Table 4 that is annotated with information about translator experience and certification: 99 of the 204 sessions were produced by 47 non-certified translators, and 105 sessions were produced by 47 certified translators. They report that:

translators engage 14% of their time in source text reading, between 17% to 37% in target text reading, between 35% to 42% inserting characters and 4% deleting characters. Certified translators spent significantly larger proportions of time in target text reading and target text typing than non-certified translators. The most common translation activity was the concurrent combination of “source text reading”, “target text reading” and “target text typing”, which occurred around 45% of the time for non-certified translators and 65% of the time for certified translators. (Martínez-Gómez, Aizawa, et al. 2014: n.p.)

In an extension of this experiment, Martínez-Gómez, Minocha, et al. (2014) use the same data to recognize translator expertise, based on the assumption that “Translators have different perceptual and motor activities, depending on their level of expertise.” They compare two methods to assess this hypothesis, one based on the AUs, and another one using unsupervised machine learning techniques with a view to discover regularities in the logging events and to reveal latent activities, that would otherwise not be detected.

For the unsupervised learning method, each log event (fixation and keystroke) was enriched with 31 additional features that were extracted from the immediate context, such as the number of insertions, deletion and fixations within the past and the next 10 events, together with the time offsets from the current event. The information was stored in the form of vectors which were then classified using a k-means clustering method (3 to 8 classes). Tri-gram language models were built from the sequences of cluster labels, and random forests used to predict translator expertise, such as whether the user is a certified translator or not (binary classification), his/her years of training (regression) and years of experience (regression).

Martínez-Gómez, Minocha, et al. (2014) report an error reduction in the recognition of certified translators, and moderate but significant error reductions in the recognition of years of experience, as compared to a baseline. Best results were obtained with the unsupervised technique. They also report that CU unit of type 5 (i.e concurrent ST reading and typing) is more likely for certified translators than for non-certified translators.

3.4 OST units

Another approach to fragmenting the process data was suggested by Nitzke & Oster (2016). They manually annotate the activity data into two main categories, orientation (O) and revision (R) with five sub-categories:

- *Ost*: The participant spends time reading both source and target text
- *Os*: More than 80 % of the fixations were on the source text
- *Ot*: More than 80 % of the fixations were on the target text
- *Rl*: Every word or phrase is processed only once.
- *Rs*: The participant works on a part of the text, moves on but jumps back later to readjust the parts she already worked on.

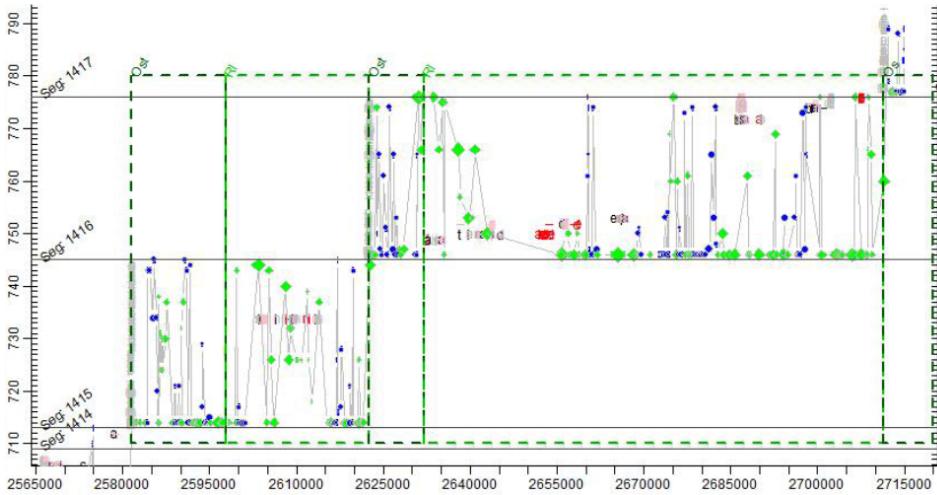


Figure 7: Annotation of OST units

With five sub-classes the annotation schema is less complex than the CU activity units - and much coarser grained. The translator activity data of 406 segments has been manually annotated into 985 segments, which is on average slightly more than two OST units per segment.

In an attempt to automatically detect OST units, Läubli & Germann (2016) segment the process data into fragments of 3 seconds, and assemble all process events (keystrokes, mouse clicks, ST fixations and TT fixations) for each segment in a vector of observations. Similar to the method used by Martínez-Gómez, Aizawa, et al. (2014), the observation vectors are then classified with a k-means clustering method and a Hidden Markov model (HMM) is trained on the sequences of cluster labels and observation vectors. The assumption is that the cluster labels represent the underlying states of the OST annotation (orientation, revision, and, as an additional state, also pausing) where each state produces randomly an observation. The transition probabilities in the HMM and observation probability densities are then trained based on the available data. The aim of the model is to yield the most probable label for each observation, taking into account (i) the feature values (dimensions) of the current observation and (ii) the label assigned to the preceding observations. In a final step the cluster labels are mapped on the three OST labels: orientation, revision and pause. The authors show that the system reaches as high an accuracy to predict the times spent on orientation, revision and pause as some of the human annotators.

3.5 Conclusion

This section summarizes different methods of segmenting the UAD into successive chunks. Depending on the available logging data, most of the segmentation methods make use of cues in the data, such as text production pauses and/or the location of the gaze data on the source or target text to define segment boundaries. An exception is the segmentation method by Läubli & Germann (2016) who segment the UAD into chunks of 3 seconds duration. With the exception of OST units described in §3.4, all segmentation methods work fully automatically.

The reported investigations show that some segment properties are typical for different translator profiles and degrees of translator expertise. They are also indicative of various translation problems.

The research discussed in this section can be characterized as instances of probabilistic translation modelling as discussed in §2.1 and equation 4.5 on page 76. Models are sought which predict behavioral patterns based of a number of different predictor variables. Linguistic features of the source text are investigated with respect to their effect on production times and revision behavior, patterns of reading and writing are related to cognitive models of the translator, such as translation expertise, and different translation techniques, machine translation and from-scratch translation are assessed in relation to translation effort.

Pause analysis is perhaps the most common approach for the analysis of behavioral patterns. In pause analysis it is assumed that longer pauses between successive keystrokes signal higher cognitive effort. O'Brien (2006) analyses keystroke pauses in post-editing and suggests that analyzing pauses is a useful indicator of cognitive effort in post-editing. Immonen (2006) finds that in translation, pause length is higher at word and clause boundaries. Lacruz et al. (2012) introduce average pause ratio as a metric to establish a relationship between pauses and cognitive effort in post-editing.

However, to obtain a more complete picture of the translation process, we ought to investigate the translators' "black box" in more detail. In the next section we will therefore investigate properties of the translators' hidden states, which, according to the Noisy Channel Model in §2.4 emit behavioral patterns.

4 Hidden translation states

It is unclear how many hidden translation states can or should be distinguished that participate in the translation process. However, a distinction can be made between states which are triggered through early priming mechanisms and other

more time-consuming and late(r) states which involve more cognitively demanding problem solving strategies. The TP model suggested in Figure 5 distinguishes these states into “early” and “late” states.

Priming is an unconscious mechanism that is based on the implicit memory of a first (source) stimulus which carries over to a subsequent, target stimulus and which has an impact of the execution of a following task. It has been shown that bilinguals, and therefore also human translators, use implicit memories during language production. Priming effects exist between stimuli in different modalities, such as visual and verbal. They are, however, stronger if source and target stimuli are in the same modality, e.g. within written language. Priming effects can be observed in translation and in post-editing of machine translation output (PEMT), but – as we will show – the effects are more noticeable in PEMT, presumably due to the fact that priming effects are generally stronger within one language (i.e. the MT output and final translation) than between two languages (Pickering & Ferreira 2008).

The degree of similarity between source and target items has an effect on the strength of the priming effect – the greater the similarity, the stronger the priming effect. Priming facilitates and simplifies translation. Priming effects exist for the choice of words as well as for word order. Hvelplund Jensen (2009) and Ruiz et al. (2008) report shorter ST reading times in translation if the word order in the ST is identical with the word order in the TT. Schaeffer, Dragsted, et al. (2016) report longer reading times for words with more possible choices than for words with fewer choices. This result is in accordance with Campbell’s Choice Network Analysis (Campbell 2000): The more choices translators have in the selection of a translation, and the more complex the decisions are that they have to make, the more difficult the translation will be. Simpler translational decisions often lead to identical results while more variation in the translation often implies difficult more difficult decisions.

As shown in Figures 3 and 4, translation process data encodes traces of early, automatized and later translation behavior. Automatised processes occur quickly and leave their traces early on, while later, more time-consuming processes are likely to involve more conscious problem solving activities.

A noisy channel model of translation as depicted in Figure 5 takes into account various kinds of hidden processes which ought to explain and generate the traces in the observed UAD. This section summarizes a few constraints of the hidden states, related to the observable output of early and later processes.

A large amount of research exists that investigates conscious processes in translation (e.g. Jääskeläinen & Tirkkonen-Condit 1991; Lörscher 2005). Accord-

ing to Gutt (1989), the translator's task is to recode the source text into a target language text in such a way that interpretive resemblance in regard to explicatures and implicatures of both texts is achieved. In order to examine interpretive resemblance, translators consciously apply meta-cognitive monitoring processes. Gutt's theory builds on relevance theory (RT, Sperber & Wilson 1995), which posits that linguistic forms encode semantic representations that are recovered using unconscious, automatic decoding processes. As a pragmatic theory of communication, RT seeks to explain the inference procedures that build on the automatic encode-decode mechanism and on which successful communication relies. The distinction between the process of encoding-decoding messages and the process of making inferences from evidence coincides for Blakemore (2002) with the distinction between semantics and pragmatics: linguistic semantics provides logical forms which are taken as input by pragmatic inferences constrained by the principle of relevance.

This section aims at giving empirical evidence for the existence of early and late translation processes. In §4.1 we describe the experimental material that much of the successive sections rely on. In §4.2, we investigate linguistic parameters that have an effect on the word production duration. Production duration is a possible indicator of translation difficulty and the amount of priming and more time-consuming translation strategies that went into the production of a translation. We show that, among other parameters, the number of possible translations for a word is a strong indicator of translation difficulty, which has an impact on early as well as late translation processes. In §4.3 we have a closer look at syntactic properties of lexical variation in the translation product in from-scratch translation and in post-editing. Finally in §4.4 we discuss revision behavior, which accounts probably for the latest of the translation processes.

4.1 Experimental Material, Measures and Metrics

Table 4 gives an overview of the size and number of texts. A total of 336 target texts (TTs) with a total of 48.295 target language tokens (TT Tok) were produced from six different English source texts (ST) into four target languages, Danish (da), German (de), Spanish (es) and English (en). The English TTs resulted from a copying task (C), English to English, whereas the other texts were either post-edited (P) or translated (T). The translations were produced by 95 translators over a period of 38 hours (*FDur*). The column *KDur* shows the accumulated keying time, excluding production pauses of more than one second. Note that the ratio of keying time (*KDur*) vs. total production time (*FDur*) is much smaller for

4 Sketch of a Noisy Channel Model for the translation process

Table 4: Annotated data for the syntactical entropy study

Study	Sessions	TL	Task	Texts	Part	FDur	KDur	TT Tok
TDA	48	en	C	1–6	15	6.1	5.8	6792
KTHJ08	69	da	T	1–3	24	6.4	5.5	10571
SG12	45	de	P	1–6	23	5.6	1.9	6352
SG12	47	de	T	1–6	24	9.4	4.6	6632
BML12	64	es	P	1–6	32	2.3	0.9	9012
BML12	63	es	T	1–6	32	8.2	5.8	8936
total	336	4	3	6	150	38	24.5	48295

post-editing than for from-scratch translation, and even less in the copying task. Danish translations were only produced for three texts (1-3). The column *Part* indicates the number of different participants involved in each translation study.

From the logs of these sessions, a number of features were extracted, (cf. Carl et al. 2016), among others:

- *LenS*: length of the English source text word in characters
- *LenT*: length of the translation in characters
- *STseg*: (sequential) number of the source text segment
- *Prob1*: frequency of the English source text word (according to BNC)
- *PoS*: English source texts were part of speech (PoS) tagged. Table 5 gives an overview of the used tagset.
- *Dur*: translation duration is the amount of time needed to produce the translation of a word.
- *HTra*: word translation entropy
- *Cross*: distance between the English source text word and its translation

In order to assess the literality of a translation, Carl et al. (2016); Carl & Schaeffer (2016) introduce a literality metric which measures the similarity of a source text (ST) and its translation, the target text (TT), along the following three criteria:

- ST and TT segments have the identical word order
- ST and TT words are one-to-one translation equivalences
- ST words have one (preferred) translation in the context

Literality criterion (2) is met if each word in the ST corresponds to exactly one TT word and vice versa, while criterion (1) is realized if the translation equivalents occur in the same order in the ST and in the TT. These two criteria are represented by an integer value, referred to as *Cross* and relate to the amount of crossing word alignments (inter-lingual alignment distortion). A one-to-one correspondences results in a *Cross* value of 1, and this value grows (negatively or positively) with the distance between the aligned words. Approximately 40% of all words in the TPR-DB (English STs) have a *Cross* value greater or smaller than 1 (Schaeffer, Dragsted, et al. 2016: 190).

In order to assess literality criterion (3) we use a corpus of word-aligned, alternative translations and measure the entropy of the translation realizations. This measure is referred to as word translation entropy H_{Tra} . Approximately 90% of all words in the TPR-DB (English STs) have more than one translation alternative, and thus a value $H_{Tra} > 0$ (Schaeffer, Dragsted, et al. 2016: 190).

4.2 Production duration in translation and post-editing

The reduction of translation duration (the increase of productivity) is a driving force for much of the technological development of machine translation (MT) and for post-editing of machine translation (PEMT). While it has been shown in several places that PEMT is often quicker than from-scratch translation (Plitt & Masselot 2010; O'Brien et al. 2014), it has not often been investigated what the possible determining factors, and what the impact for on the translation product are.

To test which properties of the text might have an impact on the translation duration, we analysed six English texts from studies BML12 and SG12, (see Table 4). We extracted 15,313 ST and 15,568 TT words that were translated into Spanish and German by 32 and 24 translators respectively and they were also post-edited into Spanish and German by 32 and 23 translators, respectively. The

data was analyzed using R (R Development Core Team, 2014) and the lme4 (Bates et al. 2014) and languageR (Baayen 2013) packages to perform linear mixed-effects models (LMMs). To test for significance, the R package lmerTest (Kuznetsova, Christensen, & Brockhoff, 2014) was used, which implements ANOVA for mixed-effects models using the Satterthwaite approximation to estimate degrees of freedom. The final model included participant, ST token, text and target language as random variables. The predictor variables were ST token frequency (*Prob1*), word length of the ST token in characters (*LenS*), *Cross* and *HTra*, in addition to task, i.e. post-editing and translation, as an interaction with both *Cross* and *HTra*. The dependent variable, production time per word (*Dur*) was log transformed, because it was not normally distributed. Data points which were more than 2.5 standard deviations below or above a participant's mean were excluded (3%). All effects were highly significant (all $t > 3$ and all $p < .001$).

The translation duration *Dur* indicates the production time for a translation. It is also an indicator of earlier and later processes: the more time is needed to produce a translation, the more likely will the translator be involved meta-cognitive reasoning. As shown in Figure 8 the production duration depends on a number of additional factors.

Figure 8 shows the effect of *Cross* and word translation entropy (*HTra*) on word production time *Dur*. The Figure shows that post-editing is much quicker for words which have small *Cross* and *HTra* values. Post-editing may take as long as from-scratch translation if the MT output is modified (i.e. many different variants are produced) and/or for large *Cross* values.

It is possible that MT systems produce more acceptable translations for segments in which the word order is similar (i.e. *Cross* values are low) than for segments in which a large amount of syntactic reordering is required. In turn post-editors would need to produce less modifications for translations with low *Cross* values which would explain why post-editors take less time to produce these words as compared with words which have a very different position in the TT, in relation to the ST.

4.3 Variation in translation and post-editing

The amount of different translations that are possible for a word (*HTra*) has a strong effect on production time. In this section we investigate this phenomenon in more detail. Post-editors seem to be less creative than translators; often, they do not modify the MT output which leads to fewer variants in the translation product than during from-scratch translation.

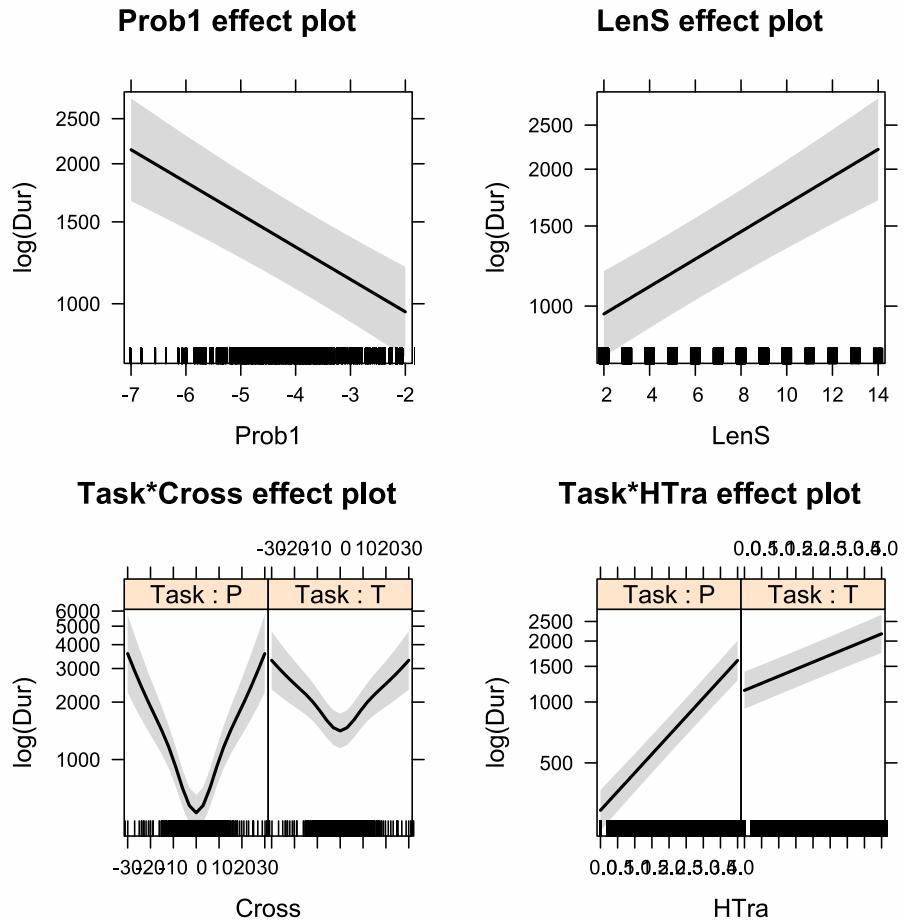


Figure 8: The effect of source text frequency (Prob1), ST word length in characters (LenS), word translation entropy (HTra) and word order differences (Cross) on ggproduction time (Dur) and observed translation variants for post-editing (P) and translation (T).

Čulo et al. (2014), for instance, describe a study in which 12 professional translators and 12 translation students translate or post-edit six texts from English (L2) to German (L1). Čulo et al. (2014) discuss the following MT output in detail:

EN : *In a gesture* sure to rattle the Chinese Government

DE : *In einer Geste*, die die chinesische Regierung wachrüttelt

The German translation “*In einer Geste*” is understandable but not idiomatic. It is a literal one-to-one translation – according to criteria 1 and 2 above – which was generated by an MT system but which was rarely changed by the post-editors. However, a great variation of different idiomatic versions was found in human translations of the same text segment. Human from-scratch translations for the above example include: “Als Geste”, “Es ist eine Geste”, “Mit der Absicht”, “Als Zeichen des Widerstandes” and “Mit einer Aktion”. The eight translators who translated this text produced seven different versions, while seven post-editors only came up with three different versions. The example clearly shows that translators are more creative, resulting in more diverse translation solutions and thus high H_{Tra} values, while post-editors are more heavily primed by and biased towards the solutions generated by the MT system which results in low H_{Tra} values but also faster production times. Note also that the translation *In a gesture* ↔ *In einer Geste* can be aligned word-by-word, which is not the case for most of the from-scratch translations.

Tightly connected to the phenomenon of interference is the amount of variation in translation solutions. Figure 9 shows word translation perplexity from English to German and English to Spanish for different word classes (PoS tags, see Table 5, below). The texts were extracted from the SG12 and BML12 studies (see Table 4) and contain approximately 800 source text words. The degree of translation variance can be measured as perplexity: an even distribution of several realised translations (e.g. all translators generate a different translation) leads to high perplexity values, while an uneven distribution (i.e. many translators generate the same translation) does not.

The values for post-editing and original translation are indicated. Some PoS tags, such as e.g. JJS (superlative e.g. “largest”, “least”), NNP (proper names), CC (conjunctions) only produce a very small number of translation alternatives (low degree of perplexity). Other PoS tags, such as e.g. RP (particles), VBN (participles) exhibit more variation in the target text. In any case, the degree of word translation perplexity in post-editing is always lower than in translation from scratch. As pointed out in §4.3, this is presumably due to the fact that MT output

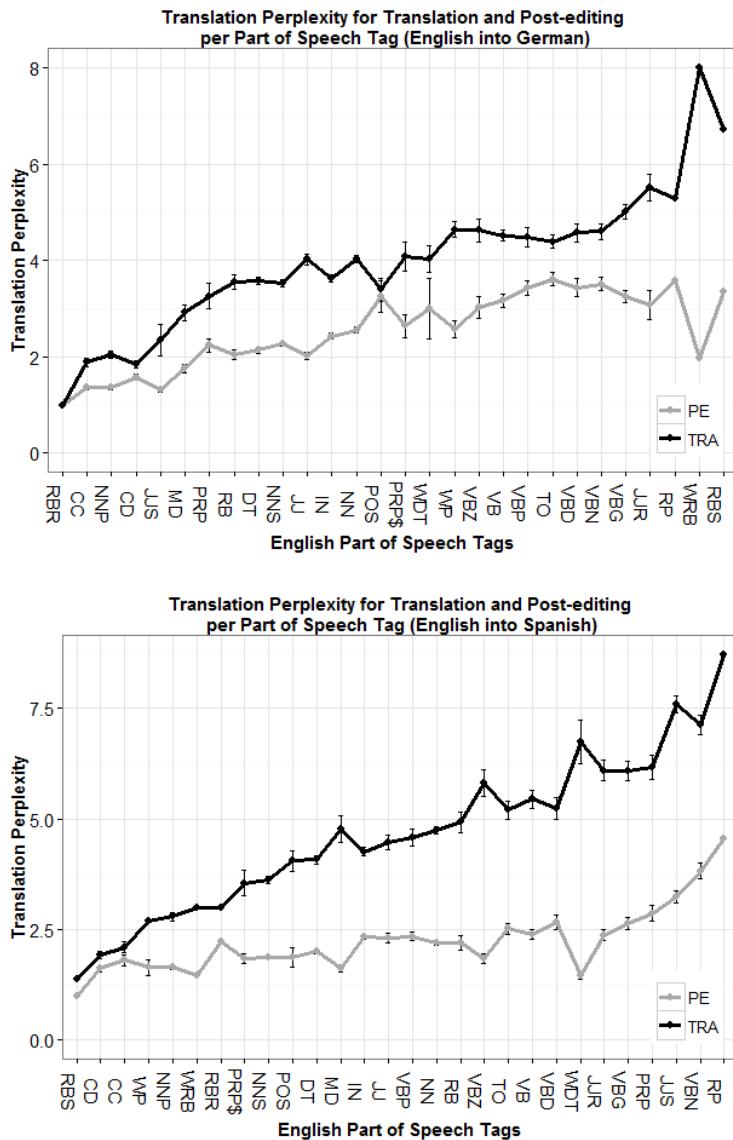


Figure 9: Priming in translation (TRA) and post-editing (PE). Perplexity in word translations exhibits the variation of generated target texts, which is always higher in translation from scratch than in post-editing.x

is often accepted without changes and all post-editors therefore often accept the same word translations.

Some PoS tags in the Spanish translation exhibit more variation than the German translation. For example, there is less variation in the translation of superlatives (JJS) in German while there is a relatively large amount of variation in the Spanish translation. Other word classes (e.g. conjunctions) seem to be translated in the same way by most translators and post-editors. The difference between post-edited texts and translations from scratch, however, are more pronounced for Spanish than for German. This suggests that Spanish post-editors accept MT output more frequently than German post-editors.

4.4 Translation revision

According to Gutt (1991) the aim of a translation is to achieve appropriate contextual effects in the target language without unnecessary effort for the reader of the target text, so that the translation corresponds to the original source text in terms of relevant aspects. In order to achieve this goal, translators consciously keep track of the possible associations between stimulus, context and interpretation, so that the resulting translations obey to the principle of cognitive and communicative relevance (Sperber & Wilson 1995: 260).

Translation revision is in many cases a compulsory activity to generate intelligible and optimal relevant translations. A distinction is made between other-revision and self-revision. Other revision is carried out by someone other than the translator, while self-revision (or checking) is done by the translator him- or herself. Self-revision of a translation is an integral part in the translators' translation process. Jakobsen (2003) distinguishes between online revision, i.e. revision during the translation drafting process, and 'end revision', which occurs after the completion of the first draft without delay. According to Mossop (2007: 109), revision may be defined as "that function of professional translators in which they identify features of the draft translation that fall short of what is acceptable and make appropriate corrections and improvements". Revisions may be due to problems in transfer, content, language and presentation (Mossop 2007) and may take place in translators' minds during the decision-making process ('internal revision') or appear on paper or the computer screen when actual changes are being made ('external revision') (Künzli 2007).

Relevance Theory considers words and phrases to encode procedural components that contain instructions which control procedures that limit calculations of conceptual representations. This distinction is known as conceptual and procedural encoding. Procedural encoding thus guides the conceptual computations

and leads to processes of comprehension so that the reader may work with a conceptual representation (Blakemore 2002). In accordance with these observations, Sperber & Wilson (1993: 16) note that “conceptual representations can be brought to consciousness; procedures cannot. We have direct access neither to grammatical computations nor to the inferential computations used in comprehension.”

However, according to Alves (2003), translators consciously learn how to manipulate conceptually and procedurally encoded information. They suspect that conceptually encoded information is easier to translate than procedurally encoded information as conceptual encoding exhibits a “relatively stronger interpretive resemblance between source and target texts” (p 20). Sekino (2012) reports findings based on translation data for Japanese into Portuguese. Their results corroborate Alves (2003), showing that processing effort is greater when dealing with procedural encodings in both from-scratch translations and in post-editing tasks in terms of keystrokes, fixation counts and fixation duration.

In order to assess these findings with our data, we investigate ST reading patterns and TT revision patterns on a set of UAD which included that shown in Table 4. The duration of the fixations – and also of the first fixation – signals the cognitive effort for processing a word. Fixations tend to be longer on words that require effortful processing as, for instance less frequent words, words containing spelling errors, ambiguous words, words which are inappropriate in a given context, etc. McConkie & Yang (e.g. 2003: 413).

We adopt Alves & Couto-Vale (2011) notion of micro units to quantify the amount of self-revision. A micro unit (*Munit*) is a typing burst which contributes to the translation of an ST token and which does not contain inter-keystroke pauses of more than 1 second. An *Munit* – in the way we use it here – indicates how the translation of a source word was modified. The number of *Munits* that the translation of a word is involved in is thus an indicator for its translation effort, since each revolving modification is an indicator for restructuring or reconsidering the translation a larger context.

We PoS-tagged the English source texts⁸ and investigated their translations into Danish, German, Spanish, Estonian, Chinese, and Hindi (i.e. the studies ACS08, BD08, BD13, BML12, HLR13, KTHJ08, MS12, NJ12 and SG12 (cf. Carl et al. 2016)) with the hypothesis that:

1. procedurally encoded words in the English source texts would require relatively more reading time

⁸we used the Penn treebank PoS tagset https://www.ling.upenn.edu/courses/Fall_2003/ling001/penn_treebank_pos.html

2. their translations into the target languages would require more revision time than conceptually encoded words

To this end, we classified the English PoS tags into 2 bins, labeled *conceptually encoding* and *procedural encodings*, according to the list shown in Table 5. We assume that the word classes in the two bins are more likely to encode their respective labels than the other one. We then investigated the distribution of effort according to the two hypothesis for these two classes.

Table 5: Penn treebank PoS tags for English source texts

Conceptual encoding		Procedural encoding	
NNP	Proper noun	IN	preposition or conjunction, subordinating
VBP	verb, present, not 3rd p. sing.	DT	determiner
NNS	noun, common, plural	PRP\$	pronoun, possessive
CD	numeral, cardinal	PRP	pronoun, personal
NN	noun, common, singular or mass	MD	modal auxiliary
VBD	verb, past tense	TO	to
VBN	verb, past participle	CC	conjunction, coordinating
VBG	verb, present participle or gerund	RP	particle
JJ	adjective or numeral, ordinal	WP	WH-pronoun
VB	verb, base form	POS	genitive marker
JJS	adjective, superlative	WDT	WH-determiner
RB	adverb	WRB	Wh-adverb
VBZ	verb, present tense, 3rd p. sing.		
JJR	adjective, comparative		
RBR	adverb, comparative		
RBS	adverb, superlative		

The data for the dependent variable total reading time of the ST token ($TrtS$) was analyzed in the same way as the data for the dependent variable Dur described in §4.3. The dependent variable $TrtS$ was log transformed because it was not normally distributed. Data points which were 2.5 standard deviations below or above a participant's mean were excluded (< 3%).

The final LMEMs had the following random variables: item, participant, text and study. The predictors were *Prob1* (ST frequency), *LenS* (word length in characters), *STseg* (sequential position of sentences in the ST), *Encoding* (see Table 5), *HTra* and *Cross*. These latter two variables implement the literality metric introduced above:

- *HTra* indicates to what extent there is a clearly preferred translation (criterion 3).
- *Cross* indicates to what extent the source and the target texts follow the same relative word order (criterion 1) and whether there is word-to-word or a phrase-to-phrase correspondence between the ST and the TT words (criterion 2).

Table 6 and Figure 10 show that translators are likely to spend more time reading conceptually encoded source text words than procedurally encoded ones. The Table shows

- Estimate: the estimated effect of the predictor variable on the dependent variable given the effect of the other predictors and the random effects.
- Std. Error: the error of the estimated effect
- t value and $\text{Pr}(>|t|)$: the significance of the estimation. These are also given as stars (*) in the last column of the Table (three *** designate significance below the 0.001 level, two ** designate significance below the 0.01 level and one * designates significance below the 0.05 level)

Table 6: Effects of *Prob1*, *LenS*, *STseg*, *HTra*, *Cross* and kind of encoding on on total reading times of source text words.

	Estimate	Std. Error	t value	$\text{Pr}(> t)$	
Intercept	5.94	1.89×10^{-1}	31.387	4.77×10^{-11}	***
Prob1	-8.51×10^{-2}	1.01×10^{-2}	-8.464	$< 2.00 \times 10^{-16}$	***
LenS	9.78×10^{-2}	4.14×10^{-3}	23.627	$< 2.00 \times 10^{-16}$	***
STseg	-1.29×10^{-2}	3.79×10^{-3}	-3.401	0.000681	***
HTra	4.35×10^{-2}	7.87×10^{-3}	5.525	3.55×10^{-8}	***
abs(Cross)	8.99×10^{-3}	2.13×10^{-3}	4.231	2.33×10^{-5}	***
Enc. Proc.	-7.53×10^{-2}	2.39×10^{-2}	-3.148	0.00166	**

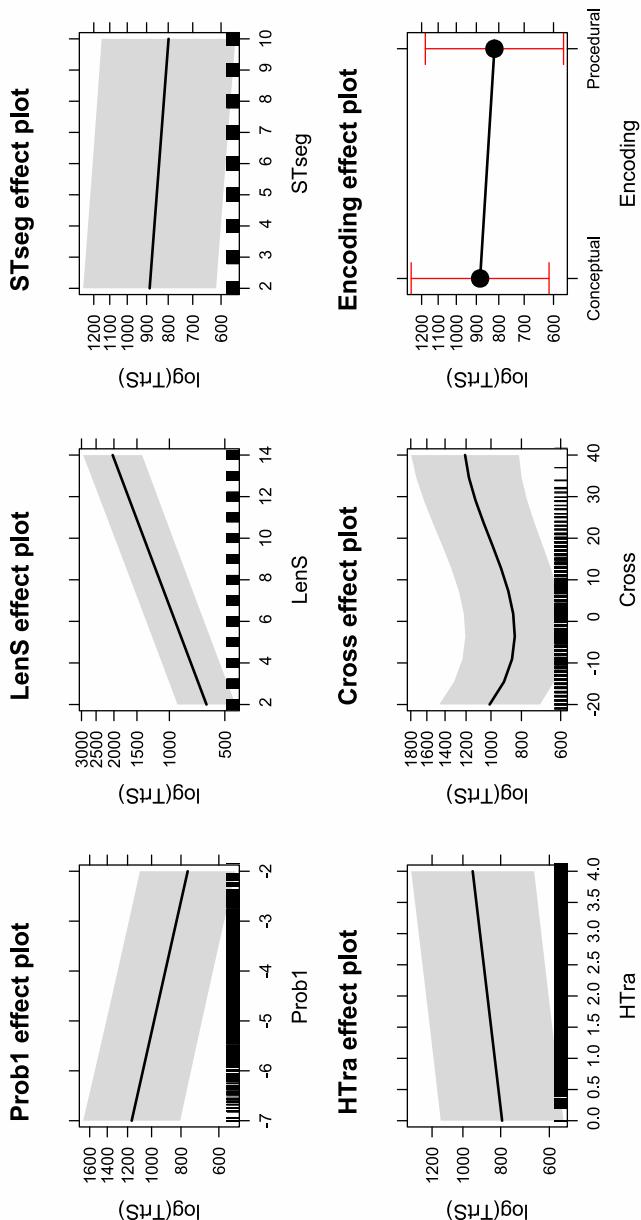


Figure 10: Effects of $Prob1$, $LenS$, $STseg$, $HTra$ and $Cross$ on total reading times of ST words

Word frequency, word length, word translation entropy and relative translation distortion (i.e. *Cross*) have all a highly significant positive effect on total reading time of ST words. These findings are not surprising and have been reported elsewhere (e.g. Schaeffer & Carl 2014). Also, the facilitation effect for later (higher number) segments in the source text is well known (Schaeffer, Dragsted, et al. 2016).

The picture is different as it comes to translation revision. Table 7 and Figure 11 show that translators revise translations of procedurally encoded words more often than translations of conceptually encoded words. The dependent variable (*Munit*) indicates how often a translator revises a translation.

The analysis for the dependant variable *Munit* was carried out in the same way as previous analyses, but it was not log transformed. Data points which were 2.5 standard deviation below or above a participant's mean were excluded (< 4%). The model included the same random variables and predictors as previous analyses, with the difference that the length (in characters) of the TT word was chosen, given that this might have a more direct effect on revision than the length of the ST word. Similar to the total reading time on the ST in Figure 10, the length of the translated word, the word translation entropy and relative translation distortion (i.e. *Cross*) have all a highly significant positive effect on the number of revisions (*Munit*). This is in line with the findings that are discussed in the context of Figure 8 which show a strong effect of observed translation variants on production time.

The results of this study suggest that there is an asymmetry in the perception and in the production of conceptually and procedurally encoded information in translation. While the perception of procedurally encoded information seems to be less effortful than that of conceptually encoded information, our findings indicate the reverse relation for translation production. Taking the number of revisions as an indicator for the effort in translation production, our dataset shows that the generation of translations for procedurally encoded information is more difficult than that of that of conceptually heavy words.

5 Conclusion

Translation is an extremely challenging task that requires a translator to possess unique skills. Aside from bridging linguistic divergences between both languages, such as e.g. syntactic shifts and lexical decisions, translators must also align the author's intention with the readers' expectations while simultaneously ensuring socio-cultural interpretations of the original text in the translation. The

4 Sketch of a Noisy Channel Model for the translation process

Table 7: Effects of *LenT*, *STseg*, *HTra* and *Cross* on translation revision

	Estimate	Std. Error	<i>t</i> value	Pr(> <i>t</i>)	
Intercept	1.09	4.23×10^{-2}	25.747	1.66×10^{-13}	***
LenT	1.35×10^{-2}	8.19×10^{-4}	16.517	$< 2.00 \times 10^{-16}$	***
STseg	-9.23×10^{-3}	2.12×10^{-3}	-4.343	1.48×10^{-5}	***
HTra	4.79×10^{-2}	4.61×10^{-3}	10.39	$< 2.00 \times 10^{-16}$	***
abs(Cross)	1.62×10^{-2}	1.84×10^{-3}	8.816	$< 2.00 \times 10^{-16}$	***
Enc. Proc.	4.93×10^{-2}	9.78×10^{-3}	5.043	4.87×10^{-7}	***

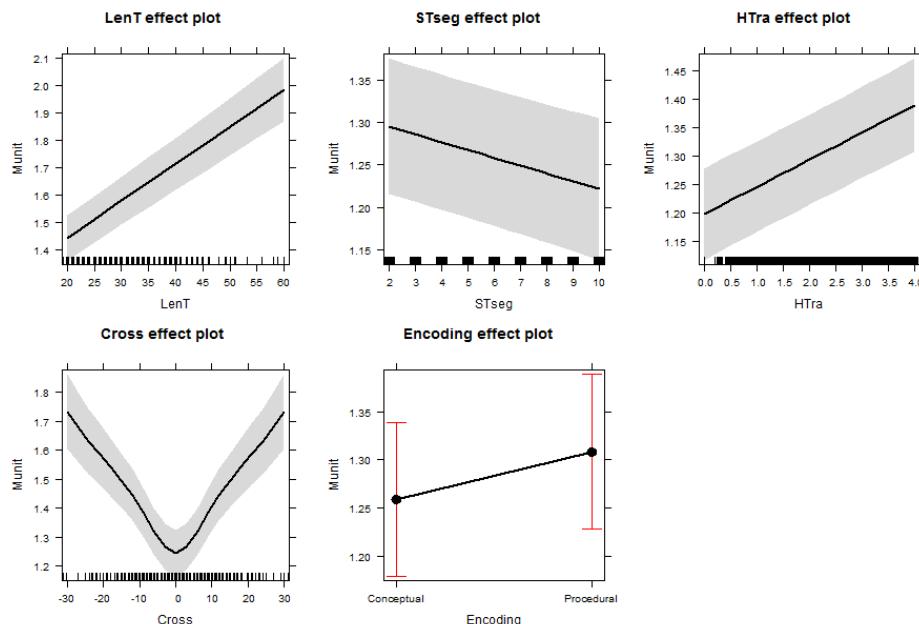


Figure 11: Effects of *LenT*, *STseg*, *HTra*, *Cross* and *Encoding* on translation revision

foundation of this activity seems to be based on unconscious memory processes: the implicit memory of source text segments primes the translator to produce a translation which is structurally and lexically similar to the target text. Subliminal priming mechanisms are the basis from which translations emerge. The first fixation is a very early behavioral measure and the word translation entropy (*HTra*) and relative translation distortion (*Cross*) have an effect on its duration such that words with small *HTra* and/or *Cross* values are easier to process than words with high *HTra* and *Cross* values.

On top of the early priming processes, translators develop a number of more consciously accessible translation strategies providing criteria to decide whether the generated translations conform to his or her expectations. This meta-linguistic knowledge is instrumental for problem-solving during the translation process. The deployment of meta-linguistic knowledge, for instance about grammatical structures or lexical translation equivalence, can be consciously directed and manipulated. For instance, repeated re-reading of a word or phrase is evidence of conscious processes. However, these processes are difficult to disentangle based on typical fixation measures such as total reading times. Each fixation on a word adds to its total reading times but it is difficult to know which meta-linguistic strategies and problem-solving activities have been used.

Some independent variables, such as word translation entropy (*HTra*) and relative translation distortion (*Cross*) have an effect on both early and late processes, which seem to suggest that early automatized processes trigger certain later conscious ones (Schaeffer & Carl 2013). The results presented by Schaeffer, Dragsted, et al. (2016) suggest that target language-specific aspects play a role right from the beginning in the translation when reading a source text word for the first time. Words with fewer alternative translations and which do not require re-ordering in the target language require less effort than words with a higher number of alternative translations and which must be syntactically re-ordered — and this effect can be observed in early and in late measures.

The lack of appropriate late (eye movement) measures makes it difficult to assess in detail which translation strategies were deployed: a total reading time of 8 seconds, for instance, is just a conglomerate of fixation durations, but it does not tell us which translation processes were used during these 8 seconds.

The analysis of behavioral patterns is much better suited to assess translation strategies. Think Aloud Protocols (Krings 1986; Lörscher 1991; Jääskeläinen & Tirkkonen-Condit 1991) provide evidences for the existence of different translation strategies. However, the analysis of TAP data is very labor intensive and it is unclear how the identified translation strategies relate to the UAD. Alternatively,

behavioral patterns can be segmented and identified in the UAD to investigate translation strategies. Schaeffer, Carl, et al. (2016), for instance, show that translation processes are much less sequential, (sentence-by-sentence, chunk-by-chunk) and much less stratification than predicted by earlier translation models.

To date, empirical translation process research has mainly focused on the textual product-based angle and there are some insights as to which linguistic constructions are more or less difficult to translate. However, besides some work into keystroke pause analysis (Immonen 2006; Lacruz et al. 2012), very little work is available that investigates in detail the temporal structure of the translation process and that systematically relates translation strategies to observable behavioral patterns.

In this chapter we develop a computational noisy channel model of the translation process, which can take into account a (possibly large) number of probabilistic functions that contribute to and explain the translation process. Prerequisites for the modelling of the process are measures and metrics that quantify different aspects of the observed data and that describe the various different early and late hidden translation processes in a translator's mind.

While translation process research investigates the underlying factors that lead to successive intermediate versions of a text that is to become a translation, corpus-based translation studies, including translation universal research, investigates regularities in different (final) translations, however, usually without access to the directly observable translation behavior. There are thus a number of similarities in translation product and translation process research, as both investigate the regularities in different (versions of) translations and the underlying mechanisms which may explain the observed regularities.

With the elaboration of a noisy translation process model, we hope to achieve “a scientifically sounder methodology of data collection, analysis and report” which will help in “the development of a relatively uncontroversial classification of process indicators” (Bernardini 2001: 260).

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Chapter 5

Language processing and translation

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The current chapter reviews studies which investigate the behavioural differences during reading and writing for translation and other non-translational language use. This chapter further argues that eye movement measures imported from Psychology are not well suited to describe the unique co-occurrence of reading and writing during written translation. In order to address these shortcomings, one existing measure (the Eye-Key Span) (Dragsted & Hansen 2008; Dragsted 2010), which describes how reading and writing activities are coordinated, is further tested by replicating existing findings with more language combinations and participants. A second, novel measure (the probability that source text reading and target text writing overlap in time) is used in conjunction with the Eye-Key Span to test predictions from an existing model of the translation process (Schaeffer & Carl 2013a). Finally, one new feature (HCross) is introduced with which an existing model of bilingual memory (Hartsuiker et al. 2004) is extended.

1 Translation and non-translational language processing

There is a long tradition of studying the differences between original texts written in one language and texts translated from a different language – in terms of the product of translation, i.e., in corpora of the final (published) texts (e.g. Hansen-Schirra et al. 2012). Corpus-based translation studies have the great advantage that the data which led to the formulation of theoretical insights is ecologically valid to a high degree: the texts used in corpora such as the CroCo corpus (Hansen-Schirra et al. 2012) are published texts and have therefore been produced in situations which are real and natural. Experimental studies, on the



other hand, often manipulate source texts (henceforth ST) and the STs are normally far shorter than those in real life situations (ranging from single words, to single sentences and short texts of approximately 150 words). In addition to the unnatural characteristics of the STs, participants are often not allowed to use reference material such as dictionaries or glossaries and typically do not have access to the internet. Further increasing the unnatural conditions of experimental studies is the fact that participants translate knowing that their reaction times or keystrokes and/or eye movements are recorded and the simple presence of a researcher may further impinge on the process of translation. However, the shortcoming of corpus-based translation studies is that it is difficult to attribute observed effects to particular aspects of the translation *process*, given that the source of information is typically the frequency of a particular item in the *final product*. The factors which led to the observed result of the process remain hidden in the dialogue between ST reading and target text (henceforth TT) reading and writing and interaction with other information sources.

The current study therefore aims to provide insights into the cognitive processes which occur during translation by first reviewing existing studies which compare translational and non-translational language use and by comparing the effect of two tasks (monolingual copying and translation) on two behavioural measures. One of these behavioural measures was first proposed by Dragsted & Hansen (2008) and Dragsted (2010), and the second behavioural measure is novel. The two measures take into account both eye movements on the source text and typing activity. The eye-key span (Dragsted & Hansen 2008; Dragsted 2010) describes the temporal distance between a first reading of a particular word and the first keystroke which contributed to the translation of that particular ST word. It can be seen as a relatively late indicator: Many intervening processes between a first reading and the first keystroke can and typically do occur during translation, while fewer occur during monolingual copying. The second measure is the probability that ST reading and TT typing occur (at least partially) at the same time. It is an indicator of cognitive effort: the less likely the co-occurrence of these two processes, the more effortful the process. The more likely it is that reading and writing overlap in time, the less effortful is the process as a whole at that time. These two measures take into account one aspect of the nature of the translation process which it shares with few other tasks, apart from monolingual copying: the direct relationship between read input and written output.

Jakobsen argued that with the introduction of eye tracking and keylogging into translation process research the hope was that

...eye data would provide evidence pertaining identifiably to source-text reading so that source-text comprehension processes could be studied sep-

arately from text-production processes and could be compared with other reading processes that were not part of a translation process. (Jakobsen 2011: 41)

Very few studies have systematically compared the cognitive processes during non-translational language use with those that occur during translation. The current chapter will review the studies which have done so and will provide new evidence which addresses shortcomings in existing studies.

2 Reaction times and eye movements during translation

2.1 Reaction times per clause

Shreve et al. (1993) compared reading times in three tasks and groups: reading for later translation by translation students, reading for later monolingual paraphrasing by students of English and reading for comprehension by students in psychology. Reading times were measured per clause (including re-reading) and normalised by the number of words in each clause. Results from principal component analysis of the reading times showed that, at least on the basis of these behavioural measures, none of the four factors of the principal component analysis distinguished reading for translation clearly from the other two tasks. However, reading for translation was overall more similar to reading for monolingual paraphrasing than to reading for comprehension. The authors further point out that there was more variation in how translators read for translation while the other two groups of participants approached their tasks more homogeneously. The paraphrasing and translation groups were also asked to indicate post-task the nature and number of problems in the clauses they identified in their reading. The expectation was that the number of problems identified post-task would correlate with reading times. This was not the case. Although the authors do not interpret their findings in this way, it is entirely possible to argue that post-task identification of problems might not accurately reflect the processes which occurred during reading, given that they are produced off-line. One other reason might be the fact that reading times per clause might not accurately reflect actual reading times, which might show the expected effect locally rather than globally.

2.2 Reaction times per word

In a series of studies, Bajo and colleagues (Macizo & Bajo 2004; 2006; Ruiz et al. 2008) employed more sensitive behavioural measures, i.e., reaction times per

word using the self-paced reading paradigm. In all three studies, a similar experimental design was used: masked self-paced reading is the sequential presentation of single words which is controlled via button press by the participant, so that subsequent button presses are used to measure reaction times per word. The interval between two successive button presses is taken as an indication of the time needed to process the currently displayed word. These studies therefore address the concerns raised in relation to the study by Shreve et al. (1993). Bajo and colleagues (Macizo & Bajo 2004; 2006; Ruiz et al. 2008) refer to the model proposed by Seleskovitch (1976) who argued that translation is normally carried out sequentially in that the first step is source text comprehension and only when this is complete and only once the source material is “deverbalised” can reformulation in the target language begin. Opposed to this sequential view is the assumption that representations specific to the target language (TL) are activated at the same time as source language (SL) representations are activated (horizontally and in parallel). The vertical model by Seleskovitch (1976) is essentially what in machine translation would be called an interlingual model. It is the highest level in the Vauquois triangle (Vauquois 1968) (see Figure 1), where transfer occurs at a language-independent interlingual representation, common to all languages.

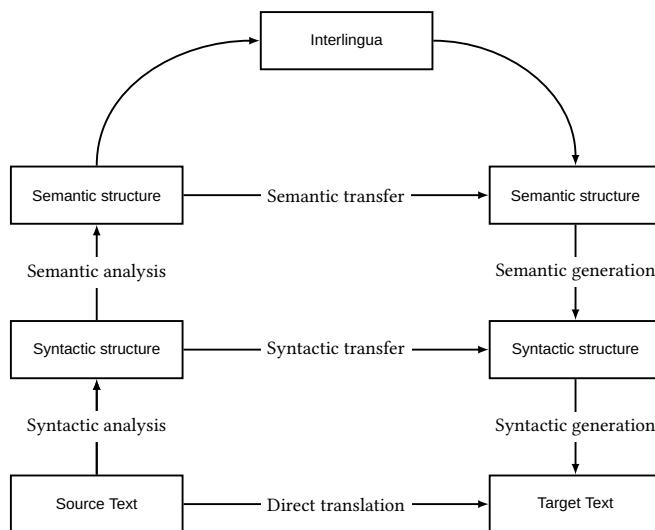


Figure 1: The Vauquois triangle of translation based on Vauquois (1968)

The studies by Bajo and colleagues were designed to test the Seleskovitch model. Participants in all three studies carried out two tasks: reading for com-

prehension and reading for translation. Participants were not overtly producing the translation while reading – they were asked to orally produce the translation after having read the sentence (for translation). The expectation in all three studies was that the manipulation of the stimuli would elicit an effect only in the reading for translation condition, because of a) increased working memory load due to the added effort related to online translation and b) because the assumption was that during reading for comprehension the TL would not be activated and TL-specific manipulations would not have an effect on source text (ST) reading. In the 2004 study, Macizo and Bajo manipulated both working memory load and the availability of pragmatic cues. The stimuli consisted of object relative sentences such as “The judge that the reporter interviewed dismissed the charge at the end of the hearing.” The authors argued that working memory load would be particularly high for the verbs of the main clause and the relative clauses, because in object relative clauses, the thematic roles of the first two constituents (*judge* and *reporter* in the example) can only be assigned retrospectively once the subordinate verb (*interviewed*) is read. Pragmatic cues consisted of verbs which were either more or less predictable based on the previous context. It is, for example, more predictable that a reporter interviews than that a reporter admires or it is more predictable that a judge dismisses a charge than that he drives a car.

In addition to testing the sequential versus parallel view of translation, Macizo & Bajo (2004) tested the predictions of the Revised Hierarchical Model (RHM) of bilingual memory (Kroll & Stewart 1994) which predicts that backward translation (BT) (from L2 into L1) is faster than forward translation (FT) (from L1 into L2), because L2 lexical representations have stronger connections to their L1 equivalents than to shared conceptual representations. Translation from L2 into L1 is therefore predicted to use the faster lexical routes and translation from L1 into L2 is mediated by the less direct conceptual connections. However, during translation, both routes are always activated – one is simply faster than the other. The predictions based on the sequential/parallel model and the RHM are therefore that an effect appears only in the reading for translation condition and that FT, because it is more conceptually mediated than BT, is especially susceptible to the manipulation of pragmatic cues. These results are clearly borne out by the evidence: Reaction times were significantly slower during reading for translation, particularly during FT and particularly for the constructions which require retrospective assignment of thematic roles and therefore high working memory load, supporting the parallel activation of SL and TL representations during reading for translation. In addition, more predictable verbs were read significantly faster than less predictable verbs in FT, but not in BT, supporting the predictions of the RHM.

Further support for the co-activation of SL and TL representations during reading for translation was provided by the two subsequent studies (Macizo & Bajo 2006; Ruiz et al. 2008). In both studies, participants also read single sentences for comprehension and for translation in a self-paced reading paradigm. In the 2006 study, the stimuli for experiments 1a and b consisted of interlingual homographs which created an ambiguity only if they were translated: the Spanish word *presente* is not ambiguous in Spanish (it can only refer to the present time), but it is ambiguous when translated into English, given that *present* can refer both to a gift and the present time. In experiment 1a and b, the number of words intervening between the ambiguous homograph and the disambiguating context was manipulated so that working memory load was a factor in the design. In experiment 2a and b, cognates were used. The manipulation in experiments 1a and b was expected to result in inhibition only when the reading purpose was translation and particularly when the working memory load was high, but not when the reading purpose was comprehension alone. The prediction for experiment 2a and b was that the presence of cognates would facilitate. Both of these predictions were designed to lend further support to the hypothesis that activation of the TL during ST reading is task-dependent. Again, the predictions were confirmed in this study. The 2004 study by Macizo and Bajo only employed professional translators, but the 2006 study by the same authors replicated the effects found in professional translators with innocent bilinguals who had no professional translation experience: interlingual homographs, the working memory manipulation and cognates resulted in the same pattern of results, suggesting that the mechanisms underlying the task-dependent co-activation of SL and TL is not a function of expertise, but co-extensive with bilingualism.

The 2008 study by Ruiz et al., again, employed essentially the same experimental design as the previous two studies. TL-specific aspects were manipulated here: the frequency of critical SL items was kept constant while the frequency of their TL equivalents was either high or low (experiment 1). Experiment 2 manipulated the congruence of the word order in the ST with that in the TT: In the SL Spanish, adjectives can either precede the noun they modify or they can be placed after it while in the TL (English) they can only precede it. Only professional translators participated in this study and working memory load was not manipulated. Results were as predicted, in that the manipulations only had a significant effect on reaction times when the reading purpose was translation, but not when the reading purpose was comprehension only.

All three studies by Bajo and colleagues support the horizontal model of translation. All three studies show that co-activation of SL and TL is task-dependent.

In all three studies by Bajo and colleagues, the results are interpreted in terms of Grosjean's (1997) language mode continuum, which predicts that, depending on the context of language use, a bilingual's two languages are activated to varying degrees. At one extreme is the monolingual mode, in which mainly one language is active and at the other extreme is the bilingual mode in which both languages are active.

2.3 Complete texts and eye movements

Jakobsen & Hvelplund Jensen (2008) investigated essentially the same question as all the studies presented thus far, but employed an eye tracker. In this study, there were four tasks: reading for comprehension, reading for translation, reading while speaking a translation and reading while writing a translation. The expectation was that the task would have an effect on eye movements. The authors found significantly more fixations on the whole ST in reading for later translation than reading for comprehension, reading while speaking a translation had significantly more fixations than reading for translation and reading while typing a translation had significantly more fixations than reading while speaking a translation.

Further support for task-dependent co-activation of two linguistic systems comes from the study by Hvelplund Jensen et al. (2009). The manipulation in this study is very similar to the one by Ruiz et al. (2008), in that it investigates the congruence of word order. In the study by Jensen et al., the stimuli consisted of complete Danish texts which were translated into English. In the critical declarative clauses, embedded in the longer texts, the subject either preceded (SV) or followed the verb (VS). When translating these clauses into English, participants had to invert the order of verb and subject for the VS clauses, but not for the SV clauses. As in the study by Ruiz et al. (2008) the expectation was that it would be more difficult to process the incongruent clauses than the congruent ones. Results confirmed this. Jensen et al. employed an eye tracker and so the dependent variable was total reading time on the phrases. Total reading time is the sum total of all fixations on the area of interest. During translation, participants (professional translators) looked longer at clauses which had an incongruent word order than at clauses with a congruent word order. The fact that this effect is task dependent came from a follow-up study (Winther Balling et al. 2014) which employed the same stimuli as in the previous study, but in this case, the participants were either Danish-English bilinguals or English-Danish bilinguals and they were asked to read for comprehension only. The participants were therefore asked to read in their L1 and L2 respectively. The rationale for the follow-up

study was to make sure that the effect observed in the 2009 study was in fact task-dependent and not due to the fact that VS clauses are inherently more difficult to process when reading for comprehension in either L1 or L2. The manipulation (VS vs. SV) had no effect on total reading time during reading for comprehension in either L1 or L2.

One question, which is relevant in this context is how early the effect of the co-activation of the two linguistic systems during translation appears. The study by Shreve et al. (1993) employed a very late measure (reading latency of a complete clause), the studies by Bajo and colleagues employed a more sensitive measure (reaction time per word). The studies by Balling and colleagues ((2009; 2014)) employed total reading time on a phrase. Total reading time, given that it is the sum total of fixations on a particular region of text, is not informative regarding the time course of the effect.

2.4 Early and late eye-movement measures

Schaeffer et al. (2017) employed more fine-grained eye movement measures than previous studies, but otherwise, the design was similar to previous research. Professional translators read for comprehension and translated single sentences. The manipulation consisted of the number of target words which were equivalent to a single source word. Half of the stimuli contained items which had a one-to-one equivalence (the likelihood that an ST word was translated using just one TT word was high) and the other half contained one-to-many equivalences (the likelihood that an ST word was translated into more than one TT word was high). Global analyses showed that average fixation durations were 20ms longer during reading for translation than during reading for comprehension. Participants made on average 16 fixations more per sentence during reading for translation and the number of regressions also doubled, as did total reading time. The significant increase in all these eye-movement measures confirms and extends findings from earlier studies discussed above, i.e., that during reading for translation, co-activation of the two linguistic systems increases effort from early on (duration of single fixations) and into later processes (total reading time and regressions). That co-activation occurs very early during the process is further supported by the fact that the manipulation had a significant effect on first fixation durations: when it was likely that an ST word would be translated using more than one word, participants spent 23ms longer on this word when they were to translate it afterwards, but not when they only had to read it for comprehension. First fixation durations describe the time readers spend on a word the first time they encounter it. The critical items which were likely to be translated using more

than one TT word necessarily introduced lexical items which, when translated back into the SL, had no direct equivalents (see examples 1a and 1b below) in the context in which they appeared. It is therefore likely that, in the context in which they appeared, the one-to-many items did not share semantic representations across the two languages to the same degree as did the one-to-one items. First fixation durations on one-to-one items were not significantly different from first fixation durations on either kind of item during reading for comprehension. This pattern of results suggests that if the overlap in terms of lexico-semantic representations between SL and TL items is high, as in the case of one-to-one items, then translators are able to exploit the effects of co-activation and (initial) processing is similar during reading for comprehension and reading for translation. If, however, the semantic overlap is smaller, as in the case of one-to-many items, co-activation has an inhibiting effect on reading for translation, but not on reading for comprehension.

(1) a. ONE-TO-MANY

‘The water in the bottle is *low*...’

In the bottle is *not any more much* water...

In der Flasche ist *nicht mehr viel* Wasser...

b. ONE-TO-ONE

‘The water in the bottle is *bad*...’

The water in the bottle is *bad*...

Das Wasser in der Flasche ist *schlecht*...

Further support for the early activation of TL-specific representations during ST reading comes from a corpus-based eye movement study (Schaeffer et al. 2016). This study was designed to test a model proposed by Schaeffer & Carl (2013b). While the studies by Bajo and colleagues and Balling et al. described above contrasted a sequential and parallel model of translation, the model by Schaeffer and Carl argued that translation is best represented by both early, parallel and late, sequential processes. Schaeffer and Carl hypothesised that early automatic priming processes activate semantic and syntactic representations which are shared by the SL and the TL and later, more conscious, essentially monolingual vertical processes monitor the output from the early processes. Shared syntactic representations are defined in terms of the shared syntax account (Hartsuiker et al. 2004) and shared semantic representations are defined in terms of the Distributed Feature Model (de Groot 1992). In line with these models, Schaeffer and Carl argue that “shared representations are accessed very early during the process” (Schaeffer & Carl 2013b: 174) and that during the early stages “there is no

conscious control over how source and target are aligned cognitively” (Schaeffer & Carl 2013b: 173). In order to test the possibility that the automatic cognitive alignment has an observable effect on early eye movement measures and that these primed, shared representations serve as a basis for later processes, Schaeffer et al. (2016: 189) quantify the syntactic similarity (in terms of word order) of the source and the target texts and the variation of word translation realizations. The metric termed Cross (Carl et al. 2016: 26) describes the relative word order differences between the ST and the TT. If the word order is identical in two segments, then the Cross value for each word is 1. If, say, the equivalent of the first ST word is aligned to the sixth TT word, then the Cross value is 6. If, however, the distortion is in the opposite direction, i.e., if the sixth TT word is aligned to the first ST word, then the Cross value is -5. The Cross value can be computed by counting how many TT words need to be progressively or regressively counted in order to arrive at the equivalent of a given ST word. It is then termed CrossS. But the Cross value can also be computed by counting the number of ST words which need to be read progressively or regressively in order to arrive at the equivalent of a given TT word. This is then termed CrossT. CrossS can be seen as a process by which the ST is cognitively aligned with the TT, while CrossT describes a process which aligns the TT with the ST. The computation of CrossS progresses in a linear and sequential manner through the ST and finds aligned TT items, while CrossT progresses in a linear and sequential manner through the TT and finds aligned ST items.

The variation in terms of TT realizations of a particular ST item is computed by counting how many different TT items, which are aligned to the same ST item, there are in a corpus of a number of translations of the same ST. On the basis of the probabilities of each of these TT realizations, the distribution of these probabilities is then calculated. This is then expressed as word translation entropy (HTra) (Carl et al. 2016: 31) if the variation underlying this metric is lexical in nature, and it is termed syntactic entropy (Bangalore et al. 2016) if the underlying variation is syntactic in nature.

Schaeffer et al. (2016) find that both word translation entropy (HTra) and syntactic distortion (CrossS) have a significant positive effect on first fixation durations and total reading time. It is therefore likely that the effect of CrossS and HTra on first fixation durations represents early, automatic cognitive alignment, which is less effortful in the case of ST items for which the overlap between ST and TT representations in terms of syntax and lexico-semantics, respectively, is greater (low HTra and Cross values). The study by Bangalore et al. (2016) found that syntactic entropy had a significant positive effect on total reading time of

source text segments. The studies by Bangalore et al. (2016) and Schaeffer et al. (2016) found evidence of the above in the TPR-DB (Carl et al. 2016), which is a large database containing eye-movement and keylogging data in relation to several translations of the same source texts into a large number of target languages. The data for the study by Schaeffer et al. (2016) consisted of 42,211 English ST words translated into six different target languages and the data for the study by Bangalore et al. (2016) consisted of 26,139 words translated from English into three different target languages. While the large number of languages and the sizeable amount of material warrants confidence in the results, it should be stressed that a non-negligible amount of variation could not be explained with the predictors in the model presented by Schaeffer et al. (2016). In other words, while the model could make predictions with a certain degree of confidence, a possibly large number of variables which impact eye movements during translation remains unknown. To sum up, it is likely that task-dependent co-activation occurs early (horizontally) and that later processes use the output from these relatively automatic processes in the relatively vertical processes. The time needed to process a particular ST item is likely to be a function of the degree of overlap between ST and TT syntax and/or semantics.

3 Automatic translation

The studies reviewed so far have found that co-activation during translation is task-dependent. However, there is evidence which suggests that activation of translation equivalents is automatic even if participants are explicitly asked to ignore verbal stimuli (Wu & Thierry 2012; Wu et al. 2013). In the 2012 study by Wu and Thierry, participants were asked to perform a go/no-go task in which they had to respond with a button press to the presentation of shapes (circles or squares) while electrophysiological data were recorded. Half of the trials consisted of words. Participants were told to ignore the words and only respond to the shapes. Unbeknown to the participants, 30% of the word trials consisted of English words, which, when translated into Chinese, were homophone with the Chinese words for circle or square. Behavioural responses to the critical items showed that Chinese-English bilinguals were not likely to make more erroneous responses to the critical items (English words which when translated into Chinese sounded like either circle or square) than to control items (English words which were unrelated to the Chinese sounds for circle and square). However, ERP results (results from the recorded electrophysiological data) showed that the manipulation resulted in an N200 effect. The N200 effect is normally observed in

situations in which conflicts of a linguistic or non-linguistic nature are the underlying cause. What the study by Wu and Thierry thus shows is that, although the Chinese-English bilinguals were told to ignore all the word trials and only respond to shapes, Chinese translations of the English words were nevertheless activated automatically and early (200-300ms). The fact that this did not translate into a motor response and increased erroneous responses to critical word trials shows that the Chinese-English bilinguals were not necessarily aware of the co-activation and/or inhibited the Chinese equivalents. This interpretation is in line with the Inhibitory Control (IC) model (Green 2003) which predicts that the non-target language, i.e., the language which is not intended to be used in a given task, is inhibited to varying degrees. The 2013 study by Wu et al. showed very similar effects in an eye movement study.

It is therefore reasonable to think that the failure to find a co-activation effect during reading for comprehension in the studies by Bajo and colleagues and Balling et al. is due to the fact that the behavioural dependent variables are not sensitive enough to detect (inhibited) co-activation during reading for comprehension.

3.1 Independent translation routes

García (2015) reviews 21 cases of pathologies in bilinguals who presented with disorders which affected their translation behaviour. Though limited, this evidence makes exciting neurofunctional predictions regarding the relationship between languages in bilinguals. The most interesting of these hypotheses is that “Lexical translation routes are independent from those supporting monolingual production” (García 2015: 131). In other words, the suggestion is that there are connections or networks which are exclusively used for translation and not for monolingual language use. The evidence regarding this hypothesis comes from patients who were e.g. unable to spontaneously use one of their languages, but were able to translate from or into it. If it is confirmed that some form of translation route is independent of monolingual language use, this would explain how translators and interpreters are able to navigate the competing demands of a linguistic system which is essentially non-selective and which inhibits the SL to some degree, while still allowing it to be used for reading or listening and while activating the TL only rather than also the SL for production. This argument must remain speculative, given current evidence, but, should it find further support, it is entirely possible to argue that the unique and repeated exposure to translation or interpreting tasks may strengthen and possibly expand the nature of these translation routes which are independent of monolingual language use

and which are co-extensive with bilingualism. It is further possible to hypothesise that these routes are likely faster than those routes which are also active during monolingual language use, because they do not face the competing demands emerging from an essentially non-selective system which needs to inhibit the non-intended language system. In addition to the speed and strength of these translation routes, a third hypothesis may be articulated: it is possible that lexical items which are translated very frequently in the same way (low HTra) may result in better established translation routes than items which are translated in different ways when encountered in context. In other words, the strength and availability of these routes may be a function of their semantic overlap.

So far, only reception-related processes have been considered, but, as will be shown in the remaining sections, translation also has an effect on typing behaviour.

4 Monolingual text production and translation

Very few studies have systematically studied the difference between monolingual writing and typing during translation – in terms of the cognitive process and on the basis of behavioural data (as mentioned above, corpus based translation studies have investigated the differences between original and translated texts successfully and extensively). The studies by Immonen (Immonen & Mäkitalo 2010; Immonen 2006; 2011) are a notable exception. Immonen (2006) had 18 Finnish professional translators carry out two tasks: the author asked participants to write a short original text in their L1 (Finnish). The second task consisted of a translation of a text from English (L2) into Finnish (L1). Immonen asked participants to write an informative presentation based on a brochure which was a guide for those planning a career in the European Commission. The ST for the translation task was similar in register and topic – it was a text about the unity of the EU and had been used in exams for translators applying for a post at the EU. No particular brief was given for the translation task apart from the requirement that they should have publishable quality. Both tasks were recorded with the keylogging software Translog (Jakobsen & Schou 1999). One obvious difference between writing an original text and translation was that, at least on the basis of the raw means, participants spent proportionally more time drafting during original production (73%) than during translation (63%). Participants also spent less time revising after writing the original text (11%) than after drafting the translation was finished (24%). Immonen (2006: 323) classified all pauses according to where on the linguistic hierarchy they occurred: preceding a paragraph,

a sentence, within a clause, preceding a word, a compound boundary within a word, preceding a syllable within a word and within a word other than at the compound or syllable boundary. Of course, a pause preceding a paragraph is also a pause preceding a word and a sentence, but Immonen defined a pause always at the highest possible level of the hierarchy of linguistic categories. So a pause at the beginning of a paragraph is a pause preceding a paragraph (the highest rank), not a sentence or a word. Immonen found that the distribution of pause lengths was similar in original writing and translation in that the higher up in the linguistic hierarchy the pauses occurred, the longer they were in both tasks. However, pauses within a word (both at the syllable boundary and elsewhere word medially) were significantly longer during translation than during original text production. Pauses between words were also significantly longer during translation than during original text production. However, at the sentence and paragraph boundaries, pauses during original text production were significantly longer than during translation. Immonen (2006: 333) argues that macro-level planning may be the driving force behind the longer pauses during original text production at the higher levels of the linguistic hierarchy, given that pauses between paragraphs and sentences are mainly used for this kind of planning. During translation, macro-level planning may be less important. Decisions between a number of possible lexical items and between different word orders or other syntactic choices may be more effortful during translation than during original text production and hence lead to longer pauses at the lower levels of the linguistic hierarchy, where these choices are relevant.

28 professional translators participated in the study by Immonen (2011). Participants carried out the same tasks as in the previous study. A very similar pause classification as that in the previous study was used. In the 2011 study, Immonen defines a processing unit by comparing the pause lengths at the different levels of the linguistic hierarchy for each participant. If the pause lengths to adjacent levels of the linguistic hierarchy did not significantly differ from each other, then they were grouped together. Results showed that grouped processing units were very different in the two tasks. Immonen (2011: 243) thus concludes that “processing units in translation cannot be predicted from the profile in monolingual text production”. Immonen clusters the different linguistic levels into three further groups according to what kind of processing takes place: textual (paragraphs and sentences), lexical and syntactic (clauses, phrases and words) and word medial processes. In terms of textual processing, monolingual processing and translation were not significantly different. The most interesting difference between the two tasks was in terms of syntactic processing: on the basis of the clustering,

Immonen (2011) concludes that in monolingual text production, “the weight of syntactic level processing is carried by clauses and words” (244) while in translation, “the emphasis of syntactic processing is on phrases and words.” (245) At the textual level, processing clusters were more varied during monolingual text production than during translation, while in the syntactic clusters, the opposite was the case. Immonen therefore suggests that control over processes is stronger at lower levels during translation and that processing occurs in smaller units during translation.

The studies by Immonen compared writing of an original text with translation. However, copying may be a better comparison, given that a copyist, like a translator, has no control over the content of the text that is being produced.

Carl & Dragsted (2012) show, on the basis of an implemented model, that copying can be very similar to translation. Carl and Dragsted show that the model by John (1996) predicts the time a copyist needs to produce a segment with an error rate of less than 5% when the segment is easy to comprehend. However, John’s model does not predict extensive re-reading, while the examples Carl and Dragsted provide show that copyists do present such behaviour when the segment is difficult to comprehend. Translation by professionals of easy segments can also be predicted with an error rate of less than 5% by John’s model, while translation of segments which are difficult exceed the production time predicted by John’s model. In sum, the study by Carl and Dragsted suggests that copying may provide a good contrast to translation because it involves coordination of input and output in a similar manner to how eye movements and typing activity need to be coordinated during translation, so that a difference in the behaviour may be attributed to the involvement of two linguistic systems rather than one. The next sections will show that traditional eye movement measures are not adequate for the description of the extensive re-reading behaviour typical for translation, as observed by the studies discussed so far.

5 Beyond the first run

The dependent variables in eye movement studies during reading typically employed are all based on the assumption that a reader moves from left to right (or from right to left in languages such as Hebrew) in a fairly linear manner. The fundamental criterion for defining dependent variables is what is called a first run. A first run describes a more or less sequential progression through the sentence. A first run is interrupted when a regression to an earlier word is made. All early eye movement measures are defined in relation to the first run: a first fixation

duration is the time a reader spends on a word before moving on to either an earlier word_{n-m}, to a later word_{n+m}, or when the same word_n is refixated. The probability that a word is skipped is also defined on the basis of a first run, i.e., if word_n is fixated, word_{n+1} is not while word_{n+m} is, then word_{n+1} is defined as a skipped word, even if it is re-fixated in a later run. The same applies to gaze duration: this measure is the sum of all fixations on a word_n before a word_{n+/-m} is fixated. Later eye movement measures typically include the spillover duration, i.e., the time spent on (a number of) word(s)_{n+m}, the probability of a regression, the second pass duration and total reading time. Probability of a regression in refers to a situation in which an eye movement is made from a word_{n+m} to a word_n – so here again, a regression in is defined as a deviation from a linear, more or less sequential progression through the sentence. The second pass duration consists of the sum of fixations which were registered during the second run – if there was one. Total reading time, however, is entirely insensitive to the sequence of eye movement events and simply describes the sum of all fixations on a word irrespectively of when they occurred. The measures described above have also been applied to areas of interest covering several words.

The eye movement measures described above have been very useful for the description of early effects of the text that is being read on how it is processed. However, previous studies (e.g. Jakobsen & Hvelplund Jensen 2008; Schaeffer et al. 2016) have found that reading for translation is especially intense during the later stages of reading. This may have several reasons. On the most basic level, it may have to do with the fact that reading for comprehension is often investigated using single sentences which normally do not form a coherent text: when single sentences are presented one at a time, rereading of earlier text is of course impossible, resulting thus in potentially fewer late eye movement events. During translation, a number of other processes co-occur which may result in more and later eye movement events: typing and the presence of two texts (the ST and the emerging TT). In addition, the ST and the TT are of course in two different languages. During translation, reading occurs typically as a succession of eye movements in the source text followed by eye movements on the target text and shifts from one text to the other are relatively frequent, as is re-reading of already read source and target text (e.g. Jakobsen & Hvelplund Jensen 2008; Hvelplund Jensen 2011). A very rough indication of the importance of late events during reading for translation may be the average total reading time. Kliegl et al. (2004) report a mean total reading time per word during reading for comprehension of 245ms (SD = 48), a subset of the TPR-DB shows that during (monolingual) copying the mean total reading time per word on the source text is 797ms (SD = 1068), however, during translation, the mean total reading time per word on

the source text is 1577ms (SD = 5824). There have been attempts (Hyönä et al. 2003) to develop late eye movement measures which are more adequate for the description of global text processing. However, these eye movement measures, while extending the ones described above, still depart from a first run and, crucially, cannot do justice to the complexities of translation, because they involve one rather than two intimately related texts and these measures do of course not take the relationship of eye movements to typing behaviour into account. The next section will describe an eye movement measure which addresses these shortcomings.

6 The eye-key span

Dragsted (Dragsted & Hansen 2008; Dragsted 2010) developed the eye-key span (EKS) in reference to the ear-voice span which is used to describe the distance between input and output during simultaneous interpreting, typically measured in words or seconds (e.g. Defrancq 2015). While translators do not have the same time pressure as simultaneous interpreters, it is nevertheless the case that translators have to coordinate input and output similarly to copyists and simultaneous interpreters. The eye-key span describes the time that elapses between the first or last time an ST word is fixated before the first key is pressed which contributed to the production of the equivalent TT word(s) (Dragsted 2010: 51). Hansen (2008) found that difficult words result in longer eye-key spans than easy words. The difficulty of the words is described in terms of the number of alternative translations different translators produced for the same source text words. Easy words were translated the same way by all translators and difficult words were translated differently by nearly all translators in the sample. However, only three ST words were analysed and only eight translators participated in the study. Dragsted (2010) also found that professional translators have a shorter eye-key span than student translators. The next sections will present analyses from the TPR-DB, which were designed to replicate and extend the findings from Dragsted (Dragsted & Hansen 2008; Dragsted 2010).

6.1 The dependent variable for experiment 1a and 1b

The EKS was calculated from the first fixation. Only the drafting phase was included, i.e., both orientation and revision were excluded from the analysis. Figure 2 visualises the eye-key span for the ST word “flaring” in the segment “His withdrawal comes in the wake of fighting flaring up again in Darfur...” which has been translated into German.

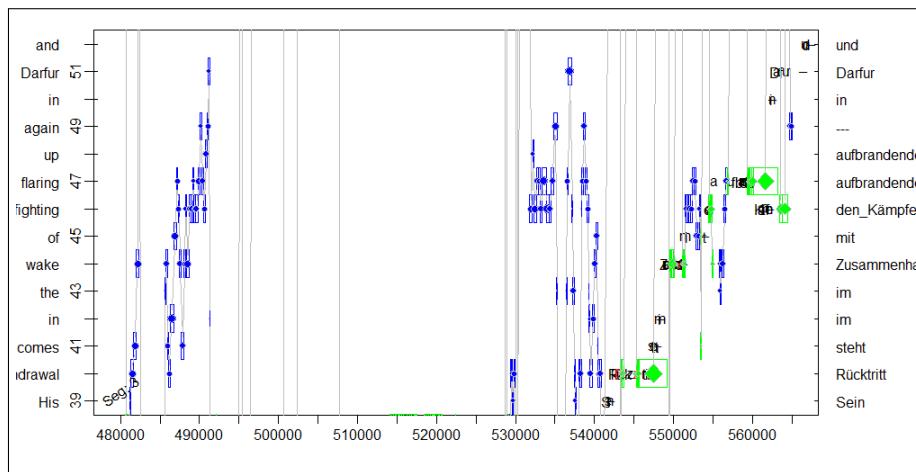


Figure 2: Progression graph exemplifying the eye-key span from first fixation on the ST word to first keystroke of the equivalent expression.

In Figure 2, the horizontal axis represents time in ms. The left vertical axis represents the ST and the right vertical axis the TT. Blue dots are fixations on the ST, keystrokes are black (insertions) and red (deletions), while fixations on the TT are green diamonds. The first fixation on the ST word “flaring” occurs at around the time of 487,000 during a first, relatively linear reading of the segment. The segment is read again in a far less linear manner before TT production of this segment begins around the time 542,000. The eye-key span (EKS) for this word is therefore roughly 55 seconds. From a first contact with the word, the translator needs to re-read the ST segment twice before they are in a position to produce an equivalent TT item. The aim of experiment 1a was to firstly replicate the findings from Dragsted & Hansen (2008) and Dragsted (2010) in a larger sample involving more participants and target languages. Secondly, the aim was to find factors which can predict the EKS during translation. The aim of experiment 2 was to test how the EKS during copying differs from the EKS during translation.

6.2 Experiment 1a: Data, participants and procedure

For experiment 1, the following studies were used: ACS08, BD08, BD13, BML12, KTHJ08, MS12, NJ12, SG12. The SL for all these studies is English and the TLs are Danish, Spanish, Chinese, Hindi, and German. Together, these constitute 12,474 ST words, 3,242 unique ST items, 108 participants and 12 different STs. The task was always translation.

6.3 Data Analysis

For all the analyses in the present study, R (R Core Team 2014) and the lme4 (Bates et al. 2014) and languageR (Baayen 2013) packages were used to perform (general) linear mixed-effects models ((G)LMEMs). To test for significance, the R package lmerTest (Kuznetsova et al. 2014) was used, which implements ANOVA for mixed-effects models using the Satterthwaite approximation to estimate degrees of freedom.

Data points which were more than 2.5 standard deviations above or below a participant's mean for the dependent variable were excluded. This resulted in the exclusion of less than 4% of the data. The dependent variable (EKS) was transformed with the natural logarithm because it was not normally distributed.

The final LMEM for the EKS had the following random variables: item, participant, text and target language. The predictors were:

- **TokS.sg** represents the number of words in a given ST segment.
- **LenSWord** represents the number of characters in a given ST word.
- The segments in each ST are numbered sequentially. **STsegment** represents this.
- The different texts in the TPR-DB are of comparable length (around 150 words), but they are not comparable in terms of the number of segments in each text. **STseg_nbr** therefore represents the number of sentences in each text.
- Given that Cross values can be either positive or negative, the absolute values of **CrossS** were used for this analysis.
- The only categorical variable in the analysis was whether participants were **students or professionals**.
- The variable **HCross** is calculated in the same way as HTra, but represents something different. HCross is determined on the basis of the probability that a given ST word has a particular Cross value. Given that there is considerable variance in the word orders of different translations of the same ST, HCross describes the distribution of these probabilities. The higher the value, the less likely it is that a number of different translations of the same ST item will have the same Cross value. This metric therefore represents both lexical and syntactic aspects in one value, given that, if the word order is different it is also likely that different lexical items are chosen.

Collinearity was assessed by inspecting variance inflation factors for the predictors; all values were low (<1.2), indicating that collinearity between predictors was not a problem. Initially, HTra was also in the model and it had a significant positive effect on EKS. However the variance inflation factor was relatively high (1.96) and was therefore excluded from the final model.

Table 1 lists the effects of the predictor variables on EKS and Figure 3 visualises these effects.

Table 1: LMEM results for the effect of LenSWord, STsegment, STseg_nbr, Cross, Student, HCross and Student on EKS (experiment 1a)

	Estimate	SE	t	p	
Intercept	9.680	4.771×10^{-1}	20.288	1.71	***
TokS.sg	1.187×10^{-2}	1.812×10^{-3}	6.550	6.95×10^{-11}	***
LenSWord	5.259×10^{-2}	5.209×10^{-3}	10.095	$<2.00 \times 10^{-16}$	***
STsegment	1.753×10^{-1}	7.432×10^{-3}	23.582	$<2.00 \times 10^{-16}$	***
STseg_nbr	-8.620×10^{-2}	2.576×10^{-2}	-3.347	0.00295	**
abs(Cross)	1.542×10^{-2}	5.116×10^{-3}	3.014	0.00258	**
StudentYes	6.050×10^{-1}	2.383×10^{-1}	2.539	0.04770	*
HCross	1.989×10^{-1}	3.511×10^{-2}	5.666	1.62×10^{-8}	***
StudentYes:HCross	-9.894×10^{-2}	4.112×10^{-2}	-2.406	0.01617	*

6.4 Results of experiment 1a

The number of words in a segment (**TokS.sg**) had a positive effect on EKS. This might not be too surprising, given that if a translator first reads the whole segment before translating it, the EKS is naturally longer for longer segments. The number of characters in a word (**LenSWord**) had a positive effect. Word frequency also had a similar and highly significant effect on EKS, but only when word length was not included. This is not surprising, given that these two variables covary to a high degree. That word length or frequency should result in longer EKS is to be expected, given that it is more difficult to process long rare words than short frequent words. The sequential numbering of segments in the ST (**STsegment**) had a positive effect on EKS. The likelihood that a word situated further to the end is fixated long before it is translated may lead to this effect. The number of segments in a given ST (**STseg_nbr**) had a negative effect on EKS.

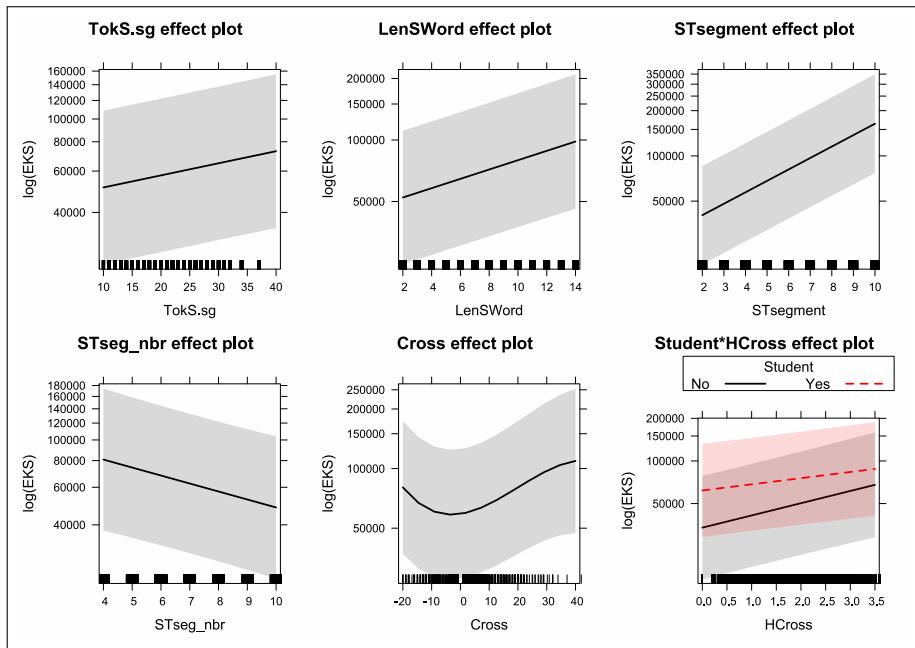


Figure 3: Visualisation of the effects of the predictor variables on EKS (experiment 1a)

This effect is to be seen in relation to the number of words in a segment. Given that all texts had a comparable length, longer segments which were associated with longer EKS, result in fewer segments per text. The length and number of segments in a text can therefore be seen as an indicator of the difficulty in translating it: the longer the segments, the more effortful. **CrossS** had a positive effect on EKS. Again, this would be expected, given that **CrossS** describes the distance (in number of words) between an ST item and the TT item to which it is aligned. The coordination of reading and writing is less effortful when ST and TT follow the same word order as opposed to a situation where they do so to a lesser extent. **HCross** had a positive effect on EKS. The higher the number of different, possible word orders, the more effortful is the coordination of reading and writing. This result extends those found in the study by Bangalore et al. (2016). However, in the latter study, the dependent variable was the total reading time on a segment. The current results localise the effect on a word level. Students had longer EKS than professionals. This suggests that the coordination of reading and writing while translating in addition to all the other processes which take place during translation is something which is acquired during practice. Additional analyses

showed that HCross had an effect on the EKS of both students ($t= 4.1, p < .001$) and on professionals ($t= 5.7, p < .001$). In addition, there was an interaction between HCross and professional status. HCross had a stronger effect on EKS in professional translators than for students' EKS.

6.5 Experiment 1b: Data, participants and procedure

The study by Carl & Dragsted (2012) showed that when the text is easy to copy or translate, the behaviour in these two tasks is very similar. As pointed out earlier, traditional eye movement measures do not adequately capture the behaviour during translation. EKS may be one measure which can capture the effort that is associated with the coordination of reading and writing. The same data that was used in the previous analysis was compared to data gathered during monolingual copying. One additional study was included here (HLR13), which does not have any information regarding the professional status of participants and was therefore not part of experiment 1a. The data comprised 24,684 ST words, 5,111 unique ST items, 158 participants, 15 different texts and the 5 TLs as in experiment 1a in addition to Estonian and English (for the copying task). The same random variables as those in experiment 1a were used. Outliers (< 4%) were determined in the same way as in the previous experiment.

6.6 Results of experiment 1b

Table 2 lists the effect of the same predictors that were used in the previous study and they had a similar effect: word length (**LenSWord**) had a positive effect and so did the position of a sentence in the text (**STsegment**). **STseg_nbr** remained positive after the inclusion of the monolingual copying data. **CrossS** was not included in this model, because for monolingual copying all Cross values are constant, i.e. 1. The number of words in a segment (**TokS.sg**) was only marginally significant after the inclusion of the data from the copying task and was therefore excluded. Figure 3 visualises the effects.

As would be expected, the EKS is considerably shorter during copying (~3 seconds) as compared to translation (~60 seconds). However, the fact that there is an EKS during copying of non-negligible length suggests that copying and translation share a process which consists of coordinating reading and writing, at least to some degree, and the longer EKS during translation can therefore be seen as resulting from the involvement of two different linguistic systems.

Table 2: LMEM results for the effect of LenSWord, STsegment, Stseg_nbr and Task on EKS (experiment 1b)

	Estimate	SE	<i>t</i>	<i>p</i>	
Intercept	7.908	6.443×10^{-1}	12.273	0.00149	**
LenSWord	4.913×10^{-2}	4.204×10^{-3}	11.686	$<2.00 \times 10^{-16}$	***
STsegment	1.927×10^{-1}	6.010×10^{-3}	32.057	$<2.00 \times 10^{-16}$	***
STseg_nbr	-9.776×10^{-2}	2.223×10^{-2}	-4.398	6.73×10^{-5}	***
TaskTranslation	2.715	6.781×10^{-1}	4.004	0.04232	*

6.7 Concurrent ST reading and TT typing

EKS is only a rough measure which describes the temporal distance between a first contact with a word and the first keystroke which contributes to the production of an aligned TT item. What happens within this time frame remains unknown. In order to describe the processes of how a translator arrives at a translation for a given ST item, by shifting visual attention between the ST and the emerging TT different eye movement measures to those used traditionally need to be developed. One such measure describes the probability that the ST is read while the TT is being produced. Schaeffer & Carl (2013a: 184) argued that “instances of concurrent reading and writing during translation are indicative of automatic processes and shared representations.” In other words, the hypothesis was that, if the activation of shared semantic and/or syntactic representations results in a TT which is acceptable to target norms, and the monitor does not interrupt the tight coupling of reading and writing, the process as a whole is relatively automatic and ST reading may occur concurrently with TT production – at least to some degree. Experiment 2a was designed to test this hypothesis.

6.8 Experiment 2a: Data, Participants and procedure

The data for experiment 2a and 2b was essentially the same as the one used in the previous experiments. However, for this experiment, the .pu files were used. A .pu file represents the information on the basis of a production unit (PU). A PU is defined as a sequence of coherent keystrokes. The boundaries between different PUs are determined by the pauses between keystrokes: a pause of more than 1000ms constitutes a PU boundary. Carl & Kay (2011) found that at pause values below 1000ms, the resulting PUs were less linguistically plausible, i.e. they

were more likely to divide individual words and alignment units (aligned ST and TT items). At higher pause values, the number of PUs per text was very small, so that the pause value of 1000ms was adopted in the TPR-DB as defining the boundaries between PUs. There were a total of 21,973 PUs, 110 participants and the same 5 TLs as in the previous experiments. The task was always translation.

6.9 The dependent variable for experiment 2a and 2b

The dependent variable for experiment 2a and 2b is binomial. It expresses the probability that the ST is fixated during TT production, i.e., during a PU. Figure 4 may exemplify this.

The progression graph in Figure 4 shows the translation of the ST words “..investments in the Sudanese...” Striped boxes visualise PUs. There are two PUs in this graph: the translation of “investments in the” and “Sudanese”. During the first PU, while the translator is typing “die” (the), they already look at the next ST item (“Sudanese”). There are two fixations on this word before it is then typed in the second PU.

6.10 Results of experiment 2a

Given that the dependent variable for this experiment was binomial, generalised fixed effects models (GLMEM) were used. GLMEMs for the concurrent ST reading and TT writing had the following random variables: participant, study and TL. Item was not included as a random variable, because, of course, PUs are not the same across participants. When text was included as a random variable, the models did not converge. It accounted for the smallest amount of variance and was therefore excluded. The predictors were: professional status, i.e., whether a participant was a student or a professional. CrossT represents the distance in number of words between the TT and the ST, as counted while progressing in a linear and sequential fashion through the TT while searching for aligned ST items. The CrossT value for PUs is the average CrossT value for all the words in the PU. STsegment is the sequential numbering of segments in a given text and PuSTnbr is the number of ST words in a given PU.

Table 3 and Figure 5 show that as translators progress in the target text, they are less likely to read the ST while typing (the effect of STsegment). Concurrent ST reading and TT writing may be an indicator of the degree of co-activation of the two linguistic systems. Very much like during simultaneous interpreting, the translator processes input in one language at the same time as output is produced in a different language. Given that this is more likely at the beginning of

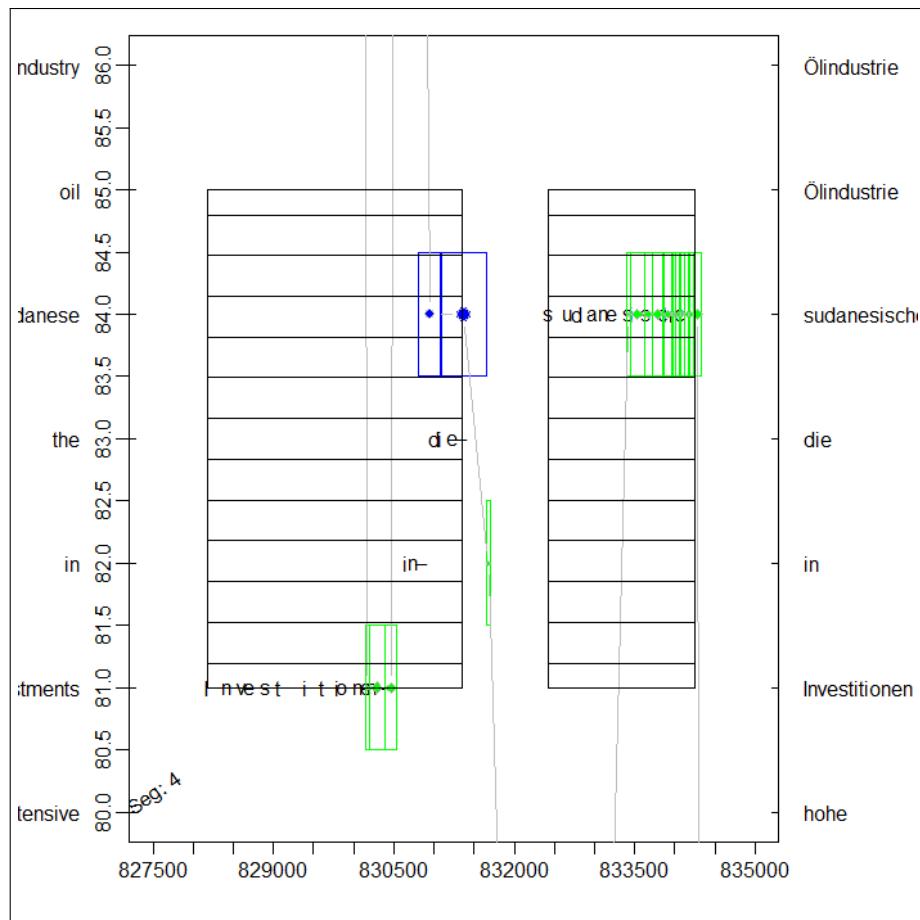


Figure 4: Progression graph showing concurrent ST reading and TT production

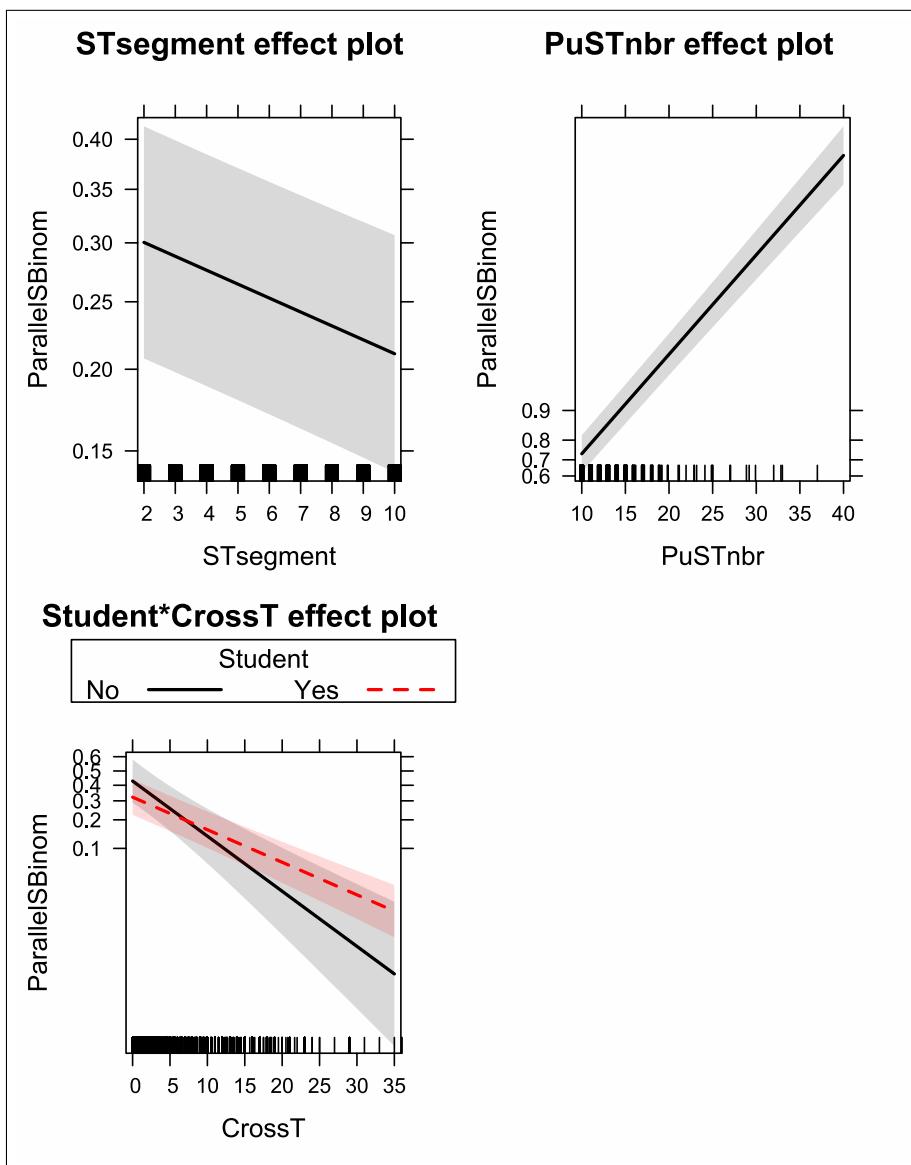


Figure 5: Visualisation of the effect of predictor variables on the probability that ST reading occurs during a PU (experiment2a)

Table 3: The effect of the predictor variables on the probability that ST reading occurs during a PU (experiment 2a)

	Estimate	SE	<i>z</i> value	Pr(> z)	
Intercept	-0.80	0.32	-2.57	0.0102	*
StudentYes	-0.46	0.23	-2.03	0.0425	*
CrossT	-0.16	0.03	-5.22	1.75×10^{-7}	***
STsegment	-0.06	0.01	-6.827	8.66×10^{-12}	***
PuSTnbr	0.27	0.01	31.44	$<2.00 \times 10^{-16}$	***
StudentYes:CrossT	0.064	0.03	2.078	0.0377	*

a text rather than towards the end may suggest several things: on the one hand, it may mean that, as the translator progresses in the text, they move closer towards the monolingual end of the bilingual continuum (Grosjean 1997). It may, however, also mean that at the beginning of a translation, the translators need to engage in more concurrent reading and writing in order to co-activate relevant task schemas and semantic fields relevant to the text. The facilitation observed in all relevant traditional eye movement measures in the study by Schaeffer et al. (2016) would support such a view: towards the end of the text, the process is less effortful, because the translator is in a more monolingual mode and the extra demands emerging from co-activation are smaller.

The fact that the number of ST words in a PU (**PuSTnbr**) has such a large effect on concurrent ST reading is hardly surprising: the longer a PU is the more likely it is that a translator will fixate the ST at least once. Both CrossS and CrossT had a significant and negative effect when entered separately. When both were entered, the model did not converge. CrossT had a stronger effect than CrossS and CrossS was therefore dropped. The negative effect of **CrossT** on concurrent reading and writing suggests that when the word order is similar in a stretch of ST and TT, processes are likely to be more automatic than when the word order is very different. Concurrent ST reading and TT typing is an early measure which also describes how well integrated the process is as a whole, i.e. how horizontal/parallel it is. The fact that CrossT had such a large effect on the dependent variable suggests that when the syntax in the ST and the TT is likely to overlap to a high degree (low CrossT values), then primed, shared syntactic representations serve as the basis for TT production. In addition, there was an interaction between professional status and CrossT such that when the

CrossT values were very low, professionals were more likely to read and write concurrently. For higher CrossT values, on the other hand, professionals were less likely to read and write at the same time (see Figure 6). Figure 7 shows the distribution of CrossT values in the data. It is very obvious that the lower CrossT are much more frequent. In other words, professionals are most of the time more likely to read and write concurrently, but when the text becomes more difficult, they are more sensitive to this than students are and they are more likely to work sequentially, i.e., more monolingually – of course not entirely monolingual, though.

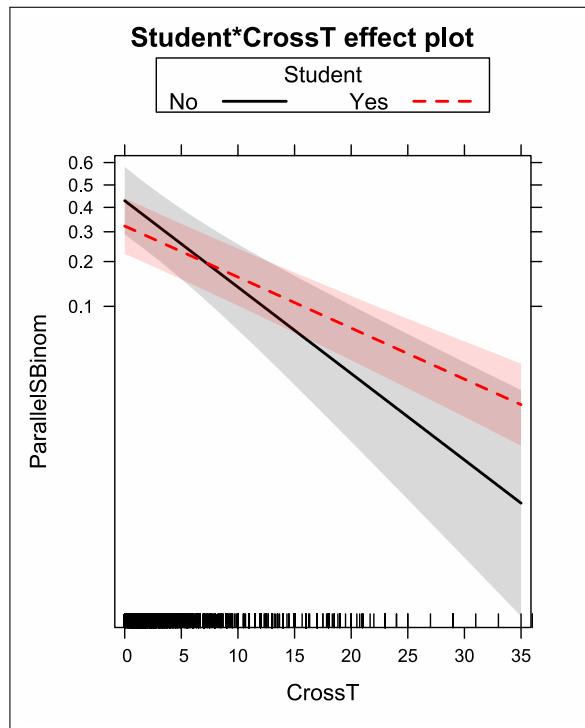


Figure 6: Interaction of CrossT and professional status (experiment 2a)

6.11 Experiment 2b: Data, Participants and procedure

The data for experiment 2b was identical to the data in experiment 2a apart from the fact that the same copying data that was used in experiment 1b was also added. There were 28,226 PUs, 153 participants, 12 texts, 8 studies and 6 TLs. The tasks were translation and copying.

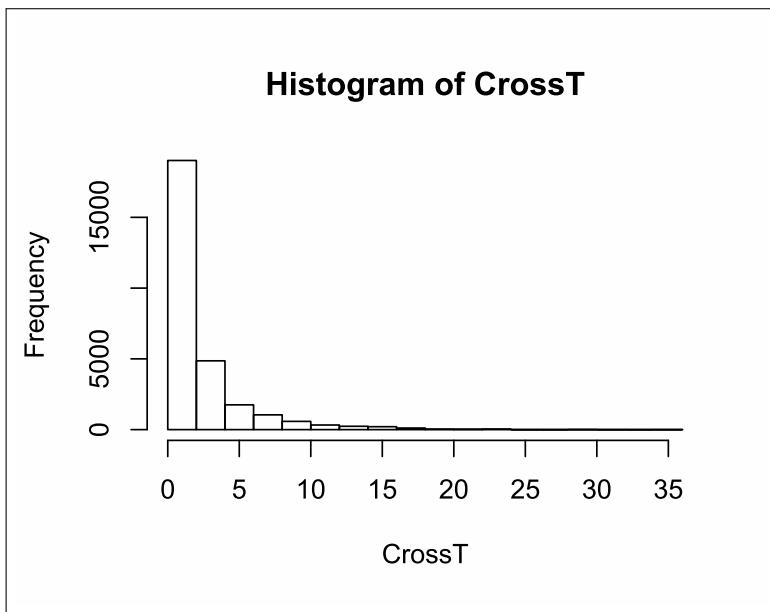


Figure 7: Distribution of average CrossT values in PUs (experiment 2a)

6.12 The dependent variable for experiment 2b

The dependent variable for experiment 2b was identical to the one in experiment 2a.

6.13 Results of experiment 2b

Table 4 summarises the effects of the predictor variables on the probability that some concurrent reading occurs during a PU and Figure 8 visualises these effects. The effect of both the position of a segment within a text (**STsegment**) and the number of ST words in a PU (**PuSTnbr**) in experiment 2b was similar to the effect in experiment 2a. The likelihood that concurrent ST reading and TT typing occurs was significantly higher during copying than during translation. This suggests that, while both copying and translation share some aspects, the involvement of two linguistic systems makes a more automated and horizontal process less likely.

Table 4: The effect of predictor variables on both translation and copying (experiment 2b)

	Estimate	SE	<i>z</i> value	Pr(> <i>z</i>)
Intercept	0.35	0.55	0.63	0.527
STsegment	-0.07	0.01	-9.43	$<2.00 \times 10^{-16}$ ***
PuSTnbr	0.27	0.01	38.53	$<2.00 \times 10^{-16}$ ***
TaskTranslation	-1.62	0.61	-2.64	0.008 **

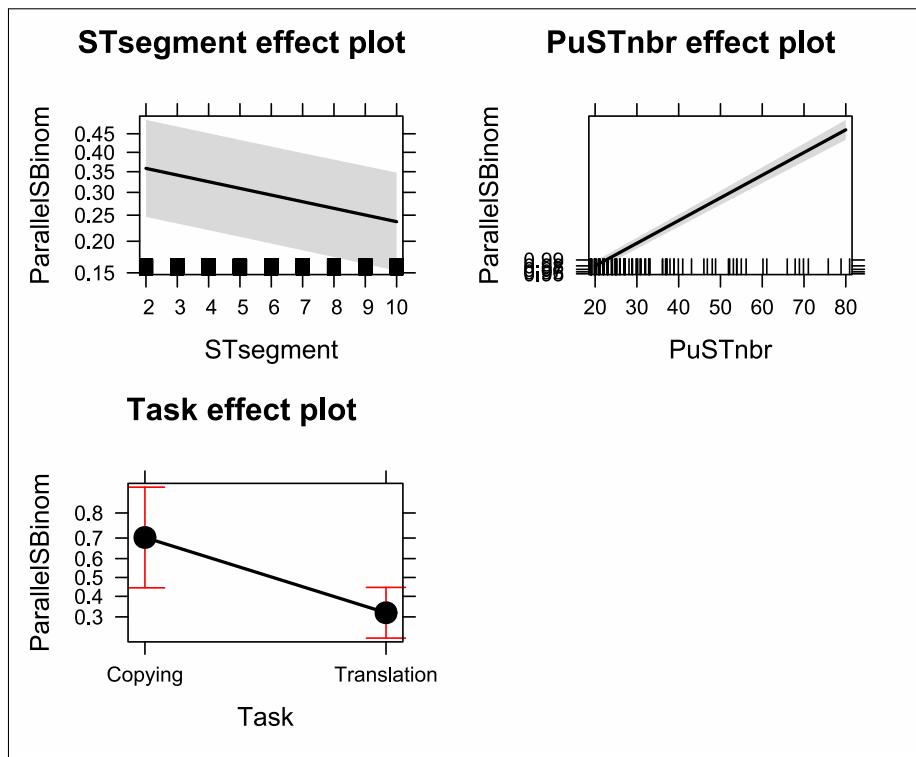


Figure 8: Visualisation of the effect of predictor variables on the probability that the ST is fixated during a PU (experiment 2b)

7 General discussion

Research aimed at showing that the target language is activated during source text reading and that translation is a horizontal process rather than a sequential, vertical process (Macizo & Bajo 2004; 2006; Ruiz et al. 2008; Jakobsen & Hvelplund Jensen 2008; Hvelplund Jensen et al. 2009; Winther Balling et al. 2014). What these studies have shown is that co-activation is task-dependent, at least if behaviour is observed. However, there is a large body of evidence which suggests that inhibition plays an important role in bilinguals as such (Kroll et al. 2015) and in translation (Macizo et al. 2010) and there is considerable evidence which suggests that not only lexical access is fundamentally non-selective, but also production is affected by competition between the two languages of the bilingual (de Groot & Starreveld 2015). Grosjean (1997) argued that a bilingual's two languages are more or less active depending on the context. The studies reviewed here are consistent with this. It is very likely that translation increases the co-activation of the two linguistic systems to a high degree. Rather than pitting the horizontal view of translation against the vertical one, the model proposed by Schaeffer & Carl (2013a) argued that translation is best understood as both an early and a late effect, i.e., it is likely that translation is best understood as early, relatively automatic processes which are highly bilingual in nature and late processes which are more monolingual. This chapter further argues that traditional eye movement measures cannot adequately describe the processes which are unique to the task of translation. The eye-key span (Dragsted & Hansen 2008; Dragsted 2010) and the degree to which ST reading and TT typing co-occur are measures that address this shortcoming. Schaeffer & Carl (2013a: 184) predicted that concurrent ST reading and TT typing is evidence of the activation of shared representations and automatic processing. The results presented here support this view. Both the early and the late processes during translation are likely to be modulated by the degree to which SL and TL items share representation. The DFM (de Groot 1992) suggests that semantic overlap between two lexical items is a matter of degree. This model receives support from two eye movement studies (Schaeffer et al. 2016; 2017). The shared syntax account (Hartsuiker et al. 2004) predicts that syntax, if similar across languages, shares the same representation. The effect of word order differences (HCross) on the eye-key span and the effect of word order differences on the likelihood that ST reading and TT typing occur concurrently lend support to the shared syntax account. The measure HCross, introduced in the current chapter, lends further support to this notion and extends it in that it shows that when the word order in the ST and the TT is dissimilar, also the

eye-key span (EKS) is shorter and fewer different word orders are observed.

The shared syntax account is very well suited to explain priming effects. However, when the choice of lexical item leads to required changes in the syntactic structure (and word order), and the more different word orders (and syntactic structures) are possible, these possibilities compete for selection and inhibit the translation process, resulting in a longer EKS. The shared syntax account predicts priming effects when the syntax is shared across the ST and TL, but makes no predictions about when the degree of overlap in terms of syntax is small. The present study quantifies and predicts the effects of such a situation in the form of the HCross metric.

The following sentence from the data may serve as an example: “As a result, full-time leaders, bureaucrats, or artisans are rarely supported by hunter-gatherer societies.” In the database, there are 26 translations into German of this text. In the appendix, we list seven versions which all use a different lexical item for the verb phrase [are supported]. The verb [supported] has a very high HCross value (3.57). Only one translation [schätzen (appreciate)] out of the seven shares a combinatorial node with the source, because [schätzen], just like [supported], is in the passive voice. All other lexical choices require additional changes in the syntactic structure of the target language sentence, some of the underlying syntactic choices are depicted in Figure 9. Differences in syntactic choices result in changes in word order.

There is the possibility that there are translation routes in bilinguals which are independent from monolingual processing routes. It was hypothesised that these might be faster, because they might be less susceptible to the competing demands of co-activation and inhibition and it was hypothesised that their strength and breadth might be modulated by practice. Both the eye-key span and concurrent reading and writing are modulated by expertise. This could be seen as an indication that independent translation routes, modulated by extended exposure to the task, result in strengthened and widened access to these independent translation routes, though this must remain speculative at present. Finally, it is likely that the mechanisms underlying translation are shared to some degree by monolingual copying.

Very few studies have systematically compared translation to monolingual language use. The existing findings are promising and both reading for comprehension and monolingual copying seem to be good contrasts. It further seems necessary to develop eye movement measures, such as the eye-key span and concurrent reading and writing, which do justice to the complexities of translation,

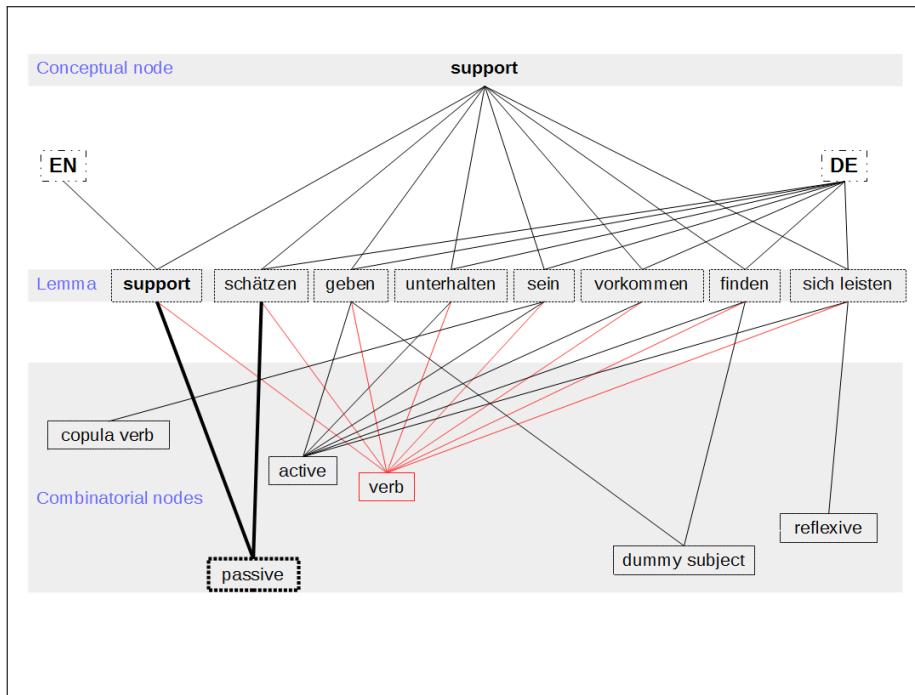


Figure 9: Item (support) with a high HCross value (3.57). Different lexical choices (into German) lead to different syntax which in turn result in large differences in word order (see appendix). Based on the shared syntax account (Hartsuiker et al. 2004). In the shared syntax account, there is a shared conceptual level, a language node, a lemma node and combinatorial nodes. In this case, the overlap for combinatorial nodes is minimal (only [schätzen] shares two combinatorial nodes with [support]).

particularly when the later processes are investigated. These later processes seem particularly relevant, simply because they so evidently distinguish reading for or while translating from reading for comprehension, while paraphrasing and while copying.

Appendix

ST As a result, full-time leaders, bureaucrats, or artisans are rarely supported by hunter-gatherer societies.

TT1 Folglich werden Führungspersönlichkeiten, Bürokraten oder Handwerker

nur selten von Jägern und Sammlern **geschätzt**. (Passive)

- TT2** Deshalb **gibt es** in Jäger-und Sammlergesellschaften meistens keine Personen, die nur Anführer, Bürokraten oder Kunsthändler sind. (Dummy Subject)
- TT3** Daher **unterhalten** Jäger-Sammler-Gesellschaften nur selten hauptberufliche Anführer, Bürokraten oder Handwerker. (Active)
- TT4** Daher **ist** in Jäger-und Sammlergesellschaften auch kein **Platz** für Anführer, Bürokraten oder Handwerker, die ansonsten keine Aufgaben übernehmen. (Copula)
- TT5** Daher **kommen** in Jäger-und-Sammler-Gesellschaften kaum Bürokraten, Handwerker oder Personen **vor**, die ihre gesamte Zeit als Anführer verbringen. (Active)
- TT6** Dies ist der Grund dafür, dass man hier auch kaum Personen in ständiger Führungsposition und Künstler **findet**. (Dummy Subject)
- TT7** Dementsprechend **leisten sich** solche Gesellschaften auch selten den Luxus, Berufspolitiker, Bürokraten oder Kunsthändler zu unterhalten. (Reflexive)

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Chapter 6

Cognitive effort and explicitation in translation tasks

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Drawing on the framework of systemic-functional linguistics, this paper examines cognitive effort for meaning explicitation in translation tasks. Two hypotheses were formulated building on Steiner (2001a,b) and Tirkkonen-Condit (2005): (1) literal translation, as a default translation procedure/strategy, minimises cognitive effort; and (2) explicitation of more implicit realisations in the source text requires more cognitive effort. To test these hypotheses, 16 Brazilians and 16 Germans, proportionally distributed as field specialists and professional translators, were asked to perform a translation task of one of two versions of an L2 (English) source text into their L1. Both source text versions construed analogous meanings, but they had either the most explicit or the most implicit variants of ten agnate realisation pairs (five of each in each version). The task was recorded using the key-logging program Translog 2006. From a process-oriented perspective, the key-logged data were analysed to determine the renditions per variant, number of micro-units per word, number of pauses per word, and drafting time per word. From a product-oriented perspective, subjects' renditions were analysed to investigate the impact of their choices on the explicitness and implicitness of the target texts. Overall, the results confirm the hypothesis that literal translation is a default procedure that requires less cognitive effort. As to the second hypothesis, more implicit variants in the source text do not necessarily require more cognitive effort than their less implicit variants.



1 Introduction

Building on empirical-experimental research, Tirkkonen-Condit (2005) hypothesises that ‘literal’ translation, i.e., opting for wordings in the target text (TT) that are closely patterned upon the lexico-grammar of the source text (ST), is a default translation procedure/strategy adopted by both experts and novices. Assuming that similar lexico-grammatical patterns entail similar levels of explicitness in wordings Steiner (2001b) and that the human translator as a ‘cognitive miser’ (Fiske & Taylor 1984) resorts to explicitation as a complex strategy for TT production when problem solving is demanded, literal translation, as a default procedure, is expected to minimise cognitive effort. According to Tirkkonen-Condit, a monitoring process called ‘monitor’, usually better developed in experts, enables translators to recognise instances in the ST that constitute translation problems unlikely to be solved through a literal translation strategy.

If literal translation is a default procedure in translation and it involves similar lexico-grammatical patterns, translated texts would be expected to evidence a good deal of shared level of explicitness with their source counterparts. However, corpus-based research has pointed to translated texts as being more explicit (Olohan & Baker 2000; Steiner 2001a,b). Explicitation has been reported as a phenomenon partially accounted for by typological differences between source and target languages as well as differences in the source and target contexts of culture and situation. In addition, a third source of explicitation has been claimed to be translators’ understanding of the ST and its role in TT production (Steiner 2001a,b).

Drawing on insights of both empirical-experimental research and corpus-based research, this paper reports on a process and product-oriented investigation of explicitation with a view to testing two hypotheses, namely:

- literal translation, as a default translation procedure, minimises cognitive effort;
- translating more implicit realisations in the ST requires explicitation on the translator’s part, which entails an effortful translation procedure.

To test these hypotheses, 16 Brazilians and 16 Germans, proportionally distributed as field specialists and professional translators, were asked to perform a task of translation of one of two versions of an L2 (English) ST into their L1. Both versions construed analogous meanings, but they had either the most explicated or the most implicated variants of ten agnate realisation pairs (five of each in

each version). The task was recorded using the key-logging program Translog 2006. To operationalise an investigation of ‘literal’ translation and explicitation, we relied on the notions of ‘grammatical metaphor’ and ‘de-metaphorisation’ as expounded in the Literature Review.

This paper is made up of five sections including this Introduction. The Literature Review section provides the framework that was used to support this study. The Methodology section describes materials and methods for data collection and analysis. The Results and Discussion section focuses on the analysis of key-logging data. The Final Remarks section summarises our findings and points out future research avenues.

2 Literature review

According to Tirkkonen-Condit (2005), translators tend to adopt the default, less effortful strategy of providing renditions patterned upon the ST – i.e., ‘literal’ translations. However, as translators move up in the novice-expert cline, they increasingly develop a monitoring mechanism (Monitor) that enables them to abandon such a strategy when they recognise ST patterns that require more careful attention due to target language constraints.

The tendency to use ‘literal’ translation can be seen in translation process data, as Tirkkonen-Condit (2005) argues, when first renditions are examined. These tend to be reached by novices and experts through automatism and are subsequently revised, as shown by interim renditions, when the Monitor mechanism is activated, usually in the case of more expert performance. In a 2006 study, Tirkkonen-Condit, along with Mäkisalo and Immonen, investigated the changes implemented by professional translators in the drafting phase and found out that 40% of the revisions were triggered by the need for adjusting instances that had previously been literally translated.

Automatism is ascribed by Tirkkonen-Condit to solutions patterned on the source language lexico-grammar and to translation at ranks lower than the clause (e.g., word). Working at higher ranks and dealing with rearrangement of meanings differently construed in the ST and TT are assumed to be instances of the Monitor mechanism at work (Tirkkonen-Condit 2005: 409) and can be deemed as instances of effortful TT production. One such example is explicitation, a phenomenon that has been investigated in studies of both translated text (e.g. Blum-Kulka 1986; Klaudy 1998) and translation process (e.g., Séguinot 1988; Englund Dimitrova 1993; 2005; Alves et al. 2011; Carl & Dragsted 2012; Schaeffer 2013; Carl & Schaeffer 2014; Halverson 2015).

Explication, as explained by Hansen-Schirra et al. (2007), is a process or a relationship between intralingual variants and/or translationally related texts.

We assume explication if a translation (or, language-internally, one text in a pair of register-related texts) realizes meaning (not only ideational, but also interpersonal and textual) more explicitly than its source text – more precisely, meanings not realized in the less explicit source variant but implicitly present in a theoretically motivated sense. The resulting text is more explicit than its counterpart (Hansen-Schirra et al. 2007: 243).

Hansen-Schirra et al. (2007: 243) point out, and we follow suit, that their definition deliberately excludes the indefinite number of possibilities through which meaning can simply be added to some text/discourse, without being in any motivated sense implicit in the source variant. In their approach, explication is characterised by a comparative measurement of explicitness as a property of encoding, not as a property of the communicative act as such. In other words, explicitness is a property of lexico-grammatical or cohesive structures and configurations, and explication is the result of a process taking place in rewording tasks such as paraphrasing and translation.

From the very first process-oriented studies (Séguinot 1988; Englund Dimitrova 1993), explication has been reported to be a phenomenon partially accounted for by typological differences between source and target languages as well as differences in the source and target contexts of culture and situation. However, Steiner (2001a,b), building on the notion of explication as a translation universal (Baker 1995; 1996) and further developing it as a property of translated texts empirically observable in corpora, has posited a model in which he adds a third factor that may account for explication, namely understanding on the part of the translator.

Steiner models understanding as an operation of de-metaphorisation. A key concept to this is *grammatical metaphor* as conceived of by systemic functional linguistics (SFL) (Halliday & Matthiessen 1999; 2004) and defined as “the phenomenon whereby a set of agnate (related) forms is present in the language having different mappings between the semantic and the grammatical categories” (Halliday & Matthiessen 1999: 7). Figure 1, elaborated with variants of a sentence used in our experiment, displays four agnate forms with different levels of grammatical metaphoricality in a cline from less metaphorical, and hence more congruent, to more metaphorical and less congruent.

As can be seen, congruency and metaphoricality are a matter of level and may be identified through comparison of different agnate wordings. On the one hand, the more congruent wordings provide explicit agency (i.e., the researchers are

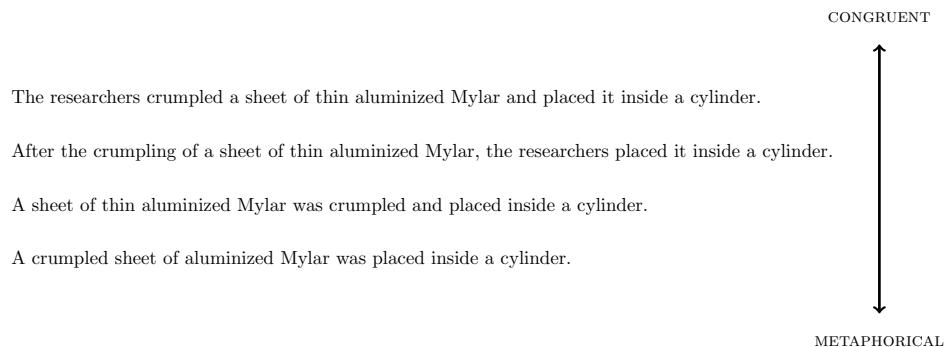


Figure 1: Different levels of grammatical metaphoricity

the agents of the processes ‘to crumple’ and ‘to place’) and explicit causal and temporal relations (i.e., the researchers first crumpled the sheet of Mylar and then placed it inside a cylinder). On the other hand, the more metaphorical a wording, the more implicit and the more densely packed the meaning construed with increasing numbers of nominal forms and decreasing agency.

According to Steiner, understanding in translation involves mapping ST units onto their congruent meanings. This implies de-metaphorising and making meanings more explicit. As a result, due to typological features, registerial differences or understanding processes (also influenced by fatigue), the wordings produced in the TT may end up being less metaphorical than those in the ST.

Within the discipline of translation studies, systematic differences in the amount of explicated information between original and translated texts have been approached from different perspectives and theoretical standpoints through the concepts of implicitation and explication (see Vinay & Darbelnet 1958; Blum-Kulka 1986; Séguinot 1988; Klaudy 1998; Olohan & Baker 2000, among others). In particular, Englund Dimitrova (2005) is one of the few process studies, which draws on think-aloud protocols (TAPs) and key-logged data, to show how translators deal with explication. Even though these concepts have proved very insightful and researchers have attempted to pin down their definitions, there remain many uncertainties as to how to measure what is a more explicit or implicit rendering of meaning. A more theoretically-informed approach to this issue draws on the aforementioned concept of grammatical metaphor, which allows a more precise determination of what is explicit or implicit in a wording of meanings and where in the overall system of the language those meanings can be located.

To the best of our knowledge, process-oriented studies that have, to a greater or lesser extent, drawn on the notions of ‘grammatical metaphor’ and ‘de-metaphorisation’ are Hansen (2003); Liparini Campos (2008; 2010); da Silva (2007); Pagano & da Silva (2010b). In her translation experiment with a professional translator and a translation student working in the German-English and French-English language pair (both L2-L1), Hansen observed that (1) re-metaphorisation (i.e., providing renditions with metaphoricity levels analogous to that in the ST) was the most frequent strategy, and (2) de-metaphorisation was more frequent than metaphorisation (e.g., increasing metaphoricity level in the TT compared to the ST) when the subjects worked under no time pressure. Similarly, in an experiment involving novice translators working in the English-Portuguese language pair (2008) and in an experiment involving professional translators working in the both English-Portuguese and German-Portuguese language pairs (2010), Liparini Campos also found more instances of metaphorisation in under no time pressure condition. However, contrary to Hansen, she identified metaphorisation as the most frequent strategy also under time pressure condition. Finally, da Silva (2007) and Pagano & da Silva (2010b) analysed the L1-L2 translation process and product of a Brazilian Medicine field specialist and showed how he managed to render a highly grammatically metaphorical English-language text. They noticed that de-metaphorisation instances were at play during the entire translation process before the production of more metaphorical realisations in the target text.

3 Methodology

The data analysed in this paper were collected in an experimental study described in da Silva (2012) and Alves et al. (2014a). A group of 8 German and 8 Brazilian professional translators and another group of 8 German and 8 Brazilian physicists were recruited to take part in an experiment in which they translated an English ST (L2 for all subjects) into German or Brazilian Portuguese, their respective L1.

Physicists were recruited as participants in the experiment in the capacity of field specialists who “perform translation tasks as part of their daily work, but neither have formal education in translation nor claim to be translators” (Pagano et al. 2013: 264). Given their domain knowledge and discourse knowledge, field specialists in many countries are considered considered successful disciplinary writers, in both their L1 and L2 (mostly, English) even though their texts usually undergo through some editing before reaching the publication stage (Vascon-

cellos et al. 2007), and given their domain knowledge and discourse knowledge (Scardamalia & Bereiter 1991), and despite their lack of formal training and experience in translation, therefore they constitute, along with professional translators, a rich source of insights to understanding tap into processes involved in the understanding and production of highly metaphorical texts (Pagano & da Silva 2010a) as is the case of scientific texts (Halliday 2006).

Subjects were instructed to carry out their task with no time pressure and with the sole external support of a general reference dictionary in electronic format. Their translation processes were key-logged using Translog 2006. A translation brief drafted in the subjects' L1 was displayed on the computer screen prior to the subjects being allowed access to the ST (displayed on the top half of the screen). English-Portuguese language data were collected at Universidade Federal de Minas Gerais in Brazil, while English-German language data were collected at Universität des Saarlandes in Germany.

Subjects were randomly assigned one of two versions (A or B) of an ST on the behaviour of crumpled balls, which was manipulated from an original publication of a popular science magazine. Both versions construed analogous meanings, but they had either the most explicit or the most implicit variants of ten agnate realisation pairs (five of each in each version). For each of these variants we investigated the number of renditions (interim and final solutions) and the implicitation levels of the first and last renditions, as well as their related number of micro-units (see definition below) per word, number of pauses per word in intervals of 2.4 seconds (see Jakobsen 2005 and below) or longer, and drafting (see Jakobsen 2002 and below) time per word. The analysis focused exclusively on the sentence parts that varied, and most variables were computed per word to assure comparability across ST wordings and TT renditions. Figure 2 illustrates segmentation as carried out for the purposes of identifying variables in the key-logged data.

Figure 2 shows a total of 12 micro-units – 11 in the drafting phase, and 1 in the revision phase. According to Jakobsen (2002), the drafting phase starts when the subject types the first character and ends when s/he types, for the first time, the last character that concludes a preliminary first version of the TT, while the revision phase starts immediately after the drafting phase and ends when the subject completes the task. In this study, each rendition was assigned to either the drafting or the revision phase, and only those in the drafting phase had their duration computed.

Following Alves & Couto-Vale (2011: 107), micro-units were observed in “the flow of continuous TT production, which may incorporate the continuous read-

Drafting

- M1 ★★★★ poruq ☒ ☒ que ◆
M2 ★ uma ◆ bola ◆
M3 ★★ [Ctrl←][Ctrl←]☒☒☒ a
M4 ★★⇨ amassada ◆ se ◆ compot ☒ rta ◆
M5 ★★★★★★★★★★ [^] [^] como ◆ ☒☒☒☒☒ porque ◆☒⇨
M6 ★★★★★★★★★★ [^] [^] [^]
M7 ★★★★★★★★ [^] [^]★★
M8 ⇨ da ◆ maneira ◆
M9 ★ ☒☒☒☒☒☒☒☒☒☒
M10 ★★★★★★★ [^] a ◆ sua ◆ maneira ◆
M11 ★★★★★★★ [^] de ◆ uma ◆ maneira ◆ particular ◆

Revision

- M12 ★★★★★★★★★★★★★ [^] [^] peculiar ◆ ☒★★

Note: ★ = pause intervals of 2.4 seconds, ◆ = blank spaces, ← = cursor left, ☒ = backspace, ☓ = delete,⇨ = tab key

Figure 2: Portuguese language rendition by BP1 for “why the crumpled ball behaves the way it does”

ing of ST and TT segments, separated by pauses during the translation process”. In Figure 2, the pauses are represented by ★ and their duration is 2.4 seconds, a threshold determined by Jakobsen (2005).

First interim renditions were mapped and a new rendition was mapped onto it every time the subjects’ keystrokes showed indications of recursiveness, such as deletion, backspacing, and mouse clicks, that were related to attempts at construing or revising meaningful forms. The mapping concluded when subjects arrived at a final rendition in the TT. In Figure 2, for instance, the first rendition is “porque uma bola [why a ball]” (corresponding to micro-units M1 and M2), and the second rendition is “porque a bola [why the ball]” (micro-unit M3), since replacing the indefinite article “uma” with the definite article “a” was considered a meaningful change. Different renditions could also be found within the same micro-unit as in M5, in which the subject first replaced “porque [why]” (rendered in M1) with “como [how]”, and then rendered back “porque”. Notice that non-meaningful changes, such as correcting typos (as in M1: “poruq” instead of “porqu[e]”), were not identified as new renditions.

Each rendition had its grammatical metaphority level determined. The metaphority level of the first rendition was compared to that in the ST, and the

metaphoricity level of the last rendition was compared to that in the ST and the first rendition.¹ Instances of ‘literal’ translation were identified when the metaphoricity levels tended to be analogous to that in the ST, instances of explicitation were ascribed to reduced metaphoricity levels, i.e. de-metaphorisation. Implicitation was considered the opposite of explicitation and ascribed to instances of increased metaphoricity levels.

Descriptive statistics (mean, standard deviation, and absolute and relative numbers) was used to explore the data. For some of the variables, we ran, whenever possible, non-parametric tests, namely Mann-Whitney U test or Fisher’s exact test, using SPSS v. 17.0. The significance level was set at $p<0.05$. The tests were aimed at comparing ST versions (A and B), subjects’ nationality (as a proxy for language pair), profile (translators/field specialists), metaphoricity level of the first rendition compared to that of the ST (analogous or non-analogous as proxies for ‘literal’ translation and explicitation/implicitation, respectively), and metaphoricity level of the final rendition compared to that of the ST (analogous, higher or lower as proxies for ‘literal’ translation, implicitation and explicitation, respectively) and that of the first rendition (analogous or non-analogous).

Since first and interim renditions are on-going solutions, distinguishing (or rather predicting) de-metaphorisation or metaphorisation (which fairly depends on further choices within a sentence) was not possible to all variants, and therefore the analysis was restricted to determining analogous or non-analogous renditions. Metaphorisation at a certain point may be followed by de-metaphorisation further in the sentence, and vice-versa.

In other words, this method ignored changes in interim renditions when the final solution was arrived at the third or further rendition (e.g., instances that first had the same level of metaphoricity, were then modified in the interim version and switched back again in the final version). This is a trade-off we had to make to avoid noise in the data: as Halliday & Matthiessen (1999); Steiner (2001a,b) predict, de-metaphorisation and metaphorisation may be necessary at a given point of a text in order to make it in all more implicit or more explicit. Despite this

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trade-off, we believe this method ensured the internal validity of our experiment, since we worked with a tendency of ‘literal’ translation in the first rendition (assuming it as a default procedure) and had the full metaphoricity level in the final rendition.

- literal translation, as a default translation procedure, minimises cognitive effort;
- translating more implicit realisations in the ST requires explication on the translator’s part, which entails an effortful translation procedure.

Hypothesis (1) was expected to be confirmed through (1.1) a greater number of final solutions that were arrived at in the first rendition tendency to keep the metaphoricity level of the ST in both first and final renditions and (1.2) higher values for measures number of renditions, pauses per word, drafting duration per word and micro-units per words in the production of non-analogous renditions. Hypothesis (2) would be confirmed through higher values for measures number of renditions, pauses per word, drafting duration per word and micro-units per words in the translation of more metaphorical variants.

Analyses for ST version (A or B), subject profile (professional translator or field specialist) and subject nationality (Brazilian or German) were expected to provide further insight into the matter. More specifically, we tested if those independent variables could (also) have an impact on the results.

4 Results and discussion

Table 1 shows the number of renditions till a final solution was arrived at by the two groups of subjects for the variants in each ST version used in the experiment.

The first rendition was frequently the final solution in the experiment with this occurring in 55% of the renditions for variants in both versions A and B among the Brazilians and at least 40% of the renditions among the Germans. Mann-Whitney U test pointed to no significant differences between versions A and B ($p=0.235$ among Brazilians; $p=0.253$ among Germans), but to significant differences between different nationalities ($p=0.004$). This may be interpreted as evidence of a tendency for the final solution to be the first rendition in both nationality groups, though the Brazilians tended to resort to such a strategy even more often. Since extending the final solution to the fourth or further rendition seemed to be rarer among the subjects, this is a potential threshold to be used in

6 Cognitive effort and explication in translation tasks

Table 1: Absolute and relative numbers of final solutions arrived at in the nth rendition per text version and subject nationality

Final solution arrived at in the ...	Version A variants				Version B variants			
	Brazilians		Germans		Brazilians		Germans	
	n	%	n	%	n	%	n	%
... first rendition	44	55.00	33	41.25	44	55.00	32	40.00
... second rendition	15	18.75	24	30.00	23	28.75	18	22.50
... third rendition	6	7.50	12	15.00	8	10.00	16	20.00
... fourth rendition	8	10.00	4	5.00	3	3.75	7	8.75
... fifth rendition or further	7	8.75	7	8.75	2	2.50	7	8.75

further studies as indicative of additional cognitive effort to produce the translated text.

Table 2 further explores general data in Table 1 to provide the results for the nth renditions and final solutions per subject nationality, subject profile, and metaphoricity level of the variants in the ST.

Table 2: Absolute and relative numbers of final solutions arrived at in the nth rendition per subject nationality, subject profile and metaphoricity level compared to that in the ST (↑: high metaphoricity level variants; ↓: low metaphoricity level variants)

Final solution arrived at in the ...	Brazilians				Germans			
	Field Specialists		Translators		Field Specialists		Translators	
	↑	↓	↑	↓	↑	↓	↑	↓
...first rendition	22	19	26	21	20	19	16	10
...second rendition	10	8	8	12	10	10	9	13
...third rendition	2	3	1	3	7	6	7	8
...fifth rendition or further	4	3	–	1	1	4	4	5

In Table 2, it is to be noted that instances of high metaphoricity levels in the ST did not result in a higher number of renditions till the final solutions were arrived at than the instances of lower metaphoricity levels. The number of final solutions arrived at in the first renditions was higher among the variants with higher metaphoricity levels, regardless of profile and nationality. The difference, however, was not statistically significant.

Table 3 provides results on the metaphoricity level of the first renditions compared to their respective ST variants. Results are split by nationality and ST version.

Table 3: Absolute and relative numbers of first renditions with analogous or non-analogous metaphoricity levels compared to those in the ST per subject nationality and source text version variants

Metaphoricity level of 1st rendition compared to that in the ST	Brazilians				Germans			
	Version A variants		Version B variants		Version A variants		Version B variants	
	n	%	n	%	n	%	n	%
Analogous	57	71.25	67	83.75	58	72.50	65	81.25
Non-analogous	23	28.75	13	16.25	22	27.50	15	18.75
Total	80	100.00	80	100.00	80	100.00	80	100.00

As shown in Table 3, the metaphoricity level of the first solution tended to be analogous to that in the variants in both ST versions. That was so in 70% of the sample. Fisher's exact test indicates that the difference of 12.5 percentage points between the ST versions is significant among the Brazilians ($p=0.044$), whereas the difference of 9.25 percentage points is not among the Germans ($p=0.130$).

The difference in the numbers of analogous and non-analogous renditions between the two ST versions may be ascribed to the Brazilians' performance in variants 5 and 8 and the Germans' performance in variant 8, because, as discussed in da Silva (2012), the metaphorical versions of these two variants required subjects to cope with complex translation problems related to typological and registerial differences between source and target languages. As such, they needed to be de-metaphorised, i.e., be made more explicit in the TT.

Excluding from the sample variants 5 and 8 from both text versions A and B (cf. Table 4), the difference between the versions is no longer significance among both Brazilians (4.25 percentage points) and Germans (3.62 percentage points), with $p=0.317$ and $p=0.413$ among Brazilians and Germans, respectively. In other words, when highly influential typological and registerial differences are not at play, the first renditions do tend to have explicitness levels analogous to those in the ST wordings.

Table 5 shows to what extent the tendency for first renditions to have metaphoricity levels analogous to those in the ST is also observed in the final solutions. The number of first renditions with metaphoricity levels analogous to those in the ST is divided by the number of final renditions with metaphoricity levels analogous to those in the ST.

As shown in Table 5, final solutions have metaphoricity levels analogous to those in first renditions compared to their ST counterparts. Such a tendency

Table 4: Absolute and relative numbers of first renditions with analogous or non-analogous metaphoricity levels compared to those in the ST per subject nationality and text version (excluding variants 5 and 8 from both versions)

Metaphoricity level of 1st rendition compared to that in the ST	Brazilians				Germans			
	Version A variants		Version B variants		Version A variants		Version B variants	
	n	%	n	%	n	%	n	%
Analogous	55	86.00	52	81.75	52	81.75	50	78.13
Non-analogous	9	14.75	12	18.25	12	18.25	14	21.78
Total	64	100.00	64	100.00	64	100.00	64	100.00

Table 5: Tendency of keeping the metaphoricity level of the source text in both first and final renditions (excluding variants 5 and 8 from both versions)

Brazilians				Germans			
Version A		Version B		Version A		Version B	
n	%	n	%	n	%	n	%
49/55	89.00	48/52	92.31	50/52	96.10	47/50	94.00

was of at least 89% considering only analogous renditions and at least 73% considering the lowest number (47) of analogous renditions and the total number of renditions (64 for Germans' translation of version B, excluding variants 5 and 8).

Subtracting divisors from dividends in Table 5 we obtain the number of final renditions having metaphoricity levels analogous to those in the ST though not necessarily so in first renditions. In total, that was the case of 15 (23%) final renditions. This indicates that no more than 23% of the total number of revisions made during a translation task has to do with metaphoricity changes, the remaining 77% being mostly related to changes in lexis rather than in grammar.

Table 6 provides the absolute and relative number of final solutions comparing their metaphoricity levels to those in the ST.

Confirming previous results provided above, Table 6 shows that at least 76.56% instances of the variants were rendered with metaphoricity levels analogous to those in the ST (i.e., 'literal' translation). This seems to corroborate Tirkkonen-Condit (2005) and to provide further food for thought regarding the concept, usefulness and potential role of 'literal' translation for both humans and machines translation (e.g. Chesterman 2011; Carl & Schaeffer 2014; Halverson 2015).

Table 6: Absolute and relative numbers of first renditions with analogous or non-analogous metaphoricity levels compared to those in the ST per subject nationality and metaphoricity level (excluding variants 5 and 8 from both versions; ↑: high metaphoricity level variants; ↓: low metaphoricity level variants)

Metaphoricity level of 1st rendition compared to that in the ST	Brazilians				Germans			
	↑		↓		↑		↓	
	n	%	n	%	n	%	n	%
Analogous	49	76.56	50	78.13	50	78.12	51	79.69
Higher	8	12.50	12	18.75	7	10.94	8	12.50
Lower	7	10.94	2	3.12	7	10.94	5	7.81
Total	64	100.00	64	100.00	64	100.00	64	100.00

In addition, the results point to a slight tendency for decision making to involve metaphorisation (implication, metaphoricity level higher than that in the ST) rather than de-metaphorisation (explication, metaphoricity level higher than that in the ST), namely 29 instances of metaphorisation (11 among physicists) vs. 27 instances of de-metaphorisation (121 among translators), with no differences significantly ascribable to subject profile (Fisher's exact test: $p>0.05$). This seems to support da Silva's (2007), Liparini Campos's (2008, 2010) and Pagano & da Silva's (2010a) findings though run counter Hansen's (2003) findings.

In order to investigate whether 'literal' translation is a cognitive effort-minimising strategy and explicitation and implication require more cognitive effort, a close look at Table 7 can be enlightening. Table 7 shows the means and standard deviations of four variables (number of renditions, pauses per word, drafting time per word, and micro-units per word) per metaphoricity level of the ST variant, ST version, subject profile, and subject nationality.

The significance analysis of the data summarised in Table 7 points to no significant differences ($p>0.05$) for the variables when comparing within metaphoricity level and within ST version. The result for ST version is reasonable, since versions A and B were carefully manipulated to be strongly comparable. However, the finding for metaphoricity level somehow came as a surprise, since we expected that translating more metaphorical variants would be more effortful than translating less metaphorical variants. For two variables (number of renditions and micro-units per word), it was even more effortful to translate the less metaphorical variant. A potential explanation may be the fact that congruent sentences are not those with best readability (Wolfer et al. 2015), but this should be further investigated for the data in question.

6 Cognitive effort and explicitation in translation tasks

Table 7: Mean and standard deviation of cognitive effort measures per metaphoricity level of the source text variant, source text version, subject profile, and subject nationality

Variable	Metaphoricty level of the ST variant		Source text version		Subject profile		Subject nationality	
	↑	↓	A	B	Translators	Field Specialists	Brazilians	Germans
Number of renditions	1.94 / 1.38	2.16 / 1.38	2.10 / 1.47	2.00 / 1.28	2.08 / 1.34	2.02 / 1.42	1.89 / 1.36	2.21/1.38
Pauses per word	1.59 / 2.08	1.53 / 1.56	1.62 / 2.20	1.51 / 1.39	1.27 / 1.48	1.86 / 2.10	1.43 / 2.11	1.69/1.51
Drafting duration per word	6.84 / 6.37	6.51 / 4.74	6.67 / 6.43	6.68 / 5.61	5.49 / 4.19	7.87 / 6.53	5.87 / 5.60	7.49/5.52
Micro-units per word	0.47 / 0.30	0.53 / 0.89	0.52 / 0.89	0.49 / 0.33	0.44 / 0.31	0.57 / 0.89	0.49 / 0.89	0.52/0.33

As for the subject profile, the differences are significant ($p<0.05$) for all variables but number of renditions, i.e., translators were faster than the field specialists, since the translators had fewer pauses, rendered words within a shorter interval, and needed less micro-units to accomplish the translation of each variant. These results are indicative of translation competence (Alves & Gonçalves 2007; PACTE 2014).

As for subject nationality, the differences are significant ($p<0.05$) for all variables, i.e., the Brazilians were faster than the Germans when rendering the variants under scrutiny. These differences should be further explored, and may be ascribable to typological differences (Steiner 2001a,b), different notions of translation (Matthiessen 2001; Tirkkonen-Condit 2010) and/or differences in TT quality (Alves et al. 2014a).

A further step in our analysis was looking at the impact of the final solutions having or not metaphoricity levels analogous to those in the ST variants. The results are displayed in Table 8, where category ‘non-analogous’ embraces both higher and lower metaphoricity levels in the final renditions compared to those in the ST.

Table 8 seems to show that opting for more or less metaphorical wordings in the TT than in the ST has processual implications. For all variables, the means are higher when the metaphoricity level in the TT is non-analogous to that in the ST. Bearing in mind that human beings are cognitive misers (Fiske & Taylor 1984), this result seems to corroborate that ‘literal’ translation is a default, effort-minimising strategy, whereas alternative strategies are more cognitively effortful (Tirkkonen-Condit 2005).

Table 8: Mean and standard deviation of cognitive effort measures per metaphoricity level in the final rendition compared to that in the source text variant

Variables per variant	Analogous (n = 247)	Non-analogous (n=73)
Number of renditions	1.95 / 1.32	2.40 / 1.50
Pauses per word	1.46 / 1.54	1.93 / 2.58
Drafting duration per word	6.35 / 4.57	7.80 / 8.14
Micro-units per word	0.50 / 0.74	0.52 / 0.33

5 Final remarks

We set out this study aiming to test two hypotheses, namely:

- literal translation, as a default translation procedure, minimises cognitive effort;
- translating more implicit realisations in the ST requires explicitation on the translator's part, which entails an effortful translation procedure.

Overall the results point to the independent variable (ST level of grammatical metaphority) as having little or no impact on our dependent variables (i.e., number of renditions, total drafting time, number of pauses, and number of micro-units). In other words, subjects do not seem to show more or less effort spent to translate a more or less metaphorical version of the ST. Our data suggest, however, that they do seem to invest more effort to change the level of grammatical metaphority of their own previous solutions in cases of multiple interim renditions.

In other words, the results confirm hypothesis (1) that the production of TT with lexico-grammatical realisations analogous to those in the ST is a default procedure and requires less cognitive effort. Nevertheless, they do not confirm hypothesis (2) that more metaphorical variants in the ST require more cognitive effort than the congruent variants. Returning to Tirkkonen-Condit's (2005) Monitor model, this additional effort may be ascribed to 'literal' translation as a default procedure and to the activation of the monitor mechanism as an effortful event. That seems to be much so that the variants that led to the highest occurrences of de-metaphorisation were those having to do with constraints due to typological and registerial differences between source and target languages and revisions tended to involve changes in the lexical rather than in the grammatical pole.

De-metaphorisation as an inherent property of translation has been probed in experimental studies of the translation process by da Silva (2007; 2012); Alves et al. (2010; 2011; 2014a,b). All these studies have relied on the present data to account for different aspects of the translation process, providing comparable analyses that complement each other. As stated in Alves et al. (2014a,b), however, more fine-grained data including analyses of the TT should be incorporated to cast further light on the role of explicitation in translations tasks. Besides, the role played by subject profile and subject nationality (as a proxy for language pair) remains poorly explored and should be addressed more deeply. Yet, we believe that our effort to carry out such an extensive study will provide further insight on cognitive aspects of the translation process and encourage collaborative work as the one involved in the experiment design and data collection.

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Chapter 7

Changes of word class during translation – Insights from a combined analysis of corpus, keystroke logging and eye-tracking data

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Drawing upon the data collected in a translation experiment, this study combines product- and process-based analyses of translations with a focus on word class shifts. The keystroke logged translation corpus used in the paper consists not only of source and target texts, but also of the corresponding log files of the translation process data. Thus, in addition to the analyses of the final translation products, this corpus allows us to study changes of word class in the intermediate versions present during the translation process. We also use the complementary eye-tracking data to test our initial assumptions about the cognitive processing associated with nouns, verbs and shifts between these two word classes.

1 Introduction

Over the last decades, laboratory experiments have been increasingly employed in translation studies to investigate research questions related to the translation



process (for an overview see e.g. Göpferich 2008). In addition, a number of studies have shown that a combination of process- and product-based analyses of the data collected during such experiments may provide new insights into the nature of translations, for instance by treating keystroke logs as a corpus (Alves & Magalhães 2004; Alves & Couto-Vale 2009; 2011; Serbina, Niemietz & Neumann 2015; Serbina, Niemietz, Fricke, et al. 2015). Keystroke logging data contains all the keystrokes and mouse movements produced while writing on a computer. This information can be linked to eye-tracking data to establish not only what an experiment participant was typing but also what stretches of text s/he was looking at (Carl & Jakobsen 2009). In purely process-based analyses, this type of data is often studied by comparing writing and reading behavior of individual participants on a rather global level, i.e. the source texts and the produced translations are analyzed with a fairly general look at linguistic phenomena (e.g. Dragsted & Hansen 2008, Pavlović & Hvelplund Jensen 2009, Hvelplund Jensen 2011). A corpus perspective on the keystroke logs, which are enriched with linguistic annotation and alignment between source and target texts, allows for systematic querying and subsequent quantitative as well as qualitative analyses of linguistic phenomena as they occur in translations across multiple participants. The present study aims at investigating word class shifts in translations using a keystroke logged translation corpus (Serbina, Niemietz & Neumann 2015). As discussed in §2, word class shifts could be indicative of deeper changes between source and target texts. Focusing on the word classes of nouns and verbs, our analyses take into account not only translation shifts between originals and the final translation products but also changes visible in the numerous intermediate versions, which are variants of the produced text identified at different points during the translation process. Including the intermediate versions allows us to also examine changes that occur within the intermediate versions but are discarded in the final translation, information that adds to our understanding of potential causes of these shifts, their existence having been shown in exploratory analyses of keystroke logging data (e.g. Alves et al. 2010). This makes it possible to perform more detailed analyses of the word class shifts. The eye-tracking data adds information that is used to infer the amount of cognitive effort involved in such linguistic changes. The analyses draw on the word class or part of speech annotation and word level alignment available in our corpus. The remainder of the paper is structured as follows. An overview of the theoretical background relevant for the present study is given in §2, and §3 introduces the methodology for obtaining the experimental data analyzed in this paper. §4 and §5 describe the results, related both to the traditional corpus analyses of shifts between source

and target texts (§4) and also to additional investigations which can be conducted only with the corpus containing translation process data (§5). §6 contains concluding remarks and an outlook on further research.

2 Theoretical background

The analysis of translation shifts, i.e. departures from a direct or literal translation, is a long-standing research topic in translation studies (cf. Cyrus (2009) for a recent state of the art). Changes in the grammatical category of individual word tokens are referred to as grammatical shift (Catford 1965) or transposition (Vinay & Darbelnet 1995). A typical example of a change in grammatical category is the change in word class, as in example (1) where the verb *behaves* is translated by the noun *Verhaltensweise* ('behavior-way'). Both items share an equivalent lexical base ({behav} and {verhalt}).

- (1) EO: Crumpling a sheet of paper seems simple and doesn't require much effort, but explaining why the crumpled ball [behaves] the way it does is another matter entirely.
GTrans: Ein Blatt Papier zusammen zu knüllen, erscheint einfach und erfordert wenig Anstrengung; die [Verhaltensweise] des Papierknäuels zu erklären, ist dagegen eine völlig andere Sache. (KLTC PROBRAL GT7¹)

Vinay & Darbelnet (1995) and Newmark (1988) approach such shifts from the point of view of procedures (to be) used by the translator in those cases where a direct translation is not desirable or otherwise impossible. At the same time, the investigation of translation shifts is also adopted in descriptive analyses of translation corpora with respect to differences between source and target texts (e.g. Cyrus 2006, Čulo et al. 2008). What these studies have in common is that linguistic units are examined more or less in isolation (with the exception of Cyrus who analyses predicate-argument structures). In contrast, Steiner (2001) suggests that there is systematicity in which shifts occur in which direction by linking some high-level assumptions about typological differences between English and German to expected shifts in word class. More specifically, he links

¹In all examples taken from the analyzed translation experiment, we use the following notation: KLTC - Keystroke logged translation corpus, GT1-GT8 - experiment participants from the group of German professional translators, GP1-GP8 - experiment participants from the group of German physicists, EO - English original, GTrans_i - an intermediate version of the German translation, GTrans - the final version of the German translation.

Hawkins' (1986) idea of a more direct mapping of semantics on grammar in German as opposed to English with the systemic functional notion of grammatical metaphor (see below), and comes to the conclusion that translators will tend to go for a closer match between semantics and grammar in the translation direction English to German by reducing the level of grammatical metaphoricity, which is then observable, for instance, in the form of shifts from nouns to verbs. While this hypothesis clearly has some appeal, Čulo et al. (2008) report results of transposition in aligned word pairs from the CroCo Corpus (Hansen-Schirra et al. 2012) which run counter to Steiner's hypothesis. Although they do report a proportion of noun to verb shifts of almost 5% of all transpositions in the translation direction English to German in one of the eight CroCo registers, shifts from verbs to nouns account for roughly 24% of the transpositions.

One factor potentially explaining this discrepancy between Steiner's hypothesis and the actual frequencies is that Steiner did not take into account the actual distribution of word classes in English and German. In his overview of the distributions in the CroCo Corpus, the German part of the corpus is reported to have more nominal word classes, whereas English has more verbal word classes (Steiner 2012: 80). Overall, Steiner concludes that nominal word classes including nouns, pronouns, adjectives and adpositions account for a slightly higher share of word classes in the German subcorpus in comparison with the English subcorpus than verbal word classes (verbs, adverbs and conjunctions), where the proportions are reversed. The relationship also applies to verbs only. As to nouns, Steiner reports somewhat lower percentages in the German than in the English subcorpora. However, divergences in spelling conventions were not taken into consideration in Steiner's analysis. These do not affect the verb count, but have an effect on nouns. While compounds in German are usually written as single word tokens which also appear as single tokens in the automatic tokenization, compounds in English are usually written as separate tokens and are hence also tokenized, tagged and counted separately. This well-known difference leads to skewed counts where a compound in English is counted as two word tokens, while its equivalent in German is counted as just one token even though it may consist of equivalent individual nouns.

A cursory look at aligned nouns in the CroCo Corpus (see Table 1) shows that in most cases the English translation consists of at least one more token.

The higher proportion of nouns in the English subcorpus can, therefore, partly be accounted for by differences in spelling conventions. However, there is no simple computational solution to this problem: The linguistically soundest way to making English and German compounds comparable would be to identify those English compounds spelled as separate words and count them as one word token.

Table 1: Equivalents of German compounds from the CroCo Corpus

No.	German	Tokens	English translation	Tokens
1	Soziale Marktwirtschaft	2	social market economy	3
2	Systemwechsel	1	system change	2
3	Fremdsprachenkenntnisse	1	knowledge of foreign languages	4
4	Aufzugtür	1	lift door	2
5	Fallhöhe	1	depth of the fall	4
6	Innenstadt	1	city center	2
7	Haarnetz	1	hairnet	1
8	Kaschmirpullover	1	cashmere sweater	2

However, this task is far from straightforward both linguistically – Biber et al. (1999: 589) call the distinction between phrases and compounds a cline – and computationally, as there is not all that much systematicity even in the spelling conventions. A search for *hairnet*, *hair net* and *hair-net* in the COCA Corpus (Davies 2008: ongoing), for instance, retrieves 74 hits for the single token, 31 for the version spelled as two tokens and one hit for the hyphenated compound. In contrast, the query for all three spellings of *city center* retrieves 62 hits for the single token spelling, 628 hits for the two tokens version and 15 hits for the hyphenated spelling. While we may safely assume the hyphenated spelling to occur with consistently lower frequencies, single word and two word spellings appear to alternate. The computational handling of multiword expressions in English is a longstanding issue that continues to receive much attention.² An alternative and more feasible approach is to chunk compounds into individual word tokens, i.e. to make German more similar to English. However, this, too, is not entirely unproblematic because some compound nouns are lexicalized. Thus chunking them into their component parts would also break the compound’s meaning (see Figure 1, where e.g. corpus position 223044, i.e. *Fußgängerbrücke* ‘pedestrian bridge’, displays a potential case of lexicalization whose chunking may be disputed). It therefore makes sense to accept the limitations of the naïve noun count based on automatic tokenization. Nevertheless, this naïve count could be enriched with additional counts to give at least an estimate of the skew introduced by the diverging spelling conventions. For the purpose of this paper we therefore counted compound chunking and noun-noun sequences in the CroCo Corpus.

²The Association for Computational Linguistics maintains its own Special Interest Group on Multiword Expressions. For an overview see Sag et al. (2002), who tellingly entitle their paper “Multiword Expressions: A pain in the neck for NLP”.

In addition to part of speech tagging in both languages³, the annotation of the CroCo Corpus includes compound chunking as part of the morphology annotation (Hansen-Schirra & Neumann 2012). We queried 110 English original texts and their matching German translations, and 121 German original texts and their English translations from eight registers for the number of noun tokens containing chunking in the morphology annotation. As can be seen from the selected query hits in Figure 1, the query retrieves quite a number of relevant hits as well as cases which would not lead to a higher count of nouns because the compounded element is not a noun (e.g. corpus positions 670, 1144, 223049).⁴ It also becomes clear that not all chunked word tokens are limited to just one additional noun, thus increasing the number of nouns by more than one (e.g. corpus positions 325, 898).

- 100: <Systemwechsels/system#wechsel>
- 223: <Exportweltmeisterschaft/exportieren#welt#meisterschaft>
- 260: <Erfolgsgeschichte/erfolg#geschichte>
- 304: <Wörterbuch/wort#buch>
- 317: <Mittelstand/mittel#stand>
- 325: <Beitragsbemessungsgrenze/beitrag#bemessung#grenze>
- 328: <Superstar/super#star>
- 618: <Geistesblitz/geist#blitz>
- 670: <Solidargemeinschaft/solidarisch#gemeinschaft>
- 898: <Bundeskartellamt/bund#kartell#amt>
- 926: <Produktivitätspeitsche/produktivität#peitsche>
- 1084: <Nachtwächterstaat/nacht#wächter#staat>
- 1144: <Rundumversorgung/rundum#versorgung>
- 222710: <Schweizertal/schweizer#tal>
- 222729: <Kaiser-Wilhelm-Denkmal/kaiser#Wilhelm#denkmal>
- 222838: <Bergbaumuseum/berg#bau#museum>
- 222962: <Lahn-Uferpromenade/Lahn#ufer#promenade>
- 223044: <Fußgängerbrücke/fuß#gänger#brücke>
- 223049: <Experimentierfreude/experimentieren#freude>

Figure 1: Selected query hits of noun tokens containing chunking in the morphology annotation

³All analyses of word classes discussed here are based on automatic part of speech tagging (Hansen-Schirra & Neumann 2012). The annotation categories will possibly differ in their conceptualization across languages. The advantage of this language-internal tagging is that the annotation is adapted to (or, in technical terms, trained on) the characteristics of the respective language. As a consequence, the results reflect the contrastive differences between the languages – provided the automatic tagging is correct. For estimates of the tagger accuracy across the CroCo registers see Hansen-Schirra & Neumann (2012: 50-52)

⁴Compound chunking after the slash is represented by lexical bases separated by hashes.

The results summarized in Table 2 can therefore only provide a rough indication of the differences between English and German. Moreover, it is well possible that the automatic morphology annotation with MPRO Maas (1998) reaches different degrees of precision and recall in the two languages.

Table 2: Mean frequencies of verbs, nouns, compounds and noun-noun sequences in the texts of the CroCo Corpus reported as percentages of all tokens

	verbs	nouns	compound nouns	noun-noun sequences
English originals	14.97	26.66	0.13	4.63
German originals	11.97	24.10	6.33	1.58
English translations	14.16	25.72	0.11	4.36
German translations	12.58	24.77	5.28	1.77

The percentage of verb part-of-speech tags displayed in Table 2 is in line with the numbers of Steiner (2012). The Fisher's exact test performed on the raw frequencies of verbs in the English and German originals cross-tabulated with all other word classes shows that the English original texts have significantly more verbs ($42,746/243,475$) than the German texts ($35,471/253,019$; $p < .001$, $df = 1$). This is partly to be explained by the reliance of English on non-finite subordination, which is not of equal importance in German (see Königs (2011) for a collection of examples). The noun counts in Table 2 seem to paint a different picture. German original texts have a lower percentage of nouns than the English original texts. However, the number of compounds shows a clear, but unsurprising tendency of the German texts to rely more on nominal expressions than the percentage of nouns alone suggests. The share of noun-noun compounds spelled as one word actually increases the noun count, because each true noun-noun compound consists of (at least) two nouns⁵. Moreover, noun-noun sequences written as separate words will partly represent compounds, at least in English. While they do not increase the percentage of nouns, because each tokenized word tagged as a noun is already included in the percentage, their relative frequency provides an indication of the role they play in each language and hence facilitates a better estimate of the underlying distribution of nouns.

⁵Although the CroCo Corpus contains morphology annotation, which includes the compound chunking discussed in connection with Figure 1, the chunked items are not annotated for part-of-speech and are thus not included in this count.

Even if we distrust the frequency of compounds and assume that half of the hits are combinations of the head noun with some other word class and that there are no combinations of more than two nouns in the compounds, there is still a slightly higher frequency of nouns in German (24.10% plus at least 3% of compound nouns) than in English (26.66% plus less than 0.1%). Additionally, and again being conservative, at least some of the noun-noun sequences will probably represent compounds that would be written as one token in German and therefore would reduce the overall number of nouns in English.

To sum up, the results suggest that German not only has a lower frequency of verbs but also a higher frequency of nouns. The analysis is further strengthened by Steiner's analysis of nominal versus verbal parts-of-speech referred to above. In an explorative study of the CroCo corpus, Steiner (2012: 80) suggests that while German in total appears to have a higher percentage of nominal parts-of-speech (51.58% versus 49.72%), English is characterized as having a higher percentage of verbal parts-of-speech (24.27% versus 21.64%). These results also corroborate Čulo et al.'s (2008) findings based on the analysis of aligned pairs, which showed that there is a directionality effect in shifts in word class. According to their results, more verbs are changed into nouns in the translation direction English to German, whereas the opposite is the case in the translation direction German to English.

At this stage the counts for translations are included in Table 2 because they will be of use in generating hypotheses and understanding the results of our analyses in §4 and §5. Suffice it to say that the translations in both directions show a clear target language orientation, albeit to a somewhat reduced extent, thus reflecting some source language shining through (Teich 2003). We would claim that based on the frequencies reported above, the longstanding assumption that German tends to be more nominal than English is corroborated. This is further complemented by the lower frequency of verbs in German which in itself suggests a different relationship between nominal and verbal word classes in the two languages. It is safe to hypothesize on the basis of these different analyses of the CroCo Corpus that translators are guided by the usage-based contrastive differences and tend to make their translations of the source texts more nominal in the translation direction English to German.

At the same time, changes between nouns and verbs are in fact only a symptom of a more complex structural change as in (1) where the clausal modification is translated by a noun phrase. A translation closer to the original could have been [...] *aber zu erklären, warum sich das Papierknäuel so verhält, wie es das tut*, [...]. The nominal translation is clearly shorter (only three word tokens)

and also appears less complex on the level of clause. But condensing the event described in the original to just the noun *Verhaltensweise*, a noun which then also implies a certain temporal extension of an ongoing process, results in a reduced amount of explicit information (Steiner 2005; Halliday & Matthiessen 1999). In Systemic Functional Linguistics this phenomenon is called grammatical metaphor, a mismatch between the grammatical realization and the respective semantic structure of an event, hence the use of the notion of metaphor (Halliday & Matthiessen 2013: 665). Unlike other related notions, such as transcategorization, it goes beyond simple observations about changes in word class by taking into account the wider grammatical and semantic context affected by such changes. It is this richer notion which we use to explain how certain nominal contexts, especially contexts involving nominalization of ongoing events (i.e. process nouns, cf. Fontaine 2017), can be described as more complex: they imply more semantic material which, in the explicit counterpart, would have to be expressed by a more complex grammatical structure. However, it should be mentioned that the question of how complexity actually manifests in grammatical structure is far from straightforward. In fact, it manifests at different levels with complexity at one level often being complemented by simple structures at another level. A higher number of verbs leads to increased complexity at the level of the clause because each verb requires satisfying its valency. This often goes hand in hand with reduced complexity at the phrasal level. By contrast, packaging the same meaning into nominal structures will lead to increased complexity at the phrase level with the elements associated with the valency of the nominalized verb being integrated into the noun phrase as modifiers (see, e.g., Halliday 2001) or being unmentioned and thus implicit. This, in turn, often goes hand in hand with a simpler clause structure. One might claim that a nominalized noun (or more generally a process noun) itself appears simple enough and is definitely shorter than its clausal counterpart, thus leading to reduced processing effort. However, nominalizations, especially if packaged into grammatically complex nominal structures, are further removed from what might be described as our experience of the world, in which we tend to observe or experience events, rather than entities (Halliday & Matthiessen 2013). Consequently, grammatical structures which are more congruent with our experience of the world might be easier to process. In other words, we assume that metaphoricity in this sense requires more effort in decoding the combined grammatical and semantic structure (Steiner 2001: 15, Hansen-Schirra & Steiner 2012: 258). Although Hansen-Schirra & Steiner (2012: 260) acknowledge “complete avoidance of unpacking in cases of highly routinized stretches of text which allow direct transfer” (see also Hansen

2003: 145 and Tirkkonen-Condit 2005: 411), their and Steiner's (2001) main assumption is that unpacking the complex grammatical structure is the default and that re-packaging of this structure "is cut short below the degree [of grammatical metaphoricity] to which it might otherwise go" (Hansen-Schirra & Steiner 2012: 260).

To specify our assumptions: in general, we might hypothesize that the translator will avoid increased effort. Complex features are expected to impose higher processing demands during translating as reflected in increased fixation durations etc. on the respective source text segments, longer pauses in text production, etc. As noted above, we assume that grammatically metaphorical variants involving semantic complexity in combination with syntactic complexity on the level of nominal phrases are more difficult to process than their more congruent versions, even though the latter are still characterized by syntactic complexity on the level of clause. Furthermore, we assume that the reduction of semantic and phrasal complexity is more frequent in translation than its increase because, again, the latter is more effortful. On these grounds, it appears plausible to assume that indicators of increased cognitive effort triggered by complexity associated with grammatical metaphor can be correlated with reduced complexity in the product. Note that this does not imply that reduction is *more* probable than maintaining the level of complexity.

Classical approaches to translation shifts do not take into account specific claims about the exact conditions under which a certain shift is more likely to occur. Possible factors affecting the likelihood of the translator opting out of the direct translation are contrastive differences like the ones discussed above, which need to be acted upon either because the feature of the source text is altogether ungrammatical in the target language or because the translator is (possibly unconsciously) aware of a target language norm and adapts to it (for corpus findings on norm-conforming behavior see Delaere 2015). Alternatively processing-related factors such as lack of understanding (also of the just mentioned norms), fatigue and time pressure (Steiner 2001) may play a role in this variation.⁶ These can only be assessed in a research design that also takes the translation process into consideration.

⁶Note that these factors only make sense when looking at the local context of the immediate translation process in which a translation problem occurs. All of these are liable to being further modified (i) to ensure overall cohesion and coherence of the translation and (ii) by proof-readers and especially editors who may not necessarily take the source text into consideration at all as shown convincingly by Bisiada (2013).

3 Methodology

The data used in this study was collected within the PROBRAL project,⁷ a cooperation between the Saarland University, Germany and the Federal University of Minas Gerais, Brazil (see Neumann et al. 2010). During the translation experiment, participants translated a text from English into their L1 German without time restrictions. The data from 16 participants was analyzed: eight professional translators with at least two years of experience and eight doctoral candidates in physics. The physicists are considered to be domain specialists, since the source text is an adapted version of an authentic text on the physical properties of crumpling paper published in a popular-scientific magazine. We expected the two groups of subjects to behave differently during the process of translation due to higher translation expertise on the side of professional translators in contrast to higher domain expertise on the side of physicists⁸. The participants were instructed to write a translation for another popular-scientific publication.

As mentioned in §2, we follow the framework of Systemic Functional Linguistics in distinguishing between two levels of grammatical complexity: the nominalization in square brackets in (3) is considered to be a more condensed and arguably grammatically more complex version of the comparable clause in (2). Ten item pairs (one for each condition), each representing different formulations of the same semantic information, were integrated into two variants of the same original text. Each of the two source texts thus contained five complex and five simple versions of stimuli. Examples (2) and (3) show the two conditions of the same stimulus, variant 1 in original text version 1, and the other variant in original text version 2. Note that the present study is not limited to part of speech shifts occurring in these stimuli, but rather we analyze part of speech shifts occurring throughout the entire texts.

- (2) **Version 1, EO:** Scientists at the University of Chicago modeled [how the force required to compress the ball relates to its size]_{Clause}. (PROBRAL Source text 1)
- (3) **Version 2, EO:** Scientists at the University of Chicago modeled [the relation between compression force and ball size]_{NP}. (PROBRAL Source text 2)

⁷The project was funded by CAPES-DAAD PROBRAL (292/2008).

⁸However, since the two different types of expertise are not investigated in this study, the group of physicists can be considered to be simply a control group.

The experiment consisted of four parts. During the so-called ‘copy test’ the participants were instructed to re-type a short text in German. This step of the experiment provided a baseline for the typing speed of every participant. Moreover, it allowed the participants to get used to the keystroke logging software. The second part of the experiment involved the main translation task. While translating one of the two source texts, participants were allowed to use the online bilingual dictionary *leo*⁹. Since the keystroke logging programme and *leo* windows were overlapping, the participants had to switch windows to look up a word in *leo*¹⁰. The translation task was followed by two types of retrospective interviews during which participants were invited to comment on their translation and to answer a series of questions related to the stimuli.

Using the keystroke logging software *Translog*, version 2006 (Jakobsen & Schou 1999), all keystrokes, mouse movements and pauses were recorded for each participant. Additional information on eye movements was collected via the remote eye-tracker *Tobii 2150*. The data extraction was performed using *Tobii Studio* (Tobii Technology 2012), where occurrences of verbs or nouns under analysis in the present study, i.e. those that are shifted to another main word class in the corresponding translation plus those that are included as part of random samples (see below for more details), were identified as areas of interest.

The part of the keystroke logged translation corpus which corresponds to the experiment described above and was used as the basis for the analysis in the present study consists of the two versions of the source text (ST), and the 16 target text (TT) translations, totaling approximately 3,650 words in the register of popular-scientific writing. It also contains the 16 log files of the translation process data leading to the target texts. The STs and TTs were automatically POS-tagged using TreeTagger (Schmid 1994). In addition, the ST and TT words were manually aligned.¹¹ The alignment was based on the alignment guidelines by Samuelsson et al. (2010). Cases of multiple alignment were grouped together: for instance, if a ST word corresponds to two or three words in the translation, it is counted as one alignment pair. Moreover, auxiliaries and main verbs were grouped together as verbs in both the STs and in the TTs to avoid counting ana-

⁹https://dict.leo.org/ende/index_de.html, accessed on 2018-09-07.

¹⁰During the post-processing of the eye-tracking data, the time periods during which the *leo* window was active were excluded from the calculation of the eye-tracking measures. During another experiment, we also tested how participants interact with *leo* when it is open in a window positioned directly next to the *Translog II* window (*TRICKLET*, technical report in preparation).

¹¹We gratefully acknowledge Adjan Hansen-Ampah’s support in programming an interface for handling the manual alignment.

lytic versus synthetic morphological representations of verbs as shifts, for example when only one member of the translation pair contained an auxiliary whereas the other was realized by a fusional verb form.

Source text words belonging to the main word classes noun, verb, adjective and adverb were extracted manually, together with their aligned TT words. In the next step, we selected all translation pairs in the analyzed data set containing shifts between nouns and verbs for further analysis. For instance, in (4) the ST noun *application* corresponds to the TT verb *angewendet* ('applied'):

- (4) EO: Instead of collapsing to a final fixed size, the height of the crushed ball continued to decrease, even three weeks after the [application]_{Noun} of weight.

GTrans: Statt zu endgültigen festen Größe zusammenzufallen, nahm die Höhe des zusammengeknüllten Papierballs weiter ab, und zwar auch noch drei Wochen, nachdem das Gewicht [angewendet]_{Verb} wurde.
(KLTC PROBRAL GT5)

Random samples of 30 nouns and 30 verbs that do not contain a shift in the final translation¹² were also extracted, to compare the cognitive effort invested into the translation of segments with and without shifts. Cognitive effort was operationalized using the eye-tracking data stream through the measures of total fixation duration and fixation count (Holmqvist et al. 2011) for the selected source text words, namely all ST nouns corresponding to TT verbs, all ST verbs corresponding to TT nouns, and the nouns and verbs from the random samples. Both descriptive and analytical statistics were performed using the software R (R Core Team (2017)). Moreover, we used the keystroke logs to examine whether the translation pairs characterized by shifts between nouns and verbs lead to intermediate translations and, if so, to which part of speech these intermediate translations belong (§5.1).

4 Shifts between source texts and final target texts

Before concentrating on the analysis of word class changes, it is worth examining the general part of speech (POS) distribution of the main word classes (nouns,

¹²Random samples of 30 were considered because this number is similar to the number of shifts between these word classes (see Table 4). In total, the analyzed data contains 776 nouns and 348 verbs that were translated by the same word classes in the final translations. These numbers involve cases of multiple alignment (see the discussion on compound chunking above): e.g. the two nouns *paper ball* are both aligned to the same noun *Papierkugel*, and result in two alignment pairs without change of word class.

verbs, adjectives and adverbs) in the two English source texts and German translations shown in Table 3.

Table 3: POS-distribution of English source texts and German target texts

	English STs		German TTs	
	%	counts	%	counts
Nouns	29.29	111/379	27.00	882/3267
Verbs	16.89	64/379	15.52	507/3267
Adjectives	10.55	40/379	9.89	323/3267
Adverbs	3.96	15/379	5.17	169/3267
Other POS	39.31	149/379	42.42	1386/3267

We can see that nouns are the most frequent word class in both English STs and German TTs, representing 29.29% of all words in the English texts and 27% in the German translations. Furthermore, in English originals there are not only more verbs, but also higher proportions of nouns and adjectives than in the corresponding German target texts. Comparing these findings to the distribution of nominal and verbal word classes in the CroCo Corpus as discussed in §2, the distance between English and German is comparable and we can conjecture that similar distributions in terms of noun-noun sequences as separate tokens in English and compounds written as single tokens in German apply.

For the categories of verbs, adjectives and adverbs, the overall hierarchy of distribution is similar in the analyzed originals and translations. For instance, the second most frequent word class is represented by verbs, amounting to 16.89% in English and 15.52% in German texts.

Table 4 provides an overview of shifts between the main word classes. In total, 136 translation shifts on the level of the main word class changes were detected in the translation products. Although the expressions *im Wesentlichen* and *im Grunde (genommen)* ('essentially') were classified as prepositional phrases, they contain nouns and verbs. For this reason, shifts to prepositional phrases were also included in our analysis of main word classes.

The first two types of shifts, namely from verbs to nouns as well as from adjectives to nouns, correspond to the two most frequent translation shifts identified for the register of letters to shareholders (SHARE) within the CroCo Corpus (Čulo et al. 2008: 50).

Table 4: Types of translation shifts in the analyzed English-German data

ST	TT	Absolute numbers	% of all shifts
VERB	NOUN	38	27.94
ADJ	NOUN	23	16.91
NOUN	VERB	17	12.50
VERB	ADJ	15	11.03
ADV	PP	14	10.29
VERB	ADV	10	7.35
NOUN	ADJ	6	4.41
ADV	ADJ	6	4.41
NOUN	ADV	4	2.94
ADJ	ADV	2	1.47
ADJ	VERB	1	0.74

Table 5: Translation shifts from nouns and verbs to other main word classes

	English ST verb	English ST noun
Shifts to other word classes in the TT	63	27
No shifts to other word classes in the TT	348	776

Table 5 analyzes the ST nouns and ST verbs to assess how many were shifted to other word classes in the target translation, and how many retained the ST word class.¹³ The majority of instances of verbs (84.67%) and nouns (96.64%) found in all originals were translated by the same word classes. Future work should analyze these alignment pairs in more detail to determine what cases could be classified as instances of literal translation (Tirkkonen-Condit 2005, Schaeffer & Carl 2013, Halverson 2015). Literal translation is understood as “T[arget] L[anguage] version of a S[ource] T[ext] segment which is quite close, *structurally and semantically*, to the corresponding segment in the ST” (Englund Dimitrova 2005: 232, emphasis added). Taking into account this definition, we suggest that literacy

¹³The table accounts for the nouns and verbs of the originals translated by all 16 participants. It does not contain instances of empty links, i.e. cases where a ST noun or a verb does not correspond to any word in the translation (Čulo et al. 2012), or shifts to minor word classes.

should be studied above the word level to consider both the syntactic structure of the aligned elements and their semantic characteristics.

The overall effect of the ST word class on the variable shifts is significant (Fisher exact test, $p = 6.245e - 13$). The mosaic plot in Figure 2 shows that in the translation direction English-German the shifts from verbs to other parts of speech occur significantly more frequently than expected.

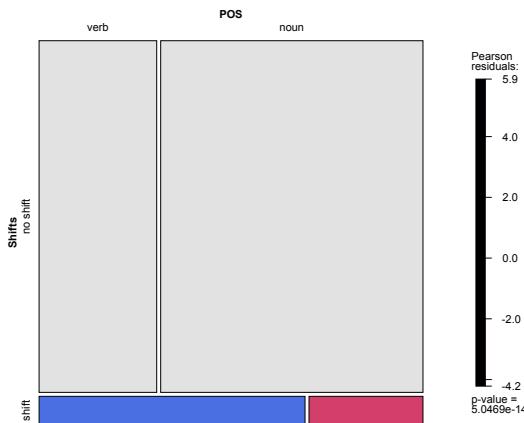


Figure 2: Mosaic plot for shifts from nouns and verbs in the final TT

This type of shift can be explained by a contrastive feature of the language pair English-German. As reported in §2, German shows a tendency to be more nominal and certainly less verbal than English: thus the translations from English into German may be influenced by the word class distribution in the German originals. The tendency to shift from a word class that is less typical of the target language can be linked to the translation property of normalization, according to which translators (over-)use the linguistic features that are associated with the target language (Baker 1996: 176).

It is interesting to observe that most of the shifts from verbs to nouns were detected among the group of professional translators, who introduce this type of shift 26 times compared to only 12 instances among domain specialists. Due to the fact that the professionals translate on a regular basis, they can be expected to be more aware of contrastive differences within the language pair and try to adhere to the language norms of the target language. The use of normalization is illustrated in (5):

- (5) EO: [...] a fact that [has confounded]_{Verb} physicists.
 GTrans: [...] eine Tatsache, die Physiker [zum Grübeln bringt]_{PP}. (KLTC PROBRAL GT3)

In (5), the professional translator shifts the verb *confounded* to the more nominal (*zum Grübeln bringen*, ‘make someone ponder [about]’). This shift, and similar shifts from the verb *confound* in the English original to noun-verb combinations in German translations, were considered to represent a shift from less to more nominal variants and were counted among ‘v-n’ shifts. Participants also apply shifts in the opposite direction, namely from nouns to verbs, in 17 cases. This is also in line with Čulo et al.’s (2008) findings that shifts in word class occur in both directions. They do, however, report differences in frequency with verb-noun shifts being clearly more frequent in the translation direction English to German. Both Čulo et al. (2008) and our own results illustrate the multifactorial character of translation due to which it is difficult to link empirical observations unequivocally with one particular source of explanation.

- (6) EO: the crumpled ball’s [behavior]_{Noun} [...]
 GTrans: wie sich die zusammengeknüllte Kugel [verhält]_{Verb} (KLTC PROBRAL GP4)

The translation in (6) contains the verbal variant *verhält* (‘behaves’). This type of shift seems to counteract the tendency to adapt to the target language norms and could be due to some kind of genuine source language shining through (Evert & Neumann 2017) not triggered by the immediate source language textual environment but by the general activation of the source language in the translator. It could, however, also support Steiner’s (2001) assumption that the translator ‘unpacks’ the complex variant (in (6) a noun phrase expressing a process), i.e. links it to a simpler verbal version. The sentence pair in (6), and potentially other instances of n-v shifts, could not be interpreted as a direct confirmation of the literal hypothesis (Tirkkonen-Condit 2005, Schaeffer & Carl 2013, Halverson 2015): the analyzed target structure, which was produced as the first and final attempt by the participant GP4, is not primed by the aligned source text structure but rather in general by a structure common in the source language.

The discussion of shifts between nouns and verbs should also consider the effect of individual lexical items in the source texts that are frequently shifted: 55 cases of shifts between the two main word classes correspond to 20 lexical items (5 distinct nouns that are translated as verbs and 15 verbs that are translated as nouns). Within the category noun-to-verb shifts, the noun *crumpling* was

frequently shifted to a verb (41.2%, 7/17). The instance of *crumpling* in the first version of the source text (see example (7)) is classified as a noun based on the definite article preceding it and the *of*-genitive following it. This grammatical construction, rather than the lexical item *crumpling* itself, might be the reason for the shift in (7).

- (7) EO: After the [crumpling]_{Noun} of a sheet of thin aluminized Mylar, the researchers placed it inside a cylinder.

GTrans: Die Forscher [knüllten]_{Verb} hierzu ein Blatt aus dünnem aluminiertem Mylar [zusammen] und legten es in einen Zylinder. (KLTC PROBRAL GT5)

Here, participant GT5 changed this noun to a German verb, as did six other participants (87.5%, 7/8). The remaining participant out of the eight who translated this version of the source text introduced a different shift, translating the noun with the nominalized infinitive *das Zerknüllen* ('the crumpling'). While this translation is certainly more literal, this nominalization strategy appears to be less frequent. We tested this assumption by querying the DWDS corpus, more specifically the core corpus of the 20th century (BBAW 2010), for two nominalization strategies. The query for the sequence of the definite article *das* followed by a noun ending in *-en* returned 80,897 hits. To compare, the query for the definite article *die* followed by a noun ending in *-ung* returned 306,945 hits. Both queries do not target all the relevant cases, e.g. nouns preceded by demonstrative or personal pronouns, and potentially involve false hits, but these numbers give us an idea of the relative frequency of the nominalized infinitives.

Among the shifts from verbs to nouns, the verb *modeled* is shifted most frequently (18.4%, 7/38). Example 8 illustrates the most typical translation of this verb – the noun *Modell* ('model').

- (8) EO: Scientists at the University of Chicago [modeled]_{Verb} the relation between compression force and ball size.

GTrans: Wissenschaftler der Universität Chicago bauten im [Modell]_{Noun} nach, wie sich die zum Zusammenpressen des Papierballs erforderliche Kraft im Verhältnis zu seiner Größe verhält. (KLTC PROBRAL GT1)

The verb *modeled* is present in both versions of the source text. Thus this particular shift is present in slightly less than half of the translations (43.8%, 7/16). However, it is interesting to observe that all of the seven instances can be found in the data of professional translators, while all eight domain specialists translated the verb using the German verb *modellieren* ('model'). This could be due to a

meaning difference between the English verb and its German cognate, with the German verb taking the more concrete meaning of shaping or sculpting. The fact that domain specialists tend to keep the verb could be arguably due to the use of loan translations in the hard sciences and thus re-introducing loan words to German. However, this intuitive assumption should be further tested in future studies.

It is also worth considering the second most frequent shift from verbs to nouns (15.8%, 6/38), namely from the infinitive *compress*, as shown in (9). Since this particular instance of the verb occurs only in one of the two versions of the source text in our experiment, it was changed in 75% of all cases (6/8). Two professional translators and two domain specialists chose to translate the infinitive *compress* by a nominalized infinitive, *Zusammendrücken*, whereas two other participants selected the noun *Kompression*.

- (9) EO: Scientists at the University of Chicago modeled how the force required to [compress]_{Verb} the ball relates to its size.
 GTrans: Wissenschaftler der University of Chicago haben untersucht, in welchem Verhältnis die zum [Zusammendrücken]_{Noun} des Papierballs erforderliche Kraft zu dessen Größe steht. (KLTC PROBRAL GT7)

Table 4 also contains a shift from adverbs to prepositional phrases (see discussion of example (5) above). This shift occurs 14 times in total but all of these cases can be traced back to the same lexical item in the English original, the adverb *essentially*. While 14 participants translated this adverb into one of two fixed expressions in German, namely *im Wesentlichen* and *im Grunde (genommen)*, two remaining participants opted for the adjectives *grundsätzlich* and *prinzipiell* in their translations. This English adverb potentially does not have a literal translation equivalent in German, so that a part of speech shift is very likely to take place.

With respect to translation shifts, the analysis of English originals and their German translations produced within our experiment has shown similar tendencies to those based on the CroCo Corpus, especially to Čulo et al. (2008). Participants frequently change ST verbs to TT nouns, thus selecting the word class typical for the target language. However, this investigation has also indicated that there are some differences in the frequency of the verb-noun shift depending on the group of participants, professional translators being more likely to change verbs into nouns. In the next section we will examine whether this type of shift is associated with particular phenomena during the translation process.

5 Process-based analysis

The process-based analysis is divided into two parts. In a first step, we use keystroke logging data to enrich the product-based discussion by qualitatively analyzing intermediate versions of translation shifts between nouns and verbs. Secondly, we examine the amount of cognitive effort associated with the translation of different parts of speech in general and with translation shifts in particular.

5.1 Word class changes in the intermediate versions

Drawing on the intermediate translation versions recorded via keystroke logging, we analyzed the verb to noun and noun to verb shifts in more detail. Among the 38 verb to noun shifts, here was a single case in which the verb was translated to a noun, only to be shifted to another noun at a later point, thus producing a translation version chain verb-noun-noun. In contrast, three ST verbs were first translated into verbs before being changed into nouns at a later stage, as illustrated in (10):

- (10) EO: Crumpling a sheet of paper seems simple and doesn't require much effort, but explaining [why the crumpled ball [behaves]_{Verb} the way it does]_{clause} is another matter entirely.
GTrans_i: Ein Blatt Papier zusammen zu knüllen, erscheint einfach und erfordert wenig Anstrengung, jedoch zu erklären, [warum das Papierknäuel sich so [verhält]_{Verb}, wie es das tut]_{clause}, ist eine völlig andere Sache.
GTrans_f: Ein Blatt Papier zusammen zu knüllen, erscheint einfach und erfordert wenig Anstrengung; [die [Verhaltensweise]_{Noun} des Papierknäuels]_{NP} zu erklären, ist dagegen eine völlig andere Sache.
(KLTC PROBRAL GT7)

First, the original ST verb *behaves* is literally translated by the reflexive verb *sich verhält* (reflexive pronoun + 'behaves'). Both verbs are integrated into clauses and thus correspond to the grammatically simple variants. At this point, no translation shift at the level of word classes and no shift in grammatical complexity has occurred. However, the verb *sich verhält* is not present in the final TT. Instead, the verb *behaves* corresponds to the noun *Verhaltensweise* ('behavior'), which functions as the head of a noun phrase: the translator did not simply change

the word class but also shifted the level of grammatical complexity from a simple to a more complex variant at the level of phrases (at the level of the clause the intermediate version is in fact more complex). Such a shift chain is in line with Tirkkonen-Condit's (2005) claim, according to which the first translation solution is likely to be literal, but can be later revised if deemed necessary (Tirkkonen-Condit et al. 2008 as well as Schaeffer & Carl 2013, Halverson 2015).

Among the seventeen shifts in the opposite direction, i.e. from ST nouns to verbs in the final TTs, there are one instance of the chain 'noun-noun-verb', two instances of the chain 'noun-verb-verb' and even one instance, shown in (11), involving a longer chain consisting of a noun and three verbs:

- (11) EO: [After the [crumpling]_{Noun} of a sheet of thin aluminized Mylar]_{PP},
the researchers placed it inside a cylinder.
 GTrans_i1: [Nachdem sie ein dünnes Blatt aluminiumbeschichtetes Mylar
[verkrumpelt]_{Verb} hatten]_{Clause}, gaben sie es in einen Zylinder.
 GTrans_i2: [Nachdem sie ein dünnes Blatt aluminiumbeschichtetes
Mylar [verknäuelt]_{Verb} hatten]_{Clause}, gaben sie es in einen Zylinder.
 GTrans_f: [Nachdem sie ein dünnes Blatt aluminiumbeschichtetes Mylar
[verknittert]_{Verb} hatten]_{Clause}, gaben sie es in einen Zylinder. (KLTC
PROBRAL GT3)

Here the original noun *crumpling* in the prepositional phrase was shifted directly to a verb. This change led to a reduction in grammatical complexity. In the subsequent intermediate versions, the translator made lexical changes without further altering the grammatical structure of the sentence. This suggests that the effort these changes cause is primarily due to lexical search in the production phase of the translation rather than cognitive effort caused by the grammatical structure of the source text segment. Otherwise, a wider section of the unfolding target text might have been affected by the changes during the translation process.

Changes in word class seem to be fairly straightforward for the participants. Only 8 out of the 55 cases of shifts discussed in this section, i.e. 14.5%, actually involved more than one step during translating.

While it would be interesting to include these more complex chains of part-of-speech shifts in the analysis of cognitive processing, such an analysis is not possible at the present stage due to a low number of shifts in the intermediate versions found in our data. This investigation should be performed when the keystroke logged translation corpus is extended to include data from further experiments.

Once the number of the intermediate versions and the direction of such shifts are added into the regression models, the estimates for the analyzed eye-tracking measures can potentially change. We would expect that modifications on the lexical level, leading to such chains as ‘n-n-n’, already result in more cognitive effort, reflected in more and longer fixations on the corresponding ST word simply due to additional processing associated with search for the right lexical item. In addition, chains of the types discussed in this section are likely to result in further increase of cognitive processing due to changes of grammatical structure. However, such lexical and grammatical changes may be also made ‘silently’ without additional fixations on the source text, but rather after (multiple) re-reading of the intermediate versions of the target text. Here, an eye-tracking analysis of the target text should provide us with additional insights. Due to the technical problem of continuously changing screen contents while producing the translation (and recording eye movements), currently it is not possible to analyze specific areas in the target text window.

We now turn to the eye-tracking data to understand the effect of translating the different parts of speech – involving shifts or not – on cognitive effort.

5.2 Eye-tracking data

As mentioned in §2, the word classes of verbs and nouns can be linked to clausal and nominal ways of expressing meaning. Since at least the nominal variants of nouns expressing processes (see Fontaine 2017) are considered more complex, we would expect the processing of nouns to involve more cognitive effort than the processing of verbs. Moreover, we assume that shifts from simpler to more complex variants, i.e. from verbs to nouns, are cognitively more effortful than shifts in the opposite direction. These hypotheses were tested using the eye-tracking data, operationalizing cognitive effort through the measures of total fixation duration and fixation count (Holmqvist et al. 2011). As cumulative measures, these are fairly general, potentially capturing various phenomena such as lexical access, preparing for the translation in addition to grammatical complexity. As it does not appear possible to disentangle these factors in a principled way in the given experiment design, the cumulative measures appear to be a plausible first step. Future work includes another experiment involving a more controlled setting which will allow to analyze more targeted eye-tracking measures. For the analyses of the eye-tracking data, we consider nouns that were shifted to verbs, verbs that were shifted to nouns, as well as random samples of 30 nouns and 30 verbs (see §3)

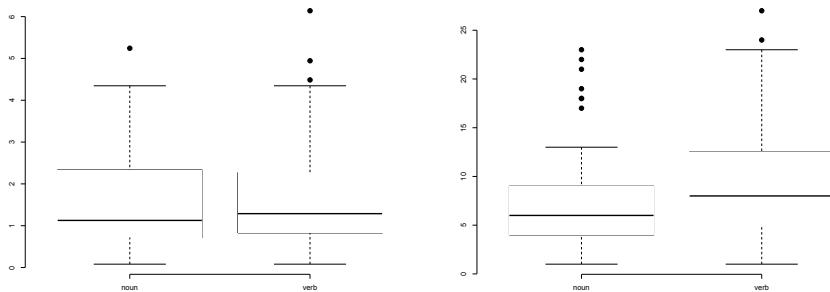


Figure 3: Total fixation duration (left) and fixation count (right) for nouns and verbs

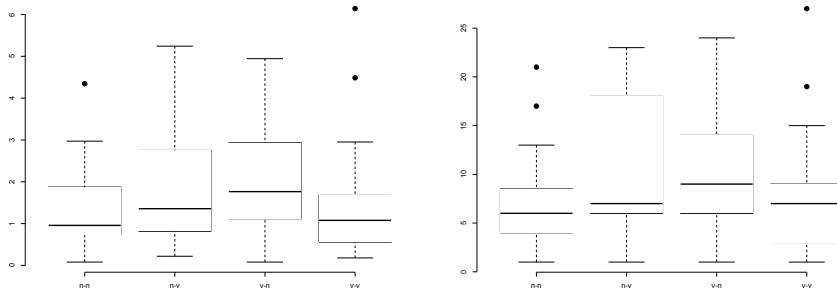


Figure 4: Total fixation duration (left) and fixation count (right) for noun-verb and verb-noun shifts

Boxplots in Figure 3 show total fixation duration and fixation count on the ST nouns and verbs.¹⁴ They indicate that, contrary to our first assumption, verbs in general are fixated slightly longer and more often than nouns. However, it is important to keep in mind that this representation averages over eye movements on all nouns and verbs under analysis, i.e. with and without shifts.

Figure 4 presents a more differentiated picture, showing the descriptive statistics for the four types of alignment pairs: 1) ST nouns that correspond to TT nouns, 2) ST nouns that were changed to TT verbs, 3) ST verbs that were shifted to TT nouns and 4) ST verbs that were translated into TT verbs. Comparing the

¹⁴The data with no shifts includes one ST verb and three ST nouns with no fixations. Since the words were translated, it is unlikely that they were not processed at all. Therefore, these cases are treated as NAs (not available) rather than zero values.

data with no shifts, we can see that the median for the fourth group involving verbs is very similar to that for the first group consisting of noun-noun pairs. Also the ST nouns that are shifted to verbs (group 2) has similar eye-tracking values. However, ST verbs that correspond to nouns in the TT (group 3) are characterized by longer total fixation duration and more fixations.

To analyze whether this difference is statistically significant and to account for additional sources of variation, two mixed-effects regression models were calculated using the lme4 R package (Bates et al. 2015). For the dependent variable of “Total Fixation Duration”, a linear mixed-effects model was selected. To approximate a normal distribution of this variable, it was log-transformed. Since “Fixation Count” represents count data, we chose a Poisson mixed-effects regression to model this eye-tracking value. The nominal independent variable labeled “Changes” contains four levels corresponding to the four types of alignment pairs discussed above. The model includes the confounding factor “Group (of participants)” to account for the fact that the target texts were produced by either professional translators or domain specialists, and “Length (of the ST item in characters)” as another control variable. We also added random intercepts for individual experiment participants and different source text words, as in some cases the analyzed word classes were realized by the same lexical items.

Table 6 summarizes the results of the fixed effects for the linear mixed-effects regression model with “Total Fixation Duration” as the dependent variable. The results of the fixed effects for the Poisson mixed-effects regression model with “Fixation Count” as the dependent variable are presented in Table 7. Statistical significance of the variable “Changes” was tested using a likelihood ratio test comparing the models with and without this independent variable. Moreover, the significance of simple effects, presented in the following table, was computed using the *lmerTest* package (Kuznetsova et al. 2016).

Examining the estimates for the four types of possible alignment pairs, we can see that the shifts from verbs to nouns lead to a larger increase in total fixation duration. This simple effect of the level of the variable “Changes” is significant ($p = 0.03$). Moreover, both types of shifts, i.e. from verbs to nouns ($p = 0.005$) as well as from nouns to verbs ($p = 0.03$), are associated with significantly more fixations on the corresponding ST verbs and nouns, as compared to nouns and verbs that are translated by the same word classes. The overall effect of the variable “Changes” reaches the conventional level of significance of 0.05 only in the Poisson regression model with “Fixation Count” as the dependent variable ($p = 0.09$ for “Total Fixation Duration” as the function of “Changes”; $p = 0.01$ for “Fixation Count” as the function of “Changes”).

Table 6: Linear mixed-effects model, “Total Fixation Duration” as dependent variable

	Estimate	Std. Error	df	z value	Pr (> t)
(Intercept)	-0.431	0.378	47.66	-1.14	0.26
Changes n-v	0.371	0.281	47.55	1.32	0.19
Changes v-n	0.49	0.214	51.72	2.29	0.03
Changes v-v	0.099	0.22	56.72	0.45	0.66
TranslatorGroup	0.123	0.32	12.98	0.39	0.71
STWordLength	0.04	0.04	41.58	1.01	0.32

Table 7: Poisson mixed-effects model, “Fixation Count” as dependent variable

	Estimate	Std. Error	z value	Pr (> t)
(Intercept)	1.62	0.28	5.85	<0.001
Changes n-v	0.38	0.17	2.2	0.03
Changes v-n	0.4	0.14	2.84	0.005
Changes v-v	0.12	0.15	0.85	0.4
TranslatorGroup	0.03	0.22	0.14	0.89
STWordLength	0.03	0.03	0.99	0.32

As pointed out before, our current analysis is based on cumulative eye-tracking measures, which may also include at least preparation of the translation. So, the increase in number and the total length of fixations for the verbs shifted to nouns could possibly be related to the added effort caused by the change into a noun. This is in line with our second assumption of increased cognitive processing associated with shifts to more complex structures. The potentially more effortful production of a more complex segment appears to be a viable explanation for the fact that the translation products still contain a certain amount of noun-verb shifts, although the contrastive differences in the distribution of nouns and verbs in English and German would predict an increase in the number of nouns in the translations. At the same time, we should consider that nouns shifted into verbs are fixated at least more often, if not (significantly) longer. Thus, it appears that the increased cognitive effort could be associated with a *change* in grammatical complexity during the process of translation, rather than with the *level* of com-

plexity in the source or target text segment. However, it should be kept in mind that word classes provide only an indirect link to phrasal vs. clausal complexity discussed in §2. Further information on grammatical context is required to enrich the performed analysis. Moreover, the cumulative eye-tracking measures used in this study may mask a more fine-grained effect of the inherent complexity of nominal versus verbal expressions. Future work addressing such delicate phenomena will also have to include separating the effect of lexical considerations from dealing with grammatical complexity.

6 Conclusion and outlook

We hope to have shown that shifts from verbs to nouns account for the majority of shifts between the main word classes in our data containing translations from English into German. Analysis of the keystroke logging data showed that shifts in word class tend to be implemented in one step. This result is in line with a previous study by Alves et al. (2014) based on the same data,¹⁵ which showed that over a half of all experiment participants produced just one translation solution for the analyzed ST passage. Moreover, the majority of participants did not change the initial level of grammatical complexity associated with their proposed translation, even if they did change their first translation version. The authors conclude that translators are likely to decide on the grammatical structure before they produce the first translation version, and, if they modify this version at all, then the changes tend to be lexical rather than grammatical Alves et al. (2014: 39). Although it is possible that producing one translation is accompanied by longer processing periods, it is more plausible to conclude that one-step translations are not linked to increased effort. This assumption is corroborated by another finding reported in Alves et al. (2014). The authors have shown that the three translations that do involve shifts in grammatical complexity between different versions (shifts between intermediate and final translation versions) appear to involve more cognitive effort Alves et al. (2014: 40). To test this assumption further, our next step should be to include the shifts in word class present in the intermediate versions into the analysis of cognitive processing associated with translation of nouns and verbs. Another interesting aspect for closer investiga-

¹⁵The translation experiment conducted within the project *PROBRAL* (see §3 for more details) was performed for two language pairs, namely for English-German and English-Portuguese. While the present study considers all the data for the translation direction English-German, the study by Alves et al. (2014) concentrates on the translations of one stimulus included into the ST but takes into account both German and Portuguese translations.

tion is the analysis of intermediate versions for shifts in word class where the aligned source and target texts do not indicate a shift (Niemietz 2014).

The regression models indicated some statistical association between the types of alignment pairs and the eye-tracking measures of total fixation duration and fixation count. There appears to be a tendency to fixate the verbs that correspond to nouns in the final translations longer and more often. Moreover, also the nouns that correspond to verbs in the final translations are fixated more often. In fact, the overall effect of the variable “Changes” is significant for the model operationalizing cognitive effort in terms of “Fixation Count”. These initial findings suggest that changing grammatical complexity in general might be effortful.

In this paper, identification and linguistic annotation of the relevant intermediate versions was performed manually for the experiment data examined. Automatic tokenization and part of speech annotation of the keystroke logging data allows for processing of more data points necessary for more detailed statistical analyses. Such automatic part of speech annotation of intermediate versions has been recently developed (Serbina, Niemietz, Fricke, et al. 2015) but is, at the moment, applicable only to the keystrokes collected with Translog II. Once it is extended to allow analyses of the Translog 2006 files, such as the ones generated in this translation experiment, the process-based investigations should be repeated taking into account not only random samples but all alignment pairs of the types ‘noun-noun’ and ‘verb-verb’, since these can also be characterized by intermediate versions. Even without such advanced methods, this paper has already shown the kind of more detailed test of long-held assumptions that a combined product and process-based analysis of linguistic features can yield.

Acknowledgement

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Chapter 8

What does a translator do when not writing?

Daniel Couto-Vale

In this paper, I revisit the notion of translation unit in both a production and a product sense. In particular, I present evidence that the relation between writing bursts (production segments) and grammatical structures (product segments) is not as simple as currently assumed and that the length of writing pauses does not directly correspond to cognitive effort in translation. Finally, I contrast my approach to pauses with Dragsted's (2005) and present evidence that typing pauses might be less biased indicators of cognitive effort than the standard writing pauses currently being used.

1 Introduction

In process-oriented translation studies, researchers report using a diverse set of devices for tracking translator's behaviour, amongst which keystroke loggers play a central role. When observing and describing the translation process, "typing" pauses are often used as indicators of cognitive effort (Hansen 1999; 2002; Alves 2003; PACTE 2005; Dragsted 2004; 2005). However, in most studies if not all, very little attention is given to what physically happens when someone interacts with a keyboard. In this paper, I shall explain how the keyboard layout and the translator's typing habits can enlarge and shorten the interval between two writing actions independently of how difficult the translation task is and I shall demonstrate how the writing system and the lexicogrammatical system of the target language cause pauses in writing of their own, which are unrelated to the translation task. Finally, I shall propose an experimental setup and a post-processing of keyboard logs aimed at discounting the time spent with translation-unrelated behaviour to achieve a better approximation of the time spent translating, that is, the time spent on intellectual bilingual activity.



1.1 Key-moving, typing and writing actions

When a translator types, the translator moves keys down and up. These key-moving actions are called by some **key down** and **key up** (e.g. Javascript key listeners), by others **key press** and **key release** (e.g. Java key listeners), and by others **key press** and **key break**. I shall refer to them as **key down** and **key up** actions because that term pair seems the least prone to misunderstanding.

To ground this discussion, I shall start by pointing out that a keyboard is not a tool simply for inserting, replacing and removing characters in the text area. There are at least two software levels above a key-moving action¹: the typing system² and the writing system³.

Descriptively speaking⁴, a keyboard layout maps each key to a key value. Counting from left to right in rows and top down in a single column, keys may be numbered #1, #2, #3... until the last key in the lower right corner of the keyboard. Keyboards vary greatly in how many keys they have. After numbering them in such a way, a keyboard layout can be understood as the mapping of a key index such as #1, #2, and #3 to a unicode character such as LATIN SMALL LETTER A (U+0061), CIRCUMFLEX ACCENT (U+005E), and SPACE (U+0020).

Let us consider that a particular typing system has one or more of such keyboard layouts. And let us consider that some key-down and key-up actions trigger the replacement of a layout by another. For instance, let us say that Layout *LC* maps the key #60 to the value LATIN SMALL LETTER A (U+0061) whereas Layout *UC* maps the key #60 to the value LATIN CAPITAL LETTER A (U+0041). Finally, let us assume that both layouts map the key #87 to the value SHIFT IN (U+000F). Now let's say that there is a layout controller that does the following. It keeps a **U+000F key state**, which can be either **low** or **high** and it updates the shift key state to low whenever the **U+000F key down action** is performed and it updates that state to high whenever a **U+000F key up action** is performed. Moreover, let us assume the layout controller applies Layout *LC* to key-moving actions whenever the shift key state is high and applies Layout *UC* to them whenever the shift key state is low.

¹A.k.a. a keyboard event in informatics

²A.k.a. a layout controller in informatics

³A.k.a. an input system in informatics

⁴The description I shall make does not necessarily correspond to any actual software implementation. It is a description of typewriting for the purpose of advancing translation studies and not a documentation of any particular driver, operating system or word processor.

Finally, let's suppose a writing system works in the following way. The writing system would have a typing layout that maps typing actions to writing actions. For instance, a particular typing layout would map the typing action U+0061 key down to the writing action U+0061 char insert, the typing action U+0041 key down to the writing action U+0041 char insert, while assigning the typing actions U+0041 key up, U+0041 key up, U+000F key down, U+000F key up to no writing action.

Assuming the above process, the following key-moving actions would be recognised as the following typing actions, which in turn would be recognised as the following writing actions (see Table 1). The fourth column contains the resulting text with the resulting cursor position (see §1.2 for more on text versions and cursor positions).

Table 1: Key-moving, typing, and writing actions

key-moving	typing	writing	resulting text
#60 key down	U+0061 key down	U+0061 char insert	a
#60 key up	U+0061 key up		a
#87 key down	U+000F key down		a
#60 key down	U+0041 key down	U+0041 char insert	aA
#60 key up	U+0041 key up		aA
#87 key up	U+000F key up		aA
#60 key down	U+0061 key down	U+0061 char insert	aAa
#60 key up	U+0061 key up		aAa
#60 key down	U+0061 key down	U+0061 char insert	aAaa
#60 key up	U+0061 key up		aAaa

Here is where the first issue lies. A large portion of translation process studies was developed with “key-logging” software that does not record key-moving and typing actions. One of the most used software in translation studies is Translog® and it only records writing actions. However, as we can see in Table 1, inserting some characters such as ‘A’ (U+0041) takes more typing actions than inserting other characters such as ‘a’ (U+0061): the first char insert action is realised by moving down the shift key to switch the keyboard layout and by moving down the U+0041 key (both keys need to be moved up afterwards); the second char insert actions is realised simply by moving down the U+0041 key. Because of this, the interval between inserting the char ‘a’ and the char ‘A’ is likely to be

larger than the interval between the char ‘a’ and the char ‘a’. Similarly, because the number of keys that need to be moved up after inserting the char ‘A’ is larger than after inserting the char ‘a’, the interval between inserting the char ‘A’ and the char ‘a’ is likely to be larger than the interval between the char ‘a’ and the char ‘a’.

In this way, if we take the whole time between two char insertions to be a pause in typing/writing, two typing/writing pauses of the same length may include sequences of finger movements of various lengths. If we do this, we can make no claim that similarly long pauses correspond to a similar amount of cognitive effort since part of this time is spent moving keys down and up after a decision of what to write has been made.

The ideal and long-lasting solution for this issue would be to update ‘key-logging’ software so as to start logging key-moving and typing actions. With this new kind of log, we would be able to see when typing indeed stops and when it indeed resumes. However, in the absence of a more precise solution and in the presence of large expensive corpora containing solely writing actions, I shall propose a way to treat writing pauses in a less naïve way so that some correspondence between such pauses with typing-unrelated effort can be established (see §2).

1.2 Text Versions

Let us assume, as some linguists do (Hasan 1999), that a human language ‘includes’ texts.^{5,6,7} That means, when a text is received, it not only occurs but also becomes an option of what to say in a language. Let us also assume that a language is the meaning potential in Halliday’s sense, in other words, that it is not a lexical or grammatical potential in Chomsky’s sense⁸ (1957) and that it is not

⁵This section does not focus on the dichotomy between text production and text as product.

⁶The notion of series of text versions, which applies both to translation and to other kinds of text production, is not covered by Vermeer’s model of translation.

⁷The understanding of a final target text as a translation product (“translatum”) as proposed by Vermeer in his Skopos Theory (Vermeer, 2004[1989]) follows the ancient dichotomy between text production (*τῇ ποίησις* ‘poiesis’) and text as product (*τὸ ποίημα* ‘poema’), which traces back to Plato’s discussion about who the narrator of Iliad and Odyssey is. Similarly to the difference in function (“Skopos”) between an original text and its translations, ancient rhetoricians were concerned with the fact that Homer composed Iliad and Odyssey once whereas several citar-playing singers performed those epoi multiple times throughout the ages.

⁸According to Chomsky, a language consists of all words and all grammatical rules for combining them.

a graphological potential in Eddington's sense^{9,10} (1929, p. 72). From such a perspective, a physical text is a print of a semantic form, which also gets called 'text'. For that reason, two distinct prints of 'the same play' can be understood as being 'two physical texts' *as instances* (token) but also as expressing 'the same text' *as a semantic form* (type). In that linguistic sense, each text version during translation is a separate text (*a separate instance*) and each new text version that is different from all previous ones expresses a new text (*a new semantic form*). In other words, from this perspective, language is a semantic potential, not a lexicogrammatical nor a graphological potential, in the same way as a text is a semantic form, not a lexicogrammatical form (a sequence of words) nor a graphological form (a sequence of characters).

From a formal perspective, a semantic form such as the play Romeo & Juliet is realised by a grammatical form in the sense that the semantic structure is associated with a corresponding lexicogrammatical structure (a sequence of words). In turn, the lexicogrammatical form is associated with a graphological form in so far as the lexicogrammatical structure is associated with a graphological structure (a sequence of characters). At the graphological stratum, when only one resolution, one font, one font format (size, font style, weight, colour, fill colour, underline, baseline shift, character spacing, shadow, etc.), and one single-column text area are available, a graphological form consists solely of a sequence of characters, and a graphological structure is an instance of that sequence of characters. Finally, at the graphic stratum, a graphological structure resulting from a combination of resolution, fonts, font formats, text areas and character sequences is associated with a graphic structure, which can be a series of different coloured pixels in a grid on screen or on paper (digital alternative), or a series of glyphs stamped, carved, or drawn (analogical alternative).

When studying the translation process with the help of key-logging software such as Translog®, the graphological stratum is strongly constrained. The only graphological system that a translator has control over is the one that is responsible for the selection of character sequences. It is this limited stratum (the grapho-

⁹This tradition of making arguments by supposing a random choice of letters traces back to Cicero when he stated that the annals of Ennius could be written by throwing a bag of metal letters on the floor whereas a poetry verse could not be created in such a careless way (De nātūrā dēōrum II, 37 § 93).

¹⁰During the development of set and probability theory, Borel (1913: p. 194) conceived of texts again as strings, i.e. as sequences of characters. According to him, a team of illiterate typists would create random sequences of characters and would create one day by chance all texts conserved in the largest national archives. Eddington made the same argument for monkeys typing the texts in the British Museum.

logical stratum) that interacts with the writing process. In this restricted environment, each character sequence is a different graphological form that is completely or partially associated with a text at the semantic stratum. And, in this context, each writing action such as **U+0041 char insert**, **left char erase**, and **right char erase** alter the graphological form and potentially the associated grammatical and semantic forms. Therefore, these writing actions are actions of replacing one text by another. In that sense, during a translation, we can talk about a series of target texts. Each pair of consecutive target texts is the input and the result of a text-replacing action, which is a writing action.

I shall follow Halliday (1987) and call each node in this series of texts a **version**. The **initial version** is an empty character sequence, and the **non-initial versions** are the **products of writing** or simply **products**, the **final version** is the **final product [of writing]**, and **non-final products** are **intermediate versions**. Finally, **intermediate products [of writing]** are what Halliday calls **drafts**.

However, not all writing actions are meant to replace a text by another. Some of them change the state of the a text in text production. Some typing and mouse/trackpad actions are associated with cursor motions such as **cursor back**, **cursor forward**, **cursor up**, **cursor down**, **cursor to [x]**, **cursor to line start**, **cursor to line end**, **cursor to area start**, **cursor to area end**, and with text span selection such as **back select**, **forward select**. Those are text-affecting actions that alter the state of a text (dot and mark positions) but do not replace a text by another.

In the process of writing, mouses/trackpads present an additional methodological issue for empirical studies of cognitive effort in translation. Mouse actions associated with writing actions such as **cursor to [x]** demand the displacement of either the right or the left hand from the keyboard onto a mouse or a trackpad. However, this action is logged either only at the advent of a mouse click or from the moment the pointer starts moving. The time taken for the hand to reach the mouse/trackpad is also part of this action but is not logged. I see no solution in the short term to detect the point in time when the writing action of placing the cursor at a position with the mouse starts ,since we cannot easily track with current technology when a translator starts moving his or her hand onto the mouse/trackpad. Moreover, due to their relatively infrequent occurrence, an estimation of the duration of mouse/trackpad-related non-tracked hand-motion shall not be attempted in this paper.

1.3 Pauses in Typing

Still in the process of writing, there is another much more frequent and yet non-tracked hand-motion: simple typing. Typing has been often described as happening in bursts. In that description, typing would be cuttable into units of text-production separated by typing pauses. In that sense, typing rhythm would be a good behavioural evidence for underlying cyclic cognitive processes. However, even though a cyclic translation process is a reasonable model of what happens during translation, the analysis of typing rhythm has not been an unbiased one. Researchers did not start studying typing rhythm without an expectation of what they would find. They were in a search for evidence that a particular model of translation was the case. In other words, a cyclic cognitive model was assumed and evidenced with typing rhythm.

The assumed translation cycle consists of three steps: 1) a character sequence associated with a complete grammatical structure of the source text is read, 2) then the source text segment is mentally translated into a target text segment (semantic structure), and 3) only then a character sequence realising an equivalent grammatical structure would be fully written. Given the underlying model of translation, it became imperative that the typing bursts and consequent writing bursts resulted in additions of grammatical units.

This naïve assumption that translation cycles would be the sole reason for typing bursts is pervasive and is at the core of descriptions of translation process. These studies aim at relating spans of writing actions (typically between pauses of a given size) with a **grammatical structure under translation**. However, this naïve assumption of direct correspondence between typing bursts and a translation cycle opposes on the other extreme a rather counter-intuitive assumption that random or non-grammatical segments of the character sequence of the source text are read and translated at a time.

Because the counter assumption is so unlikely to be the case, I do not want to give the impression that this cyclic process is not a reasonable approximation of what happens, but I shall claim that the boundaries of the source text segment under translation is by no means the only reason why a typing pause occurs between the production of two adjacent grammatical structures. As I shall point out next, there are several other reasons for a pause to occur that are completely unrelated to a ‘grammatical structure under translation’. I shall bring some examples of places where I found translation-unrelated typing pauses in writing for supporting this viewpoint. Examples are in German. They are sequences of **char insert** actions separated by either breve (˘) or long (˙) typing pauses (see §2 for an explanation of these pause lengths in terms of milliseconds and for es-

timations of typing pause length based on writing pause length). The symbol · indicates a **space char insert** action.

- (1) · A~u~f~w~a~n~d~s~· (Translator 2)
- (2) · F~ä~h~i~g~k~e~i~t~· (Translator 2)
- (3) · 7~5~· (Translator 2)

In Example 1, the pause we see happened between two bound morphemes of a genitive noun in German. In German, there are two alternative character sequences that can realise the suffix for this genitive word, namely es as in *Aufwandes* or s as in *Aufwands*¹¹. Both character sequences realise the same grammatical structure, one being possibly more expected than the other in the situation type that the text implied. However, this grammatical structure – a bound morpheme – does not correspond to any bound morpheme in the English source text. Therefore, the pause does not correspond to the boundary of a grammatical structure under translation. Table 2 shows a reconstruction of the typing process based on the writing actions we have in our logs. The longer pause between U+0064 **char insert** and U+0073 **char insert** is represented by a table break.

Now, let us move to Example 2. Here we find a very interesting pause from a cognitive perspective. As far as lexicogrammatical composition is concerned, here we have the lexical item Fähigkeit as in *die Fähigkeit einer Papierkugel [das zu tun]* ‘the capacity of a paper ball [to do that]’. This lexicogrammatical structure is a mention of a paper ball’s capacity to do something which is lexically agnate to *die Kraft einer Papierkugel [das zu tun]* ‘the power of paper ball [to do that]’. In this case, Fähigkeit is in the same lexical set as Kraft. These two lexicogrammatical structures are also grammatically agnate to other more congruent representations of the same physical phenomenon such as *die Papierkugel ist fähig [das zu tun]* ‘the paper ball is capable [of doing that]’, *die Papierkugel kann [das tun]* ‘the paper ball can [do that]’, and *die Papierkugel [leistet das]* ‘the paper ball offers that’. Because all these representations are agnate, we can expect that translators could have considered two or more of those options when translating that passage. In particular, as an alternative to *die Fähigkeit einer Papierkugel [das zu tun] ist ein Faktum* ‘the capability of a paper ball [to do that]’ is a

¹¹Explaining how the standard (phylos) of human language named Modern High German developed from other standards in the past (phylois) demands an observation timeframe of hundreds of years (phylogenetic timeframe). Since the current observation timeframe is of a few seconds (logogenetic timeframe), etymological considerations such as the appearance of such suffixes should play no role.

Table 2: Key-moving, typing, and writing actions for Example 1

key-moving	typing	writing	resulting text
#87 key down	U+000F key down		
#60 key down	U+0041 key down	U+0041 char insert	A
#60 key up	U+0041 key up		A
#87 key up	U+000F key up		A
#45 key down	U+0075 key down	U+0075 char insert	Au
#45 key up	U+0075 key up		Au
#63 key down	U+0066 key down	U+0066 char insert	Auf
#63 key up	U+0066 key up		Auf
#24 key down	U+0077 key down	U+0077 char insert	Aufw
#24 key up	U+0077 key up		Aufw
#60 key down	U+0061 key down	U+0061 char insert	Aufwa
#60 key up	U+0061 key up		Aufwa
#82 key down	U+006E key down	U+006E char insert	Aufwan
#82 key up	U+006E key up		Aufwan
#62 key down	U+0064 key down	U+0064 char insert	Aufwand
#62 key up	U+0064 key up		Aufwand
#61 key down	U+0073 key down	U+0073 char insert	Aufwands
#61 key up	U+0073 key up		Aufwands

fact’, the same translator might have considered an alternate representation such as *die Tatsache, dass eine Papierkugel fähig ist, [das zu tun], ist ein Faktum* ‘the fact that a paper ball is capable [of doing that] is a fact’¹². However, when comparing the lexical options of grammatically agnate translation alternates, a particular pair of lexical items shows a graphological resemblance (resemblance in terms of character sequences): in the same way as in English, the Base morpheme of the words *Fähigkeit/Fähigkeiten* ‘Capacity’/‘Capacities’ resembles the base of its agnate *fähig/fähiger/am fähigsten* ‘capable’/‘more capable’/‘most capable’. The resemblance between these two lexical words happens both in graphological form (sequence of letters) and in semantic form (meaning), but not in grammatical affordances (the structures they can fit in). Moreover, the resemblance is present not due to a derivation process such as the one that led the Old German term

¹²The way other translators chose to translate this passage reveals that such a structure was considered by at least some of the translators.

fāhan/fāhanan to evolve into the lexical items *fähig sein etwas zu tun* ‘being capable of doing something’ and *ein Tier oder jemanden fangen* ‘encarcerating an animal or someone’, but due to a synchronic graphological and semantic connection between the two. In this sense, it is quite interesting that a translator stopped shortly at the end of the overlap in graphological form between the agnate lexical words: namely, at the end of *Fähig*-insertion and before *keit*-insertion during *Fähigkeit*-insertion. Furthermore, even if the pairing of graphological and semantic forms *fähig:Fähigkeit* could be taken as evidence for a Construction Grammar explanation of how these structures came to exist in German, it is very unlikely that this translator had *capabil:fähig* and *ity:keit* in separate source text segments under translation, that is, that this translator translated each segment – the one before and the one after the typing pause – in a different translation cycle. Even if I claim this second hypothesis is unlikely, how much of such a typing pause is due to the overlap of graphological structures in the target language, and how much of it is due to a truly bilingual intellectual process, is still unresolved at the current stage of research.

Finally, Example 3 shows another process that seems unrelated to translation. The pauses before and after writing the number 75 may be in fact an indicator that 75 in the source text reading *seventy five* is indeed aligned with 75 in the target text reading *fünfundsiebzig* ‘five and seventy’. What is interesting here from an alignment perspective is that there is a pause in between 7 **char insert** and 5 **char insert**. Since the order of digits is different in written and spoken German, the question that one can raise is whether part of the pause before and after those actions was due to a cognitive writing procedure in which the translator cognitively writes *fünf und •siebzig* •*fünf und siebzig* ‘five and •seventy •five and seventy’ and only physically writes •*siebzig* ‘•seventy’ with 7 **char insert** and •*fünf* ‘•five’ with 5 **char insert**. This underlying cognitive writing would imply that the pauses before 7 **char insert** and after 5 **char insert** are longer than the one in between, and that is indeed what happens, these pauses being approximately 2⁶ times the length of the middle one, which is already significantly longer than average (more on quantifying pauses in §2). This pause pattern does not prove that the above cognitive writing happened. Understanding this pattern as caused by such a cognitive writing is simply a way of explaining translators’ behaviour, which might be plausible for some and less plausible for others that have other explanations. Alternative explanations might include, for instance, lack of practice by the translator with digit key typing: consequently, translators would switch

between looking at the screen and at the keyboard before inserting the first digit and after inserting the last digit of a number¹³.

Since there are many reasons for pauses in typing to occur, it would be naïve to hold the assumption that such pauses mostly indicate a grammatical structure boundary that corresponds to source text segments under translation and to a translation cycle. In other words, what I aim at foregrounding is that there is an issue with the standing assumption that typing pauses would be mostly due to an iterative segmentation of the source text into translatable units followed by a translation of each unit. A direct mapping of typing rhythm onto translation cycles is not to be achieved when a thorough and close analysis of typing behaviour is carried out.

1.4 Erase actions

In addition to the assumption of translation boundaries at pauses, another problematic assumption is that online revisions, i.e. revisions during the drafting phase, are related to change in the choice of semantic features. Some of these pauses indeed seem to be semantically motivated, whereas for many others such an interpretation seems questionable. In the following examples, the symbol \otimes indicates a **left char erase** action, where **left char** is the character left of the cursor.

- (4) ·~K~f \otimes r~a~f~t~· (Translator 2)
- (5) ·~k~e~i~e~n~ \otimes s~ \otimes \otimes \otimes n~e~s~· (Translator 2)
- (6) ·~b~v~ \otimes e~s~t~e~h~t~· (Translator 2)

In Example 4, what might have happened is something along the following lines. The translator had the right hand well positioned on the keyboard and the left hand somewhat misplaced and was aware of it. When typing, the left shift key was still under the left hand and was quickly moved down, which was followed by a ‘**k**’ **key down** action with the right hand in regular speed. However, after inserting the ‘**k**’ character, the time taken to insert the next character, namely ‘**f**’, is longer than usual. Here, the translator might have had the need to reposition

¹³Notice that the typicality of typing pauses and the occurrence of them in other similar co-texts do not give us information about what is going on during these pauses. We need to observe the process as a whole and characterise each pause point on its own terms with different cognitive/behavioural hypotheses. What may be the case for one translator may not be the case for another.

his/her left hand and accidentally moved down the ‘f’ key instead of the ‘r’ key. In the German keyboard used in the experiment, the ‘f’ key is directly below the ‘r’ key and a badly positioned left hand is a sufficient reason for a ‘typo’. After inserting ‘f’ instead of ‘r’, there is another long pause¹⁴, which is followed by a **left char erase** action. Such pauses and such an erase action do not seem to have anything to do with any bilingual process.

In Example 5, something else happens. The translator ends up writing the word *keines*, but in the first run of char insert actions, he or she writes *keien* instead of *keine*. The issue here was not one of moving the wrong keys, but one of moving the right keys in the wrong order. A good point to notice here is that the ‘e’ key **down** action is usually performed with the left hand with a German keyboard whereas the ‘n’ key **down** action is usually performed with the right hand. This means that this mistaken order happened when coordinating the motion of both hands. The correction procedure is quite interesting too. Only part of the problem is solved by the first attempt, resulting *keies* instead of *keines*, this is again noticed and the second revision procedure leads to the version *keines*.

Example 6 is not so simple. Here the translator ends up writing *besteht*, but types two letters very quickly and with the same hand. In the German layout used, the ‘v’ key and the ‘b’ key are adjacent and are both right of the index finger (the finger a translator would move these keys down with). Was it that the translator was unsure which key was the ‘b’ key and moved both down in a sequence to decide which character to keep on screen or was it that the translator just moved both keys down accidentally? I do not have an answer for such a question. But one thing is for sure, this was not a bilingual process, not even a monolingual process in the sense of choosing what to say.

Furthermore, there is another type of revision that seems to be related to the translation process in a rather ‘non-linguistic’ way. Such revisions are also not graphological, nor lexical, nor grammatical, nor semantic. Examples 7 and 8 illustrate these. In such cases, the translator seems to copy the source text instead of writing a target text. In Example 7, the character sequence under translation is *demands*, the target character sequence is *bedarf*. Grammatically valid alternatives in German could have been *bedürfte*, *benötigt*, *braucht*, and *bräuchte* but no word starting with *d*. Example 8 shows a similar phenomenon: the source character sequence is *paper* and the target character sequence is *Papier*. However,

¹⁴It is definitely the case that some online revision are initiated by a production failure being detected in quality monitoring processes. Missed keys are an example of such cases since it is by comparing the intended text and the produced one that such mistakes (typos) are likely to be detected and fixed.

the translator writes *Pape*. Is it the case that he or she just missed typing the ‘i’ key, or that he or she copied the source character sequence instead of writing the target one? Again, I do not have an answer for this, but it does not seem to be a bilingual process in the typical sense of what we understand by translation.^{15,16}

(7) ·̄d̄✉b̄ēd̄ār̄f̄· (Translator 2)

(8) P̄āp̄ē✉īēr̄· (Translator 2 : 1st ‘Papier’)

Other revisions such as Examples 9 and 10 look more linguistic. However, they are also not grammatical: the first is a replacement of a *latin small letter P* by a *latin capital letter P* and the second is a replacement of *latin capital letter G* by a *latin small letter G*. As seen before, replacements of characters are not performed necessarily with one **left char erase** action followed by one **char insert**. It may take more than two writing actions for realising the replacement of one character: in Example 10, a total of eight writing actions were performed for changing one letter from capital to small. Tables 3 and 4 show the series of resulting texts for both examples.

(9) ·̄p̄✉P̄āp̄īēr̄· (Translator 11 : 6th ‘Papier’)

(10) ·̄Ḡr̄ō✉✉ḡ✉✉ḡr̄ōß̄ēn̄·

As far as translation studies are concerned, such online character replacements are not very interesting, and pauses related to them, independent of how long they are, should not be assumed to be motivated by the boundaries of grammatical structures.

1.5 Lexicogrammatical choice

Other pauses and online revisions appear to be motivated by lexicogrammatical choice. However, some of them do not occur in grammatical boundaries, not even when taking bound morphemes into account. The motivation for the pauses,

¹⁵This source text copying does not seem to be an effect of ‘priming’ given that the translator is unlikely to accept the source language character sequence as a valid word in the target language. However, the notion of priming could be applied to other examples if translators choose a marked lexical item instead of a less marked one because of string similarity or shared etymological origin of the lexical items in both languages.

¹⁶As for any other online revision preceded by a breve typing pause, a quality-monitoring process can be inferred for such cases.

Table 3: Writing actions of Example 9

writing	resulting text
U+0070 char insert	p
left char erase	
U+0050 char insert	P
U+0061 char insert	Pa
U+0070 char insert	Pap
U+0069 char insert	Papi
U+0065 char insert	Papie
U+0072 char insert	Papier

Table 4: Writing actions of Example 10

writing	resulting text
U+0047 char insert	G
U+0072 char insert	Gr
U+006F char insert	Gro
left char erase	Gr
left char erase	G
U+0067 char insert	Gg
left char erase	G
left char erase	
U+0067 char insert	g
U+0072 char insert	gr
U+006F char insert	gro
U+00DF char insert	groß
U+0065 char insert	große
U+006E char insert	großen

as we shall see next, seems to be at the graphological stratum, namely at the comparison between character sequences. If you are familiar with German, take some time to read Examples 11-15 before going. Make your own conjectures and contrast them with mine.

- (11) ·-g-ǟn̄z-~~ǟn̄z~~-~~ǟn̄z~~-ǟn̄z-T̄īc̄h̄·
- (12) ·-ēīn̄ēs̄-~~s̄o~~-l̄c̄h̄ēn̄·
- (13) ·-D̄īē-~~ǟn̄z~~-~~ǟn̄z~~-ǟn̄z-V̄ēr̄h̄āl̄t̄ēn̄·
- (14) ·-d̄-ēr̄-~~s̄~~-V̄ēr̄h̄āl̄t̄ēn̄s̄-
- (15) ·-w̄-ēīt̄-ēr̄ē-~~w̄~~-K̄ōm̄p̄r̄ēs̄s̄īōn̄-z̄ū-w̄īēd̄-ēr̄s̄t̄ēh̄ēn̄-

In Examples 11 and 12, we see a very interesting pause and erase pattern. I suspect the translator was unsure whether to write the more frequent *eine ganz andere Geschichte* ‘a whole different story’ and *so eines Balls* ‘this kind of ball’ or the less frequent and register-specific variants *eine gänzlich andere Geschichte* ‘a completely different story’ and *eines solchen Balls* ‘such a ball’. The overlap between the underlined strings is *gänzlich* and *solchen*. Coincidentally or not, the translator paused once at the end of each overlap and, in Example 11, he or she erased the left characters up to the end of the first overlap, where he or she could finish the word either as *ganz* or as *gänzlich*, and ended up choosing *gänzlich* and writing it without pauses until the end. Are these pauses motivated by lexical choice? I would say so.¹⁷ But are their locations motivated by word boundary? I would say no. Comparison of graphological classes of words (comparison of strings) seems to be the motivation.

Moreover, in logs of writing actions we find not only direct replacements of lexical words, but also indirect clues that such a replacement took place in an underlying cognitive process. It seems to be the case that the translator first produces a segment of the target text cognitively and then writes this cognitive segment down. While writing the segment down, it seems to be the case that the translator continues the production of the target text and, depending on what comes, he or she needs to change parts of this text that were already written down.

¹⁷ 6 other translators chose *eine ganz andere Sache*, 1 *eine ganz andere Frage*, 1 *eine ganz andere Angelegenheit*, 4 *eine komplett andere Sache*, 1 *doch eine andere Angelegenheit*. This indicates that the deictic modifier *ganz* is the least marked one for this co-text, followed by *komplett*, followed by the once produced modifiers *gänzlich* and *doch*.

Examples 13 and 14 are evidence that such a process might happen. In both cases a ‘feminine’ Deictic word¹⁸, namely *Die* and *der*, was replaced by a ‘neutral’ Deictic word, namely *Das* and *des*. In German, Deictic words typically agree with the Thing word in grammatical gender: masculine *der/den/dem/des*, feminine *die/die/der/der*, and neutral *das/das/dem/des*. I looked up in a synonyms dictionary what could be alternative ‘feminine’ Thing words for *Das Verhalten* and *des Verhaltens*. There were many. However, since the translator made a pause after *Ver* in *Verhalten*, I assumed the lexical item he or she was considering might start with *Ver* and continue with a different letter than *h*. Then I listed all ‘feminine’ alternatives starting with *Ver* and reached the following list: *Verhaltungsweise*, *Verhaltensweise*, and *Verfahrensweise*. Only *Verfahrensweise* has a letter different from ‘h’ following *Ver*. So, if the assumptions that the translator revisited his/her lexical choice and that he/she stopped at that point because of the string overlap are right, the other lexical item considered for that position might be *Verfahrensweise*, as in *Die Verfahrensweise* and *der Verfahrensweise*. Such a claim has no scientific validity at the current stage, but being able to make such hypotheses might be helpful. Researchers can ask the translator right after the translation whether this was indeed a lexical choice they considered. It might be the case that translators are able to recall what they considered at that point in time.

When looking at these examples, one might assume that only adjacent words or Deictic words within a nominal or verbal group such as *das Verhalten* ‘the behaviour’ and *die Verfahrensweise* ‘the behaviour’, or such as *hat sich so verhalten* ‘behaved in this way’ and *ist so verfahren* ‘behaved in this way’, would be subject to such changes. Example 15 shows that neither the notion of adjacency nor the notion of co-constituents is sufficient for explaining such phenomena. In this case, the translator had three gender options and four case options for the nominal group. Given the replacement of *weitere* ‘further’ by *weiterer* ‘further’, I suspect that this was a choice between accusative and dative cases for the feminine gender. For this hypothesis, the translator considered the options of

¹⁸Following the tradition of Systemic Functional Linguistics, the contextual function of words is capitalised. For instance, the word *selbe* in *dieselbe rote Regenjacke* ‘the same red rain jacket’ is as much an adjective as the word *rote* because both of them are inflected in the same way. However, *selbe* works as a Deictic₂ because it relates the mentioned jacket with previously mentioned or previously observed jackets whereas *rote* works as a Classifier because it adds a color restriction for discriminating the jacket. Meanwhile, the word *rain* also works as a Classifier because it adds a functional restriction for discriminating the jacket. Despite this fact, it is not an adjective itself. In that sense, Deictic, Classifier and Thing are functions of words and not inflectional classes of words such as determiner, adjective and noun.

feminine accusative *weitere Kompression* ‘further compression’ and of feminine dative *weiterer Kompression* ‘further compression’. The combination of a fixed gender with a variable case would imply that the lexical item *Kompression* ‘compression’ was already selected for the nominal group and that the lexical item for the verbal group *etwas widerstehen* ‘to resist to something’ was not.

This hypothesis is very interesting from a linguist’s perspective. A ‘compression’ is not a physical thing. It is rather something that we would rather call an ongoing process. Such ‘processual things’ often have the role of Scope in a material figure (Halliday & Matthiessen 2004: 192), and are typically represented in clauses with the following participant role sequence: Agent + Process + Scope as in [das] [tut] [*weitere Kompression*] ‘this does further Kompression’, [das] [macht] [*weitere Kompression*] ‘this makes further Kompression’, [das] [verursacht] [*weitere Kompression*] ‘this causes further Kompression’. The nominal group representing the processual thing and functioning as Scope is typically accusative, which justifies the default choice for accusative by the translator. However, the lexical item for the verbal group did not represent a process of doing, making or causing something, i.e. making something happen. It represented a process of resisting something, acting against some external force so that nothing happens. In German, the lexical item *etwas widerstehen* ‘to resist something’ happens in clauses such as [so ein Ball] [widersteht] [*weiterer Kompression*] ‘such a ball resists further Kompression’, which have a Scope Complement constituent that is a dative nominal group. Based on this, when the translator reached the ‘critical’ point for case selection, having decided that the next lexical item is *Kompression* ‘compression’ was not sufficient. He or she is likely to have selected the lexical item *etwas widerstehen* ‘to resist to something’ at this point in order to avoid a time-consuming online revision if this decision were to be postponed.

Moving on, it must have become clearer by this point that some typing pauses seem to be motivated by lexical item choice, but that simultaneously these pauses are not necessarily placed at the boundaries of grammatical constituents such as morphemes, words, groups, phrases, and clauses. They are often placed at the borders of overlapping character sequences among two or more considered graphological classes of words.

Whether this lexicogrammatical feature selection is a bilingual intellectual process is still open to debate. In my opinion, none of these revisions are necessarily supported by bilingual processes, and I can imagine they might also happen when writing an original text from scratch. These revisions may be more frequent in one activity than in the other. I do not have evidence for sustaining any claim in this or that direction.

1.6 Micro/macro units of translation

Online revisions are just one kind of revision. Since text-replacing writing actions are a process of replacing a text by another, I shall consider any sequence of text-replacing writing actions a **revision** at the graphic and graphological strata. Also assuming that one grammatical structure – namely, a non-random source text segment – is put under translation at a time, Alves & Couto-Vale (2009; 2011) defined the notion of a micro-unit of translation: the span of writing activity that produces a target text segment that is equivalent to a source text segment under translation. The first span of writing actions for a given source text segment equivalent was understood as a segment insertion (P0), and the replacements of that segment by other source text segment equivalents was understood as a segment replacement. The first replacement was classified as P1 if it happened in the drafting phase, and it was classified as P2 if it happened in the revision phase. The second, third and following replacements of equivalents of the same source text segment were classified as P3. Finally, a sequence of text revisions that affects equivalents of the same segment of the source text was conceived of as a macro-unit. A macro-unit is composed of one or more revisions: it contains necessarily a P0 revision, which is either final or followed by a P1 or P2 revision, which is either final or followed by one or more P3 revisions. ‘P’ here stands for ‘process unit’.

Whereas online replacements (P1 or P3) can be easily understood just by looking at a sequence of writing actions, the understanding of revision phase replacements (P2 or P3) depends strongly on the reconstructed text and on the position of the cursor during erase actions and char insert actions. In the log of writing actions, they look like this: `~ABD~`.

However, there is nothing special about those events in the nature of replacements as far as what they actually do to the target text, except that, as Alves & Couto-Vale (2011) point out, translators seem not to go back to the source text so often during the revision phase. Therefore, the reasons for replacements during that phase are even less directly motivated by the source text, and possibly not supported by any bilingual intellectual process. This means that, as the translation moves from P0 to P3, chances are that the translator thinks progressively less bilingually and progressively more monolingually.

Taking this into account, it is important to notice that the very notion that supports such a micro-unit and a macro-unit rationale is a correspondence or an alignment between source and target lexicogrammatical structures. This is the very assumption that makes us researchers in translation studies want to

take process units as evidence for anything in the process of translation. But are we misguided in taking the micro-units, as Alves & Couto-Vale (2009; 2011) call them, to be *any* span of writing actions between pauses in typing of a given length? I am afraid we are. If the amount of grammatically unrelated phenomena that motivates pauses were not enough evidence, let us consider the following example:

- (16) *d̄i ē - K̄ r̄ ā f̄ t̄ - ā ū f̄ ḡ ē w̄ ē n̄ d̄ ē t̄ ē
 - K̄ f̄ - ā r̄ ā f̄ t̄ - z̄ ū - .
 K̄ ō m̄ p̄ r̄ ē s̄ s̄ ī ō n̄ s̄ k̄ r̄ ā f̄ t̄ .*

In Table 5, when considering replacements at the grammatical stratum, it seems reasonable to imagine that the nominal group had three versions. The first version is completed at text version 3, thus resulting in the P0 minor-unit of translation 0-3; the second version of the nominal group would be complete at text version 9, thus resulting in the P1 minor-unit of translation 3-9; an incomplete attempt would end at version 11, resulting in the P3 minor-unit of translation

Table 5: Target text segments during each pause of Example 16

text version	character sequence segment
0	
1	die·
2	die·K
3	die·Kraft
4	die·
5	die·aufgewende
6	die·aufgewendete·K
7	die·aufgewendete·Kf
8	die·aufgewendete·K
9	die·aufgewendete·Kraft·
10	die·aufgewendete·Kraft·z
11	die·aufgewendete·Kraft·zu
12	die·aufgewendete·Kraft·z
13	die·aufgewendete·Kraft·
14	die·aufgewendete
15	die·aufgewendete·Kompressionskraft·

9-11; and, finally, the span from 11-15 would be a fourth minor-unit of translation at the grammatical level. We were able to reach this chunking of the process not based on pauses, but based on the grammaticality of character sequences as products of writing.

At the same time, if we take another criterion such as key-moving actions, we find other ‘minor units’ (this time not of translation). This time, we can explain the pause before the ‘r’ **key down** action at versions 2 and 6 as being possibly due to the translator’s bad left hand position, and the replacement of the character ‘f’ by the character ‘r’ – spanning from version 7-9 – as being motivated by an erroneous **key down** action, possibly due to a bad left hand position. In the typing process, the span from 6 to 7 would be a P0 revision and the span from 7 to 9 a P1 revision: the first span inserts the character ‘f’ and the second span replaces the character ‘f’ by the character ‘r’. In parallel to this, there is probably another process going on. The lexical item *aufgewendete* is an alternative to the lexical item *aufgewandte*; the overlap of the written word with the alternative is *aufgewendete*. At the end of the overlap, there is a pause. Did the translator reconsider which lexical item to choose at this point? This might well be the case. Finally, the partially written character sequence *zu...* might have been completed as *zur Kompression* ‘in the compression’, as in *die aufgewendete Kraft zur Kompression* ‘the force spent in the compression’, or as *zu komprimieren* ‘in compressing’, as in *die aufgewendete Kraft zu komprimieren* ‘the force spent in compressing’. Such target text segments were likely discarded and a new one was typed until the end *die aufgewendete Kompressionskraft* ‘the spent compression force’. This kind of replacement is different from the one of replacing *die Kraft* by *die aufgewendete Kraft*. The earlier revision is an insertion of a word before another word that was already written. The later revision is indeed a revision of a way of formulating to another. In that case, if we go down from the nominal group to the constituents of the nominal group, what looked like four minor-units of translation becomes one P0 minor unit of translation for *aufgewendete*[*Kraft*] ‘spent·[force·]’, and two minor units of translation, [*Kraft*]*zu*[*r*·*Kompression*·] | *Kompressions*[*kraft*] ‘[force·]in·the·compression’ | ‘compression·[force·]’.

In other words, it is a selection of the process (motion, typing, writing, saying), the stratum (graphics, graphology, lexicogrammar, and rhetoricosemantics), and the rank (morpheme, word, group, phrase, clause), that makes the detection of micro-units and macro-units possible. Pauses do indeed help us in finding out whether there is more or less effort at a particular point in writing. But the reasons why a pause is there is multivariate. Next, I shall review how pauses in typing have been calculated so far and suggest a heuristics to estimate a pause

in typing. With such a heuristics we shall be able to avoid relying on pauses in writing, as has been the praxis so far.

2 Handling pauses

As seen in §1.1, there is a need to build more reliable cognitive effort indicators. Pauses of writing activity are definitely not as reliable as pauses of typing activity, which in turn are less reliable than pauses of moving activity. As said previously, we cannot calculate the time taken to reach the mouse and place the mouse hand back onto the right position of the keyboard. Moreover, it would be nice but very difficult to account for the difference in time between typing the same and different keys consecutively with the same finger, typing two keys consecutively with different fingers of the same hand and typing two keys with different hands. In that way, we would be able to account for the actual time that the translator was inert and still, after finishing a writing burst and before starting the next writing burst. If we were to add a video input, we could also subtract the time a translator moves for purposes other than translating such as adjusting the chair, the glasses, and moving back a lock of hair that falls onto one's face every once in a while (for those that have long hair), or such as sneezing and scratching one's eyes and nose (for those that have allergies and/or a cold). All these translation-unrelated actions that would motivate pauses would be subtracted in this way. Unfortunately, we cannot do this automatically at the present time and, in particular, we cannot do this retroactively for the corpora that we have already collected.

What we can do is to improve our guess, i.e. to increase the chance that what we see as a pause in writing is indeed a pause in typing and, potentially, a pause in moving. If we add an eye tracker to this improved guess, we might get closer to what is going on during translation that is truly translation-related. As for now, I shall discuss a way to improve our guess of typing pauses based on writing pauses and suggest a way to classify them according to a non-linear scale.

2.1 Classes of writing pauses

As pointed out in §1.1, latin capital letters demand a different keyboard layout from that of latin small letters. The same is true for other characters that are reachable only while the shift key is held down. In our case, we ran experiments using a German keyboard and using a German keyboard layout manager in Windows. In those experiments the following list of **char insert** actions relied on

moving a **shift key** or the **alt-gr key** down beforehand and moving it up afterwards. We have ignored the fact that sequences of capital letters and punctuation could be typed sequentially while holding the shift key (or after clicking the caps lock key) because such sequences were very rare in our logs of writing actions.

Table 6: Types of char insert depending on keystroke combinations

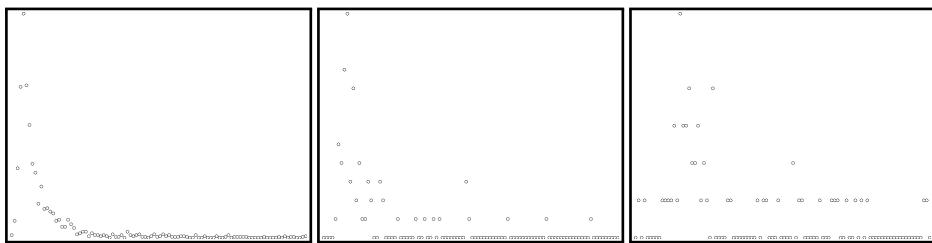
key number	standard value	shift-key-low value	alt-gr-key-low value
#18 Key	'1' Key	'!' Key	'@' Key
#19 Key	'2' Key	''' Key	',' Key
#20 Key	'3' Key	'§' Key	
#21 Key	'4' Key	'\$' Key	
#22 Key	'5' Key	'%' Key	'¡' Key
#23 Key	'6' Key	'&' Key	'¿' Key
#24 Key	'7' Key	'/' Key	'{' Key
#25 Key	'8' Key	(' Key	'[' Key
#26 Key	'9' Key	(') Key	']' Key
#27 Key	'0' Key	'=' Key	'}' Key
#28 Key	'ß' Key	'?' Key	'\' Key
#29 Key	“ Key	“” Key	““ Key
#39 Key	'q' Key	'Q' Key	
#40 Key	'w' Key	'W' Key	
#41 Key	'e' Key	'E' Key	
#42 Key	'r' Key	'R' Key	
#43 Key	't' Key	'T' Key	
#44 Key	'z' Key	'Z' Key	
#45 Key	'u' Key	'U' Key	
#46 Key	'i' Key	'I' Key	
#47 Key	'o' Key	'O' Key	
#48 Key	'p' Key	'P' Key	
#59 Key	'ú' Key	'Ú' Key	
#50 Key	'+' Key	'*' Key	“~” Key
#60 Key	'a' Key	'A' Key	'≤' Key
#61 Key	's' Key	'S' Key	'≥' Key
#62 Key	'd' Key	'D' Key	
#63 Key	'f' Key	'F' Key	
#64 Key	'g' Key	'G' Key	

key number	standard value	shift-key-low value	alt-gr-key-low value
#65 Key	'h' Key	'H' Key	
#66 Key	'j' Key	'J' Key	
#67 Key	'k' Key	'K' Key	
#68 Key	'l' Key	'L' Key	
#69 Key	'ö' Key	'Ö' Key	
#70 Key	'ä' Key	'Ä' Key	
#71 Key	'#' Key	"" Key	
#77 Key	'<' Key	'>' Key	' ' Key
#78 Key	'y' Key	'Y' Key	
#79 Key	'x' Key	'X' Key	'»' Key
#80 Key	'c' Key	'C' Key	'©' Key
#81 Key	'v' Key	'V' Key	'«' Key
#82 Key	'b' Key	'B' Key	
#83 Key	'n' Key	'N' Key	'_ ' Key
#84 Key	'm' Key	'M' Key	
#85 Key	';' Key	';' Key	
#86 Key	'?' Key	'?' Key	
#87 Key	'-' Key	'-' Key	

Table 6 shows some of the keys and the corresponding values in three layouts, namely the standard layout for the shift-key-high alt-gr-key-high state, the shift-key-low layout, and the alt-gr-key-low layout. There is also a fourth layout for when both shift and alt-gr keys are held down, but none of the characters contained in it were inserted frequently in our log of writing actions. The key values in the alt-gr-low layout were also not inserted frequently enough for any statistical analysis. The other two layouts, on the other hand, were used quite extensively.

As we have seen in Table 1 in §1.1, there are three frequent kinds of writing pauses in translation: in between two **standard char insert** actions (writing actions), there is one **char key up** action (one typing action); in between a **shift-key-low char insert** and a **standard char insert** action (writing actions), there is one **char key up** and one **shift key up** actions (two typing actions); and in between a **standard char insert** and a **shift-key-low char insert** action (writing actions), there is a **char key up** and a **shift key down** (two typing actions). Based on this realisation, I classified the pauses between writing actions into four groups: pauses between **standard char insert** and **standard char insert** were named *AA*, those

between **shift-key-low char insert** and **standard char insert** were named *BA*, those between **standard char insert** and **shift-key-low char insert** were named *AB*, and the others were named *o*. Below are three graphs showing the distribution of the pause length in each group. In these graphs, there is one bullet point for each 32 millisecond window, namely from 0 to 31 milliseconds, from 32 to 63 milliseconds, and so on. The higher a bullet point, the larger the number of pauses in that 32 millisecond window. The y-axis is adjusted to the most frequent pause window within the graph and is different among the graphs. What I aim at showing is not the absolute frequency of pauses of each kind, but the way they are distributed along the x-axis. See below:



(a) AA pauses std ch+std ch (b) BA pauses shift ch+std ch (c) AB pauses std ch+shift ch

Figure 1: Different writing pause lengths depending on AA, AB, BA pause type

Figure 1 shows that AA pauses were the smallest, BA pauses (those containing a **shift key up** action) were longer, and AB pauses (those containing a **shift key down** action) were the longest. In addition, it seems quite evident from the images that most pauses lay between 0 milliseconds and about twice the size of the most frequent pause window. For this reason, I find twice the length of the maximum value of the most frequent window a good estimate of where the start of the typing pause is. In the next section, I shall discuss how to classify typing pauses according to their length in a meaningful way for the purpose of translation studies.

2.2 Classes of typing pauses

Since we have an estimate of typing pause that is seemingly imprecise, it is not very informative to look at very small pauses. Therefore, what we count as typing pauses close to zero are actually rough guesses that these might be typing pauses and even rougher guesses that these might potentially be a motion pause. Any

actual counting of such short pauses would be very unreliable. We shall see in the following that they are nonetheless useful, even if imprecise.

Longer typing pauses with large pause windows are likely to be less unreliable. For this reason, I found 128 milliseconds of estimated typing pause length to be a good start. A typing pause window starting at 128 milliseconds was called tpw_1 . Since we need a way to compare similar-sized pauses with each other in an order of magnitude way (not in very precise ways), I find a logarithmic scale for pause windows fitting for our task. Therefore, I conceived of pause windows with the time segment $[62 \times 2^i, 62 \times 2^{i+1}[$ where the minimum pause length is included and the maximum pause length is excluded. With this pause window formula, we would have the following typing pause windows (tpw) in Table 7.

Table 7: Typing pause windows

Typing Pause Window	Minimum Length (included)	Maximum Length (excluded)
tpw^-	0 ms	128 ms
tpw_1	128 ms	256 ms
tpw_2	256 ms	512 ms
tpw_3	512 ms	1,024 ms
tpw_4	1,024 ms	2,048 ms
tpw_5	2,048 ms	4,096 ms
tpw_6	4,096 ms	8,192 ms
tpw_7	8,192 ms	16,384 ms
tpw_8	16,384 ms	32,768 ms
tpw_∞	32,768 ms	-

The first and last lines of Table 7 indicate special typing pause windows. tpw^- are the pause windows where it is a mere guess that what we see is in fact a typing pause, whereas tpw_∞ indicate pauses beyond 32 seconds. These pauses are very infrequent and they occurred not more than 5 times per participant. Making cognitive claims on typing pauses this long seemed rather unrealistic and I opted to discount them. Figure 2 shows the distribution of such pauses for a particular translation process from English to German in our corpus.

The logarithmic windows of Figure 2 contain a decreasing number of typing pauses as they get larger. The drop in typing pause frequency between one window and the next is smooth, which is a good sign for a classification of this kind.

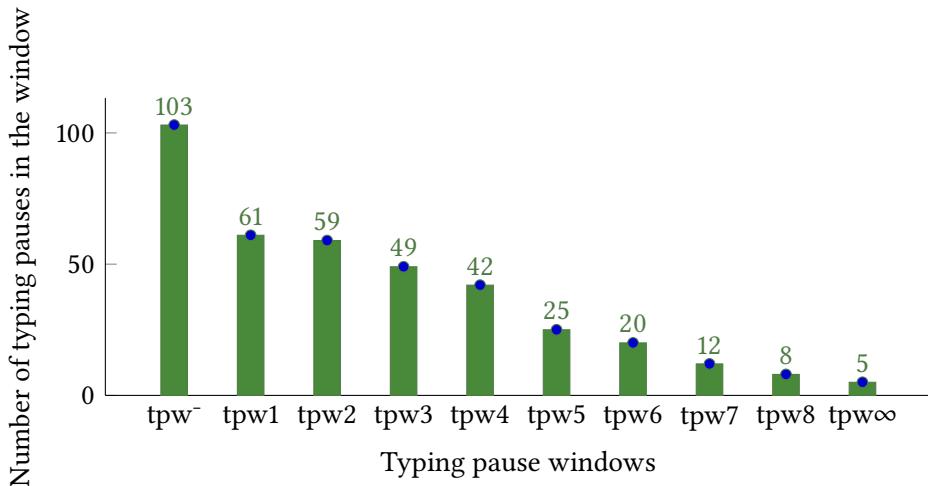


Figure 2: Frequency of typing pauses per window for a translation process

2.3 Comparison with other approaches

Up to now in translation studies, two procedures to cut a translation process into units have been tried, and both of them ignore the fact that the length of different writing pauses (AA, BA, AB) correlate differently with typing pause length. Both approaches considered gaps between two writing actions longer than a fixed threshold pause in translation, that is, these gaps were considered the boundaries of translation process units. They were not understood as pauses in writing nor as pauses in typing nor as pauses in finger motion.

The first fixed threshold used in translation studies was user-unspecific and was picked by the researcher him or herself. Early thresholds ranged between 5 and 6 seconds (Hansen 1999; 2002; Alves 2003; PACTE 2005). The second approach to cut the writing process into units during translation was proposed by Dragsted (2004; 2005). Her approach consisted of finding a writing pause¹⁹ for each participant that ‘seemed to reveal a certain pattern of syntactic units’²⁰. The attempt is valid and it does reveal a certain patterning that looks similar to a word/group/phrase based cutting of the target text production.

However, even though Dragsted’s approach is much better at capturing the writing rhythm of fast and slow writers, it tells little about how much ‘cogni-

¹⁹Typing speed in her terms since she did not distinguish typing actions from writing actions

²⁰Here called *grammatical structures*

tive' effort was put in each pause. It is also a poor indicator of cognitive effort since it tends to find boundaries of translation process units before all capital letters. This might lead researchers to believe that sentence beginnings and German nouns are especially charged with cognitive effort, when that is not really what is happening. It just takes longer for a person to type a capital letter than a small letter. Dragsted's approach also has the tendency to underestimate the cognitive effort of writing pauses between two small letters, which are typically shorter because less typing occurs during them. Examples 17 and 18 show respectively an undervaluation and overvaluation of pauses.

- (17) ·-Aˇsˇpˇeˇkˇtˇ· (TPW cut)
·-Aˇsˇpˇeˇkˇtˇ· (Dragsted's cut)
- (18) ·-zˇuˇ-57-53-2Pˇrˇoˇzˇeˇnˇtˇ· (TPW cut)
·-zˇuˇ-•7ˇ5ˇ-•Pˇrˇoˇzˇeˇnˇtˇ· (Dragsted's cut)

In Example 17, the tpw- pause before the 'A' char insert action was taken by Dragsted method as being significant whereas I estimate this pause to be on the borderline of being a typing pause or not. It is barely longer than the regular gap between two typing actions of the translator. In contrast, Example 18 shows an undervaluation of pauses. Tpw- and tpw₃ pauses between **standard** char insert actions are not recognised, whereas a tpw₂ pause before a capital letter is. In other words, even though Dragsted's approach adapts better to the writing speed of each participant, it might give us a skewed view of pauses in translation.

3 Conclusion

In the first part of this work, I went through a series of translation-unrelated linguistic phenomena that motivate pauses during translation. The assumption that the boundaries of the grammatical structure under translation are the core and sole reason for there to be writing pauses in the translation process was put in check. Reasons for there to be pauses vary between motion, typing, writing processes; in written products they vary between graphic, graphological, lexicogrammatical, and semantic strata, and in the lexicogrammatical stratum they vary between morpheme, word, group/phrase, and clause ranks. Each way of looking at the data allows us to identify different micro-units and corresponding macro-units of translation.

After listing some phenomena that occur in the translation process, I revisited the issue of what is an adequate pause to take as indicator for cognitive effort. As

pointed out in the first part, the assumption that the length of a writing pause is a good indicator of cognitive effort or translation-related activity does not hold. For this reason, I devised another indicator that results from estimating and classifying typing pauses. This indicator seems less biased than the one used so far and it is modal, i.e. it is not a cut but a scalar value that increases together with the length of the pause at a logarithmic pace.

Finally, for the future, given that we might have come to conclusions in prior publications based on skewed measurements, there is a large amount of work in need of reassessment. This work would include revisiting the claims that were defended with skewed measurements and which are now wide-spread assumptions in the field. We need to reassess whether these claims can still be sustained when analysing evidence in more detail and with less naïvité.

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Part III

Focus on the text

Chapter 9

Universals of editing and translation

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It has been claimed that translation universals are really “mediation universals” (Chesterman 2004; Ulrych & Murphy 2008), pertaining to the more general cognitive activity of mediating a text rather than specifically translating it. Among those linguistic activities that share the alleged mediation effect with translating are editing and revising. In this chapter, I critically examine the theory of “mediation universals” by comparing unedited translations with edited translations and with edited non-translations. The focus is on explicitation, normalisation/conservatism and simplification. The operationalisations are partly adopted from a similar study on English by Kruger (2012), which the present study seeks to replicate for German management and business articles. The results do not support the notion of mediation universals for the present corpus but rather show that translated texts are recognisable as such even after the editing process. Editorial influence on translated language in this genre is shown to be strongest in terms of sentence length and lexical diversity, where unedited and edited translations differ significantly from each other. Here, editors approximate the language to that of the non-translations, though the unedited translations have a greater average sentence length than the non-translations. That finding does not support the usual observation that translated texts have shorter sentences than non-translations, but highlights the importance of studying editorial influence in translation. That translations are hybrid texts, influenced by many agents other than the translator is now trivial knowledge. Yet corpus research in translation studies still relies mainly on published translations. The findings in this chapter argue for including unedited manuscripts in corpus-based studies of translated language to avoid missing phenomena of translated language that may be removed at the editing stage and to be able to differentiate which features really pertain to the translation act and which are affected by editorial influence.



1 Introduction

The notion of translation universals has been subject to debate for a long time (Baker 1993; Chesterman 2004; Mauranen & Kujamäki 2004). Its status today is problematic (see House 2008), though few would dispute that differences exist between translated and non-translated texts. Much of the controversy surrounding the issue is about the term “universal” (Chesterman 2014: 86), while the line of enquiry itself still seems productive and interesting because “the quest for universals is no more than the usual search for patterns and generalizations that guides empirical research in general” (Chesterman 2014: 87).

To advance translation studies as an empirical discipline, it is necessary to test existing theories with empirical methods and to suggest new models based on empirically tested (and testable) data. This process can be facilitated by conceiving studies in a replicable and rigorously transparent fashion, that is, they should enable other researchers to retrace the steps taken by the investigator, so that they can test the results in another language, genre or setting. To promote the use of statistical significance testing in our discipline, it would be useful for scholars to cite the sources where the significance tests they employ are documented, just as it is done with other tools or ideas that they use in their work. Merely stating the name of a statistical test without reference assumes that it is common knowledge, which in many disciplines of the humanities is arguably not the case.

The aim of this chapter is to draw attention to the influence of editors on the translation text, which so far has not received much attention in models of translation. Studying texts before and after editing can provide great insights into the translation process, which is here defined as “the period commencing from the moment the client contacts the translator and ending when the translation reaches the addressee” (Muñoz Martín 2010: 179).

Most analyses of translated language are based solely on corpora of published translations, and few attempts have been made to build a corpus of unedited translations (for an early such design, see Utka 2004). But published texts have usually undergone some kind of editing process involving various language users prior to their release. The study of manuscript translations informs current theories of translation by differentiating linguistic features that are present throughout the translation process from features whose frequency in the text was increased or decreased at the editing stage.

A holistic view of the translation process, obtained by studying manuscript translations alongside their published versions, will greatly increase the accu-

racy of the claims we make about translated language, improve the “ecological validity of experimental settings” (Muñoz Martín 2010: 179; see also Saldanha & O’Brien 2013: 110), and allow insights into the linguistic effects of editing, an as yet underresearched aspect of language use (Bisiada 2017a,b).

This chapter investigates three proposed translation universals, explication, normalisation and simplification, aiming to find out how these are affected by editorial intervention. Those universals were chosen in order to allow a comparison of results to those found by Kruger (2012). Partly adopting her methodology, I compare two subcorpora that each exhibit one type of mediation (one translated but not edited, the other not translated but edited) with a third subcorpus that exhibits both types of mediation, that is, the texts were translated and then edited.

If translating and editing really are a comparable type of language use and could be subsumed under the label of “mediation”, there should be little to no differences between manuscript and published translations, because the translation stage should already have applied the “mediation universals”. The published translations should then also be rather similar to the published non-translations, as both have undergone the editing process.

A more likely scenario seems to be that the texts differ with respect to particular universals but not to others. Tracing the evolution of the translated texts through the translation and editing stage will thus give us an idea of what stage tends to affect which type of universal. It will also allow us to investigate whether editing leads to a similar product when it takes place on non-translated compared to translated texts, as, for instance, editors aim to assimilate translated language to that found elsewhere in their publication.

The chapter is structured as follows: Section 2 discusses existing claims that translation universals are really “mediation universals”. In Section 3.1, I describe the corpus and the operationalisations of the three translation universals that were tested in this study. I then explain the statistical methods used and the procedure that I took to ensure statistical significance of the findings (Section 3.2). Section 4 contains the analysis of explication (4.1), normalisation/conservatism (4.2) and simplification (4.3). Finally, Section 5 contains a summary of the findings and a discussion of their implications.

2 Universals of “mediated discourse”?

Translating and editing are considered to be forms of mediation. Lefevere argues that what translating has in common with “other modes of rewriting, such as

editing, historiography, criticism, anthologising and the production of abridged or simplified texts” is that it “presuppose[s] a certain degree of mediation on the part of the writer/translator to adapt texts to the new audience” (Lefevere 1992: 9).

In his analysis of translation universals, Chesterman (2004) calls translation an act of “constrained communication”, arguing that universals pertinent to translation may also be found “in other kinds of constrained communication, such as communicating in a non-native language or under special channel restrictions, or any form of communication that involves relaying messages, such as reporting discourse, even journalism.” (Chesterman 2004: 10–11) Crucially, he argues that “it may be problematic eventually to differentiate factors that are pertinent to translation in particular from those that are pertinent to constrained communication in general” (Chesterman 2004: 10–11). This view was already held by Blum-Kulka (1986: 21) concerning the proposed universal of explication, which, she argues, “might be [...] a universal strategy inherent in the process of language mediation, as practiced by language learners, non-professional translators and professional translators alike”.

Ulrych & Murphy (2008) adopt the notion of “constrained communication” and the list of linguistic activities that are claimed to share particular features, so-called “mediation universals” (2008: 149). They even add to that category by arguing that “editing, copy-editing, revision or postediting” as well as ghost-writing are also types of mediated discourse (2008: 150). What unites texts of that kind, in their view, is that “they are processed, or rewritten, for particular audiences and are thus mediated for a purpose” (Ulrych & Murphy 2008: 151). Like Chesterman, they argue that “the notion of translation universals may be usefully replaced by that of *mediation universals* which may be identified in various kinds of mediated discourse” (Ulrych & Murphy 2008: 149).

By the above definition, most publicly available texts, except perhaps spontaneous online discourse such as comments, posts or tweets, could be described as “mediated discourse”. Such a wide applicability not only makes the term itself less useful. It also makes the hypothesis of “mediation universals” difficult to disprove, as very few texts are available that would be considered “unmediated discourse”. Internet discourse might be one possibility, but one would have to ensure that the authors are native speakers, have not reported any discourse or relayed any messages and have not revised their text. The reliability of such a corpus would seem to be rather low.

To back up their claims, Ulrych & Murphy (2008) conduct a study of mediated discourse, where they draw on the EuroCom corpus, a parallel corpus of

written texts drafted by non-native speakers of English at the European Commission and the same texts edited by native speakers. The size of the corpus at the time of analysis is reported as one million words in each part of the corpus (Ulrych & Murphy 2008: 152). The object of study is to investigate “whether there are typical phraseologies within mediated discourse as such” (Ulrych & Murphy 2008: 155) by comparing the edited texts both with the non-edited texts in the corpus and with the British National Corpus (BNC), which they call “a corpus of non-mediated native-speaker language” (Ulrych & Murphy 2008: 155).

Analysing three-word clusters, they find that *in order to* and *as well as* are used rather often in the EuroCom corpus, though more commonly in the non-edited than in the edited texts. Further, they are used less often in the BNC, from which they conclude that “they are not used frequently in speech or writing in non-mediated English” (Ulrych & Murphy 2008: 159).

However, these findings do not seem very convincing. As a “reference corpus of native-speaker, non-mediated English” (Ulrych & Murphy 2008: 159), the BNC may be problematic. It contains extracts from, among other things, national newspapers, specialist periodicals, academic books, popular fiction and university essays, the authors of which are unlikely to be native speakers in all cases. And even if that were the case, a claim that is not made anywhere in the description of the BNC (Burnard 2009), the corpus does not seem to contain much “non-mediated” English. It does contain some unpublished letters and essays that may be considered non-edited, and thus non-mediated. But for the most part, it consists of published, and thus mediated, texts, as newspapers, periodicals, journals and books have all been edited, copy-edited and revised to some extent.

Elsewhere, Ulrych (2009) claims that the boundaries between translating and editing as forms of mediation are becoming blurred. Unfortunately, it is not clear just what is meant by editing, specifically who does the editing. The research approach taken by Ulrych & Murphy (2008) outlined above suggests that the editing is done by someone other than the translator. However, the reference to “hybrid forms such as transediting” (Ulrych 2009: 219) seems to suggest that it is the authors or translators themselves who do the editing (for a valuable critique of the term “transediting”, see Schäffner 2012).

The existence of “mediation universals”, then, has never really been substantiated by empirical evidence. That has not kept it from being used, albeit with different understandings: to refer to non-native speaker language use (Ulrych & Anselmi 2008; Gaspari & Bernardini 2010; Rabadán & Izquierdo 2013: 79; Xiao & Hu 2015: 175), to bilingual communication (Lanstyák & Heltai 2012), to interlingual revision (Robertson 2010: 63) or to “texts produced under the constraint

of linguistic or cultural contact” (Zanettin 2014: 183). Even the term “mediation” itself is used without a commonly accepted definition (for a totally unrelated use of the term “mediated discourse”, see Scollon 2001; Norris & Jones 2005).

One empirical analysis of “mediation universals” and, more specifically, the mediation effect of editing, was conducted by Kruger (2012). The 1.2 million word corpus she draws on has three subcorpora: firstly, translations from Afrikaans to English, secondly, originally English texts that were edited by professional language editors, and thirdly, those same texts in their manuscript form before editing took place (2012: 360). All texts are from the time span 1997 to 2010 and the genres are academic, instructional, popular and reportage texts (2012: 359). Her aim is to investigate whether “the universals of translated language are the consequence of a cognitive mediation effect that is shared among different kinds of mediated language” (Kruger 2012: 358). Her analysis focuses on the three suggested translation universals explication, normalisation/conservatism and simplification (more details on the operationalisations she uses to study these universals are given in Section 3).

Her findings do not support the hypothesis that translation universals are really mediation universals as there is a “consistent difference between the translated and edited subcorpus” in each of the three types of universals investigated (Kruger 2012: 380). Instead, she argues that the differences she finds between the two corpora can be attributed to either of the facts that they differ in processing (monolingual vs bilingual) and in production circumstances (free vs constrained) (Kruger 2012: 381). She also suggests that editing as a form of mediation does not involve explication or simplification, at least not as much as in translation, which she explains by the fact that editing does not involve the production of a new text (2012: 382).

Translating and editing also differ in that translating may to a larger extent be guided by the tendency of risk aversion (Pym 2005; 2008) than editing, because translators produce a text while editors work on an existing text. The linguistic mediation that translators undertake and which tends to make them “avoid misunderstandings at all costs” (Becher 2010: 20) is different to the mediation entailed by the act of editing, as it is either the translator or the author that will be blamed in case of communication problems. Universals affected by risk aversion are thus more likely to surface during the translation act than at the editing stage.

On top of that, translators are often pressed for time and paid by the hour, working on several jobs at the same time, while the editors tend to be in-house employees (that is true at least for the editors who worked on the data in my

corpus). Editors have told me that the quality of the translation is an important factor affecting the time they spend on an article, though different concepts of what exactly is “quality” in translation exist (Drugan 2013; Mossop 2014; House 2015b). Thus, the different production circumstances further argue against the existence of “mediation universals”.

3 Methodology

3.1 Corpus details and operationalisations

The present study draws on a 300,000 word corpus of management articles with three subcorpora (detailed in Table 1). The translated subcorpus (TR) consists of manuscript translations into German of English articles that originally appeared in the *Harvard Business Review*, an American magazine for business leaders and managers. The manuscript translations were provided to me by Rheinschrift, a translation company funded in 1995 and based in Cologne. These articles were translated by a range of translators and date from 2006 to 2011 and were commissioned by the *Harvard Business Manager*, the German sister publication of the *Harvard Business Review*. The texts are drafts that were checked for accuracy within the translation company and then sent to the publisher for editing.

Table 1: Corpus details

Subcorpus	Translated?	Edited?	Texts (n)	Size (words)
TR	yes	no	27	106,829
TR+ED	yes	yes	27	104,448
ED	no	yes	27	88,312

The subcorpus of translated and edited texts (TR+ED) consists of the edited and published versions of the translations in the TR subcorpus. The edited (ED) subcorpus consists of articles that were written by a range of authors for the *Harvard Business Manager*, edited and published there in 2008. For the analysis, the three subcorpora were part-of-speech tagged and lemmatised using TreeTagger (Schmid 1995) with the Stuttgart-Tübingen tagset for German (Schiller et al. 1999).

As stated above, the setup of this corpus study is inspired by the corpus method used in Kruger (2012), which is an exemplary scientific work in that the comprehensive and detailed description of the author’s methodology allows other researchers to replicate her study or adopt its methods. The present study also

uses edited translations and non-translated articles, but instead of unedited, non-translated texts, it uses unedited translated texts, which means that in this study, all texts would count as mediated.

Kruger (2012) makes useful observations regarding differences between monolingual and bilingual text production and how they differ from editing, which involves no actual production of text. She states that her subcorpus of translations contains “[p]ublished texts as well as ephemera” (Kruger 2012: 360), yet later describes it as involving only bilingual mediation (see Table 7 in 2012: 380). I would argue, though, that published translations would also count as “mediated” monolingually, because they are usually also edited before publication.

If published translations, then, have been “mediated twice”, the effect of the mediation that takes place first may be obscured. Differentiating the linguistic effects of translating and editing thus requires the study of unedited translations, which is why I have chosen the present corpus structure over the one used by Kruger (2012).

The overview below lists the variables by which each translation universal was operationalised in Kruger (2012: 362) (on the left) and the variables used in this study (on the right). To replicate her study to the best possible degree, I have used her operationalisations as far as that was feasible for the analysis of German. Where this did not seem to be the case, for instance with contracted forms (German does not have this feature in written language) or inclusive language (no conventionalised forms exist in German), I have introduced other operationalisations that I consider relevant for the analysis of the given universal. A brief rationale for the applicability of each operationalisation will be given in each appropriate analysis section.

Explication

More complete/less economical surface realisation in translation	
Frequency of use of optional complementiser <i>that</i>	Frequency of use of <i>dass</i> ('that')
Frequency of use of full forms versus contracted forms	
More explicit relations between conceptual propositions in text	
Frequency of linking adverbials	Frequency of linking adverbials
	Frequency of pronominal adverbs
	Conjunction vs preposition ratio

Normalisation/conservatism

Frequency of coinages and loan-words	Degree of unconventional language use
Frequency of lexical bundles	Frequency of lexical bundles
Use of inclusive language	Passive alternatives

Simplification

Lexical diversity	Lexical diversity
Mean word length	Mean word and sentence length

3.2 Statistical significance

As we need to test the difference among the means of three corpora for statistical significance, a one-way analysis of variance (ANOVA) will be used. This test requires the data to be normally distributed and have approximately equal variances, though it is “fairly tolerant of all but gross departures from normality and homogeneity of variance” (Butler 1985: 132; see also Lowry 2012: ch. 14.1). As the data is not always normally distributed, I have chosen an equal sample size of 27 texts for each corpus to increase the robustness of the test.

Where the p -value yielded by the ANOVA is close to the significance threshold, I have also conducted a Kruskal-Wallis test, which is a distribution-free alternative to the ANOVA (Lowry 2012: ch. 14a; Cantos Gómez 2013: 45), to ensure the accuracy of the reported significance. The confidence level of $\alpha = 0.05$ is considered to be statistically significant and the confidence level of $\alpha = 0.01$ is considered to be highly statistically significant.

The results are reported in plots where the standard error of the mean is shown by error bars. Where statistical significance is reported, a post-hoc Tukey test, one of the standard comparison tests following the ANOVA (see Cantos Gómez 2013: 55), has been conducted to examine which corpora differ from each other for the given variable. To just compare two corpora, I have used the Mann-Whitney test, which, unlike the often used t -test, does not assume normal distribution of the data (Kilgarriff 2001: 104).

4 Analysis

4.1 Explication

4.1.1 Frequency of *dass* complementisers

The causes for the omission of *dass* ('that') in written German, generally referred to as "declarative complementiser drop" (Reis 1995: 33), have not been conclusively explored to my knowledge. There is widespread agreement that the verbs allowing the omission of *dass* are the same as the verbs known as "bridge verbs" (Grewendorf 1989: 54; Müller 1993: 362–363; Steinbach 2002: 8), though this has been refuted by Reis (1995). The omission of the complementiser is less straightforward than in English because *dass* is not always optional, depending on the semantics both of the subclause and the particular verb or noun involved (Müller 1993; Gärtner & Steinbach 1994; for an overview of some literature, see Lapshinova-Koltunski 2010: 30). Verbs that require a finite extension using *dass* in German have English counterparts that allow both finite and non-finite extensions (Fischer 1997: 214). English, on the other hand, tends to require non-finiteness more often than finiteness (Fischer 1997: 214). In German, it is only with some verbs that the same content can be expressed both with *dass* and with a coordinate clause.

For this analysis, I selected the most common German verbs and nominalisations that can take a *dass* complement. The selection was based on Jones & Tschirner (2006), who draw on the Leipzig/BYU Corpus of Contemporary German to provide a list of the 4000 most common German words. From the 2500 most frequent German words (occurring with a frequency of at least 30 instances per million words), I have compiled a list of the most common verbs and nominalisations that can be complementised both by a *dass*-clause and a main or infinitive clause according to the E-VALBU valency dictionary for German (Schumacher et al. 2004).¹ The resulting list is shown in Table 2.

I have considered *dass* to be omitted when the verb or nominalisation was followed by either an infinitive clause with *zu* or by a finite main clause because those constructions can be replaced by a *dass* clause. If the verb or nominalisation was followed by a subordinate, verb-final clause, such as a clause introduced by another conjunction like *wie* ('how'), *was* ('what'), *wo* ('where') or *ob* ('if'), the construction was not counted as an omission of *dass* because *dass* cannot replace those conjunctions.

¹ Available at <http://hypermedia.ids-mannheim.de/evalbu/index.html>.

Table 2: Verbs and nouns with *dass*

<i>sagen</i> ‘to say’	<i>wissen</i> ‘to know’	<i>mitteilen</i> ‘to inform’
<i>merken</i> ‘to notice’	<i>glauben</i> ‘to believe’	<i>meinen</i> ‘to think’
<i>schreiben</i> ‘to write’	<i>erklären</i> ‘to explain’	<i>vorstellen</i> ‘to imagine’
<i>lesen</i> ‘to read’	<i>vermuten</i> ‘to suspect’	<i>bedeuten</i> ‘to mean’
<i> hören</i> ‘to hear’	<i>fordern</i> ‘to demand’	<i>erwarten</i> ‘to expect’
<i>spüren</i> ‘to sense’	<i>heißen</i> ‘to be called’	<i>drohen</i> ‘to threaten’
<i>angeben</i> ‘to claim’	<i>behaupten</i> ‘to claim’	<i>schätzen</i> ‘to estimate’
<i>fürchten</i> ‘to fear’	<i>annehmen</i> ‘to assume’	<i>vorschlagen</i> ‘to suggest’
<i>finden</i> ‘to find’	<i>vereinbaren</i> ‘to agree’	<i>befürchten</i> ‘to fear’
<i>sehen</i> ‘to see’	<i>zugeben</i> ‘to admit’	<i>einräumen</i> ‘to admit’
<i>denken</i> ‘to think’	<i>erzählen</i> ‘to narrate’	<i>scheinen</i> ‘to seem’
<i>hoffen</i> ‘to hope’	<i>ausgehen von</i> ‘to assume’	<i>wünschen</i> ‘to wish’
<i>betonen</i> ‘to stress’	<i>versprechen</i> ‘to promise’	<i>beschließen</i> ‘to decide’
<i>fühlen</i> ‘to feel’	<i>ausrichten</i> ‘to tell’	
<i>Meinung</i> ‘opinion’	<i>Forderung</i> ‘demand’	<i>Eindruck</i> ‘impression’
<i>Ansicht</i> ‘view’	<i>Überzeugung</i> ‘conviction’	<i>Auffassung</i> ‘view’
<i>Hoffnung</i> ‘hope’	<i>Vermutung</i> ‘assumption’	<i>Behauptung</i> ‘claim’
<i>Befürchtung</i> ‘worry’		

Regarding the analysis of items that were used with a *dass* clause, the ANOVA test reports a highly statistically significant difference among the mean frequencies (see Figure 1), which is confirmed by a Kruskal-Wallis test ($H = 11.8$ ($df = 2$), $p = .0027$). A post-hoc Tukey test reveals that there is a significant difference ($p < .05$) between both the unedited and the edited translations, where *dass* is present at a frequency of just under 17.5 instances per 10,000 words, and the non-translated articles, where it occurs at a frequency of around 9 instances per 10,000 words.

Constructions where the items under analysis were used with an alternative to *dass* occur with a frequency of around 7.5 to 9.5 instances per 10,000 words in each subcorpus, and there is no significant difference as reported by the ANOVA (see Figure 1) and confirmed by a Kruskal-Wallis test ($H = 1.74$ ($df = 2$), $p = .419$).

These findings seem to support the view that translations are more explicit than the non-translated articles as the frequency of the use of *dass* in translated texts stands out. The editors do not seem to have made any substantial changes to this feature.

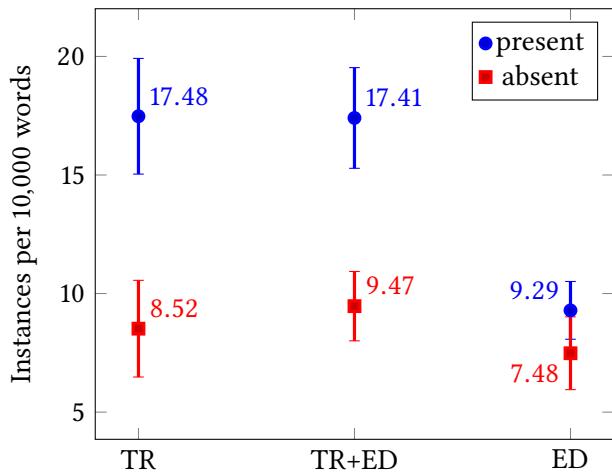


Figure 1: Mean normalised frequencies of *dass* clauses ($F(2, 78) = 5.56, p = .0055$) and coordinate clause alternatives to *dass* ($F(2, 78) = 0.34, p = .7128$)

4.1.2 Frequency of linking adverbials

Linking adverbials make links between the clauses they connect more explicit (House 2015a). A more frequent use of linking adverbials would thus increase the degree of explicitation in a text. To compile a list of the most frequent linking adverbials in German, I first extracted all the linking adverbials (“*konnekt-integrierbare Konnektoren*”, that is, connectors that can be integrated into one of the clauses they connect, see Pasch et al. 2003: 487) according to Pasch et al. (2003: 504–509). To limit the range of adverbials to those that specify links between clauses, I have only chosen those that can occur both between clauses (*Null* position) and in the final element of the sentence (*Nachfeld* position) according to Pasch et al. (2003: 504–509). I have further eliminated all pronominal adverbs, as these will be analysed separately in Section 4.1.3.

The final list (see Table 3) only includes those linking adverbials whose frequency class in the *Deutscher Wortschatz* reference corpus (Quasthoff et al. 2013) from the Leipzig Corpora Collection is no higher than 16.²

The results are shown in Figure 2. Published and manuscript translations show a basically identical frequency of 9.2 linking adverbials per 1,000 words, whereas

²The corpus, which is available at corpora.uni-leipzig.de, assigns words to frequency classes from 0 to 24, from most to least frequent. See Quasthoff et al. (2013: 2) for details on how the frequency class is calculated.

Table 3: Linking adverbials

<i>allerdings</i> ‘indeed’	<i>auch</i> ‘thus’
<i>ander(e)nfalls</i> ‘otherwise’	<i>and(e)rseits</i> ‘or else’
<i>anders/genau(er)/kurz/nebenbei</i>	<i>ansonsten</i> ‘otherwise’
<i>gesagt</i> ‘in other words/(more)	
<i>precisely/briefly/by the way’</i>	
<i>aus diesem Grund</i> ‘for this reason’	<i>aufßerdem</i> ‘in addition’
<i>beispielsweise/bspw.</i> ‘for instance’	<i>bloß</i> ‘however’
<i>dagegen</i> ‘on the other hand’	<i>das heißt</i> ‘that is’
<i>dessen ungeachtet</i> ‘notwithstanding’	<i>dennoch</i> ‘still’
<i>einerseits</i> ‘on the one hand’	<i>ergo</i> ‘thus’
<i>erstens, zweitens...</i> ‘first, second’	<i>folglich</i> ‘therefore’
<i>freilich</i> ‘of course’	<i>gleichwohl</i> ‘nevertheless’
<i>hingegen</i> ‘on the other hand’	<i>im Gegensatz zu/dazu</i> ‘contrarily’
<i>im Übrigen</i> ‘what’s more’	<i>immerhin</i> ‘at least’
<i>indes(sen)</i> ‘meanwhile’	<i>infolgedessen</i> ‘consequently’
<i>insbesondere</i> ‘especially’	<i>insofern</i> ‘for that matter’
<i>insoweit</i> ‘as far as’	<i>jedenfalls</i> ‘in any case’
<i>jedoch</i> ‘however’	<i>mit anderen Worten</i> ‘in other words’
<i>mithin</i> ‘thus’	<i>nämlich</i> ‘namely’
<i>nichtsdestotrotz</i> ‘notwithstanding’	<i>obendrein</i> ‘on top of that’
<i>ohnehin</i> ‘in any case’	<i>schließlich</i> ‘after all’
<i>sodann</i> ‘consequently’	<i>stattdessen</i> ‘in spite of that’
<i>überdies</i> ‘what’s more’	<i>übrigens</i> ‘by the way’
<i>unterdessen</i> ‘meanwhile’	<i>vielmehr</i> ‘rather’
<i>vor allem</i> ‘above all’	<i>währenddessen</i> ‘meanwhile’
<i>weiterhin</i> ‘in addition’	<i>wiederum</i> ‘on the other hand’
<i>wohlgemerkt</i> ‘let me add’	<i>zudem</i> ‘plus’
<i>zum Beispiel/z. B.</i> ‘for example’	<i>zum einen</i> ‘on the one hand’
<i>zumal</i> ‘given that’	<i>zumindest</i> ‘at least’
<i>zunächst</i> ‘initially’	<i>zusammenfassend</i> ‘to sum up’
<i>zwar/und zwar</i> ‘it’s true that/namely’	<i>...erweise</i> ‘...ly’

the non-translated texts only have 8.5 per 1,000 words. While this may support the existing hypothesis that translations are more explicit than non-translations, the difference is not statistically significant according to the ANOVA. Further research on German where a different set of linking adverbials is analysed might lead to a different result, but for the present analysis it must be concluded that the subcorpora do not differ significantly in terms of linking adverbials.

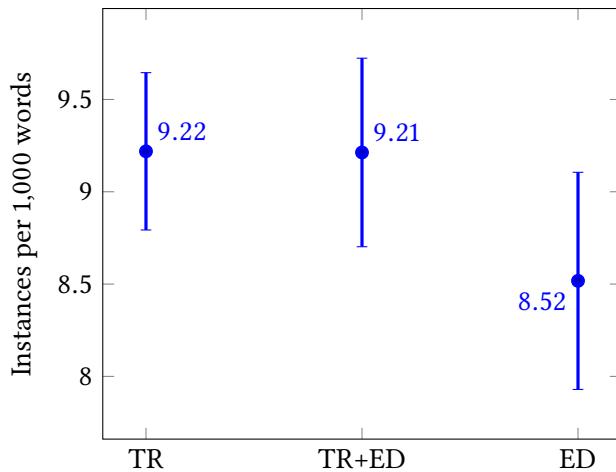


Figure 2: Mean normalised frequency of linking adverbials ($F(2, 78) = 0.62, p = .5406$)

It is beyond the scope of this chapter to consider the frequency of individual linking adverbials, but it would be interesting for further research to investigate whether any linking adverbials are used specifically in translated texts or non-translated texts.

4.1.3 Frequency of pronominal adverbs

Bisiada (2014: 14–15) has found that pronominal adverbs such as *darum* ('therefore'), *daraus* ('from that') or *darüber hinaus* ('on top of that') are regularly introduced when sentences are split, both by translators and editors. The introduction of pronominal adverbs to the text clarifies cohesive relations (Kunz & Lapshinova-Koltunski 2015) and is thus an explicating addition to the text.

Pronominal adverbs have been extracted by a search for the tag PAV, which stands for *pronominal adverb* in the Stuttgart-Tübingen tagset. The absolute occurrences were then converted to normalised frequencies.

Figure 3 shows that in the translated texts, pronominal adverbs occur at a rate of 9.4 instances per 1,000 words, while in the non-translated texts, they only occur at a rate of 8 instances per 1,000 words, which would give further support to the hypothesis that translated texts are more explicit.

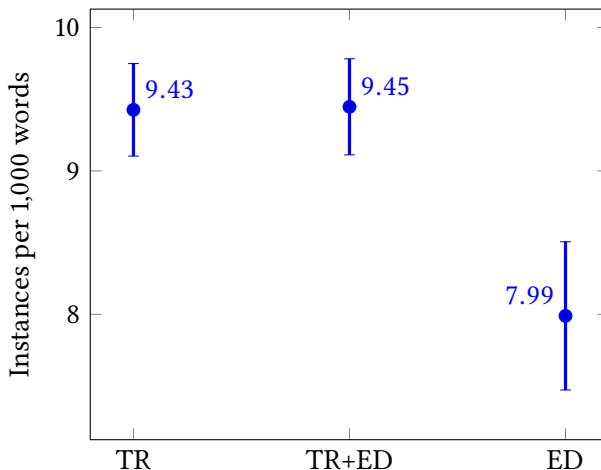


Figure 3: Mean normalised frequency of pronominal adverbs ($F(2, 78) = 4.33, p = .0165$)

However, the statistics do not quite allow this conclusion. The ANOVA test argues for a statistically significant difference (see Figure 3), and the post-hoc Tukey test places the difference between the non-translations and both translated subcorpora ($p < .05$). According to the Kruskal-Wallis test, however, the difference between the normalised frequencies in the three corpora is not statistically significant ($H = 4.07 (df = 2), p = .1307$). As stated in Section 3.2, the Kruskal-Wallis test takes precedence for data that is not entirely normally distributed. Thus, while translated texts seem to contain more pronominal adverbs than non-translated texts, that difference is not statistically significant.

4.1.4 Conjunction vs preposition ratio

Steiner (2001: 26) suggests measuring the ratio of conjunction vs preposition as a way of testing the grammatical metaphority of a text. The greater the ratio, that is, the more conjunctions a text has in relation to prepositions, the less metaphorical and the more explicit it is (Steiner 2001: 26). This measure is a somewhat superficial way of measuring grammatical metaphority, but a valid and tested method to obtain an idea of the explicitness of a text (Steiner 2008: 252).

For the present analysis, the tagged corpora were searched for the Stuttgart-Tübingen tags indicating conjunctions (KOUI, KOUS, KON, KOKOM) and prepositions (APPR, APPRART). Figure 4 shows that the ratio, while highest in published translations, is rather similar in all three corpora, between 0.63 and 0.68. It is perhaps interesting to note that editors seem to have made the text more explicit by increasing the ratio. Overall, however, the ANOVA reports no statistically significant difference between the conjunction vs preposition ratios of the three subcorpora.

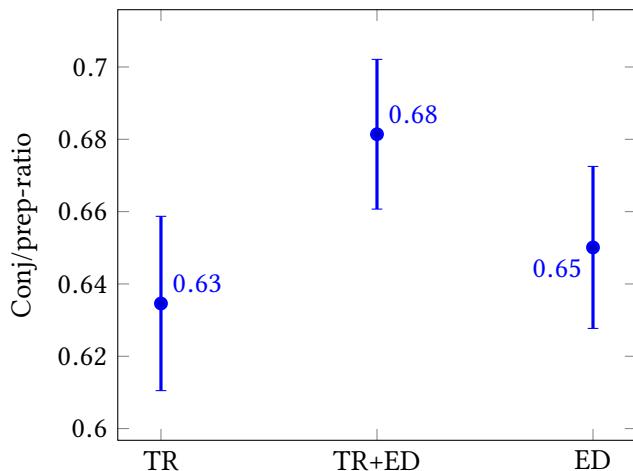


Figure 4: Mean ratio of conjunction vs preposition ($F(2, 78) = 1.12, p = .3283$)

To sum up this section, there seem to be more similarities between the two subcorpora of translated texts than between the two subcorpora that contain texts that were edited. However, the operationalisations under analysis show no statistically significant differences between the three subcorpora, except regarding the use of *dass* clauses.

4.2 Normalisation/conservatism

4.2.1 Passive alternatives

The use of passive alternatives is considered a typical feature of German. Passive alternatives have been used increasingly often in professional and scientific discourse to replace the passive while keeping the language economical (see Gang 1997). They also occur more often in German non-translated texts than in English

ones (Teich 2003: 181). Therefore, a higher amount of passive alternatives would indicate a higher degree of normalisation.

Three different passive constructions have been chosen for analysis: modal passives (combinations of *lassen* ('to let') and a reflexive verb; see König & Gast 2012: 162), clauses containing the impersonal pronoun *man* (Durrell 2003: 237; Teich 2003: 94) and modal infinitives, where *sein* is used with an infinitive phrase (Durrell 2003: 238; Teich 2003: 93; König & Gast 2012: 161).

To obtain the frequencies of modal passives, I have searched for instances of *lassen* and then manually reduced this list to instances where reflexive verbs were used as passive alternatives. Instances of *man* were simply counted. As for the modal infinitives, the subcorpora were searched for the STTS tags PTKZU and VVIZU to obtain instances of the pre- and intrainfinitival *zu*. The resulting list of infinitive phrases was reduced to those where *sein* is used.

The ANOVA test finds no significant overall difference between the three subcorpora (see Figure 5). The data is not normally distributed, but the backup Kruskal-Wallis test confirms the observation ($H = 0.45$ ($df = 2$), $p = .7985$).

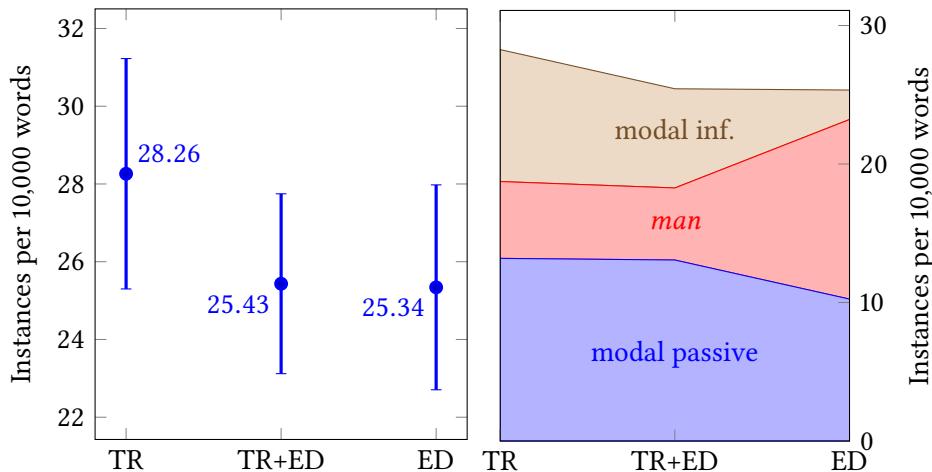


Figure 5: Left: Mean normalised frequency of passive alternatives ($F(2, 78) = 0.39$, $p = .6784$); Right: Mean normalised frequencies of modal infinitives, *man* and the modal passive.

A closer look at the individual passive alternatives, however, reveals some differences between the translated and the non-translated texts. Both unedited and edited translations use *man* statistically highly significantly less often than the non-translated texts ($F(2, 78) = 7.96$, $p = .0007$), confirmed by a Kruskal-Wallis test ($H = 9.01$ ($df = 2$), $p = .0111$). In the translations, *man* occurs at a frequency

of around 5 instances per 10,000 words, while in the non-translations, it occurs at around 13 instances per 10,000 words. A post-hoc Tukey test confirms that this is statistically significant at the $p < .01$ level.

At the same time, both unedited and edited translations use the modal infinitive statistically highly significantly ($F(2, 78) = 12.26, p < .0001$) more often than non-translated texts (at the $p < .01$ level, according to the post-hoc Tukey test). That interpretation is confirmed by a Kruskal-Wallis test ($H = 22.42 (df = 2), p < .0001$). Modal infinitives occur at a frequency of 2 instances per 10,000 words in non-translated texts, and at a frequency of 9.5 and 7 instances per 10,000 words in the manuscript and published translations, respectively. The data seem to indicate that editors have approximated the frequency of modal infinitives to that of non-translated texts, but the post-hoc Tukey test shows that the difference between the unedited and edited translations is statistically insignificant.

4.2.2 Degree of unconventional language use

Translators have been claimed to be more conservative in their language use than authors of non-translated texts (Bernardini & Ferraresi 2011: 242). Kruger (2012) conducts her analysis by searching for hapax legomena (words that occur only once in a text) and then filtering out “lexicalised” words by using the spell checker and online dictionary in Microsoft Word.

That seems like a somewhat unconvincing method to decide which words count as lexicalised. Some words may be used regularly, but may not occur in a dictionary and thus would not count as lexicalised. German has extensive means of compounding, making it even easier to coin new words. A further problem with using hapax legomena as a tool for analysing idiosyncracy of the lexis is that even the most unconventional or innovative words will not appear in the analysis if they are used a second time somewhere in the text.

Nevertheless, the analysis presented here also takes the initial step of isolating hapax legomena using AntConc. From the resulting lists, words that feature in the Hunspell dictionary³, abbreviations, web addresses, proper names and untranslated job titles have been filtered out. I have only considered English words as loan words if they were found in the text “as is”, that is without quotation marks or explanations. Like the lexicalisation issue, the question of whether or not something is a loan word is difficult to answer (Heller 2002). I will not pursue the notion of lexicalisation any further at this point.

³ Available at: <http://hunspell.sourceforge.net/>

A seminal study on lexical creativity in translation is Kenny (2001). Based on her method, I have analysed the remaining words based on their frequency in the *Deutscher Wortschatz* reference corpus (Quasthoff et al. 2013) from the Leipzig Corpora Collection (see Section 4.1.2). For the present purposes, I have reduced the list to lemmas in the frequency classes 18 or above, which means they are outside the 200,000 most frequent words in German.

Even with those parameters, the methodology remains somewhat problematic. Technical terms that are not in the dictionary might be infrequent in the reference corpus and thus be considered idiosyncratic language use. However, overall, the method does what it should by measuring the different frequencies with which unconventional words are used in the texts.

Keeping the mentioned drawbacks in mind, the analysis shows quite clearly that non-translated articles make more use of unconventional or less established words than the translated texts (Figure 6). The difference is most pronounced in the case of lexical items that are not attested in the Leipzig corpus, which occur at a frequency of less than 5 instances per 10,000 words in the translated texts, but at a frequency of 18.5 instances per 10,000 words in the non-translated articles. The rather large error bars for the non-translated texts indicate that the actual values depend largely on the individual style of the author.

A further interesting aspect is that unattested lexical items and those at frequency classes 21–24 occur less frequently in the edited translations than in the manuscript ones. That seems to indicate that editors attempt to make the text more conservative by removing unconventional words.

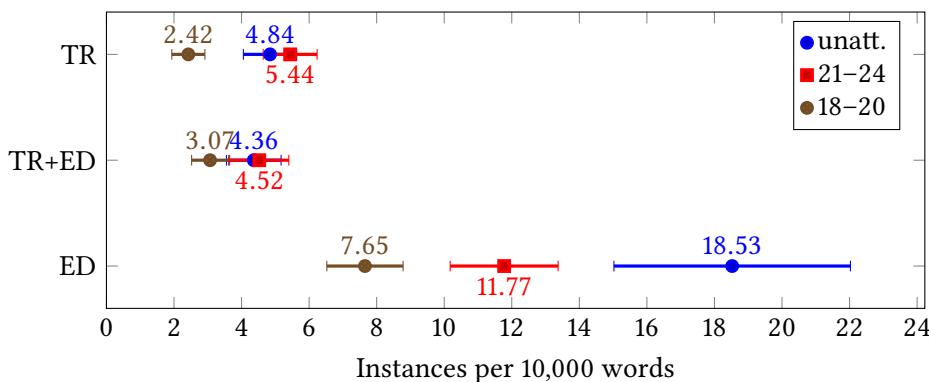


Figure 6: Mean normalised frequency of hapax legomena, unattested in the Leipzig corpus ($F(2, 78) = 14.34, p < .0001$), at frequency classes 21–24 ($F(2, 78) = 11.82, p < .0001$) and 18–20 ($F(2, 78) = 13.45, p < .0001$)

The difference according to the ANOVA is highly significant for all three levels of frequency in the Leipzig corpus. It is confirmed by the Kruskal-Wallis test ($H = 17.01 (df = 2)$, $p < .0001$ for unattested words, $H = 15.92 (df = 2)$, $p < .0001$ for the frequency class 21–24 and $H = 16.22 (df = 2)$, $p < .0001$ for the frequency class 18–20). A post-hoc Tukey test shows that while the difference between translations and non-translations is significant at the $p < .01$ level in all three cases, there is no statistically significant difference between edited and unedited translations.

Nevertheless, with regard to the unattested words and those in the frequency classes of 21–24, there are fewer instances per 10,000 words in the edited translations compared to the unedited translations. Although that difference is not statistically significant according to the post-hoc Tukey test, it may still indicate that editors think more conservatively when it comes to editing translations, whereas they leave more room for creativity to authors of non-translated texts. That is why it is only in non-translated texts that we find coinages and innovative compounds such as *Gedankenwerker* ('thought worker'), *glatterklären* ('smooth something out by explanation'), *Abwarter* ('someone who hangs back and waits'), *Lächelanordnungen* ('orders to smile') and *lebenssprühend* ('sparkling with life').

4.2.3 Frequency of lexical bundles

Kruger argues that the usage of lexical bundles, “prefabricated”, conventionalised language unit[s]” is “indicative of more normalised or conservative language use” (Kruger 2012: 365). Adopting her method to study lexical bundles, I have created a list of the most common trigrams in each corpus. Trigrams that occurred with a frequency of less than 0.01% in each subcorpus were removed. Proper nouns such as *Harvard Business School* and subject-specific trigrams such as *Triple Bottom Line* were also removed.

Unlike Kruger, I have not removed individual subject-specific words. Given the fact that all texts form part of the same genre, I see no reason to exclude trigrams that contain subject-specific words, as they may be part of the particular jargon or conventionalised discourse of that language community. As a result, the list of the 28 trigrams that are investigated in this section (see Table 4) contains some less general trigrams than the one used by Kruger (2012: 365).

The ANOVA reveals that there is a highly significant difference among the three subcorpora (see Figure 7), which is confirmed by a Kruskal-Wallis test ($H = 23.02 (df = 2)$, $p < .0001$). It is evident from the figure that this difference is found between the non-translations and the two subcorpora of manuscript and published translations. In the latter, the investigated trigrams occur with

Table 4: Trigrams selected for investigation

<i>in der Regel</i> ‘normally’	<i>nicht nur ART</i> ‘not just the’
<i>bei der Entwicklung</i> ‘while developing’	<i>bei der Arbeit</i> ‘at work’
<i>für das Unternehmen</i> ‘for the company’	<i>in den letzten</i> ‘in the last’
<i>auf diese Weise</i> ‘in this way’	<i>aus diesem Grund</i> ‘for this reason’
<i>eine Reihe von</i> ‘a range of’	<i>in den vergangenen</i> ‘in the past’
<i>die Zahl der</i> ‘the number of’	<i>dass die Mitarbeiter</i> ‘that the staff’
<i>davon überzeugt, dass</i> ‘convinced that’	<i>in der Praxis</i> ‘practically’
<i>zum Beispiel ART</i> ‘for example the’	<i>in der Lage</i> ‘able to’
<i>handelt es sich</i> ‘is about’	<i>für den Kunden</i> ‘for the customer’
<i>die Mitarbeiter, die</i> ‘employees who’	<i>in Bezug auf</i> ‘in relation to’
<i>Auswirkungen auf ART</i> ‘effects on’	<i>dass sich ART</i> ‘that REFL’
<i>für den Erfolg</i> ‘for success’	<i>in diesem Fall</i> ‘in this case’
<i>mit ihren Mitarbeitern</i> ‘with its staff’	<i>Art und Weise</i> ‘way’
<i>im Laufe der</i> ‘over the course of’	<i>sich heraus, dass</i> ‘turns out that’

rather similar frequencies of 3.5 and 3.6 instances per 1,000 words, while in the non-translated articles, they only occur at a frequency of 2.1 instances per 1,000 words. The post-hoc Tukey test confirms that this is a significant difference at the $p < .01$ level.

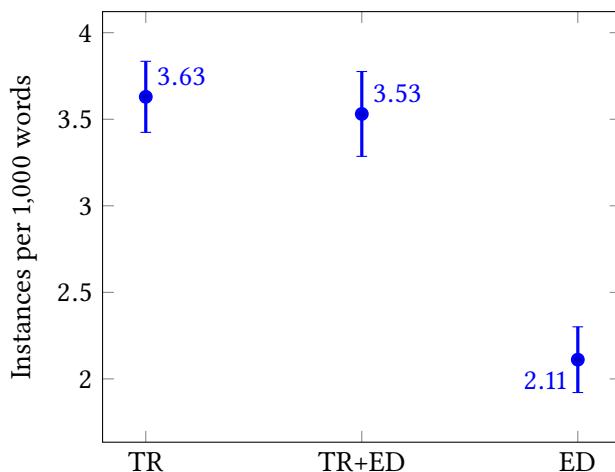


Figure 7: Mean normalised frequency of trigrams ($F(2, 78) = 15.66, p < .0001$)

Based on the higher occurrence of common trigrams in the translated texts, it would seem that translators are more conservative in their language use, and that editors have not intervened in this respect. The analysis of selected trigrams applied here is limited to analysing the frequency of specific tokens, while “obscuring differences in terms of the number of bundle types in the three subcorpora” (Kruger 2012: 384).

Thus, in order to strengthen the analysis of conservative or normalised language use in the present corpus, I have conducted a general collocational analysis. As different measures of collocational association tend to produce different types of associations, the strength of an analysis is increased by studying several measures of association (Baroni & Bernardini 2003: 373). The present analysis is therefore based on the log-likelihood and mutual information (for more information on these measures, see Manning & Schütze 1999: ch. 5.3–5.4).

For this analysis, I have used Ted Pedersen’s Ngram Statistics Package (Banerjee & Pedersen 2003).⁴ Based on the method used by Baroni & Bernardini (2003), the percentages of trigrams at or above certain cut-off points were compared for each subcorpus. High association scores mean a higher degree of collocational expression and thus, according to the present hypothesis, a more normalised language use.

For the log-likelihood ratio, three cut-off points were chosen. Log-likelihood ratios can be looked up directly in the table of the χ^2 distribution (Manning & Schütze 1999: 174). Thus, the cut-off points chosen here are the critical values 18.47, 23.51 and 28.47 given in the table for four degrees of freedom,⁵ which correspond to the confidence levels $\alpha = 0.001$, $\alpha = 0.0001$ and $\alpha = 0.00001$.

For the mutual information score, Baroni & Bernardini (2003) use pointwise mutual information. In my case, the results produced by a pointwise mutual information analysis did not seem to be a good representation of actual trigrams in the corpus (see Manning & Schütze 1999: 178–183 for a criticism of pointwise mutual information as a measure of association), so I chose to calculate the (true) mutual information score instead. As the scores are all quite low, there is only one cut-off point at a mutual information score of 0.01.

The results are shown in Figure 8. Surprisingly, the mean percentage of trigrams with a log-likelihood ratio at or above the specified cut-off points is higher in the non-translated texts than in the translated texts, though the difference seems to disappear if the cut-off point is set to a higher value and thus a stricter

⁴ Available at <http://ngram.sourceforge.net>

⁵ There are four degree of freedom because there are four independent values: one per word in the trigram and the total number of trigrams.

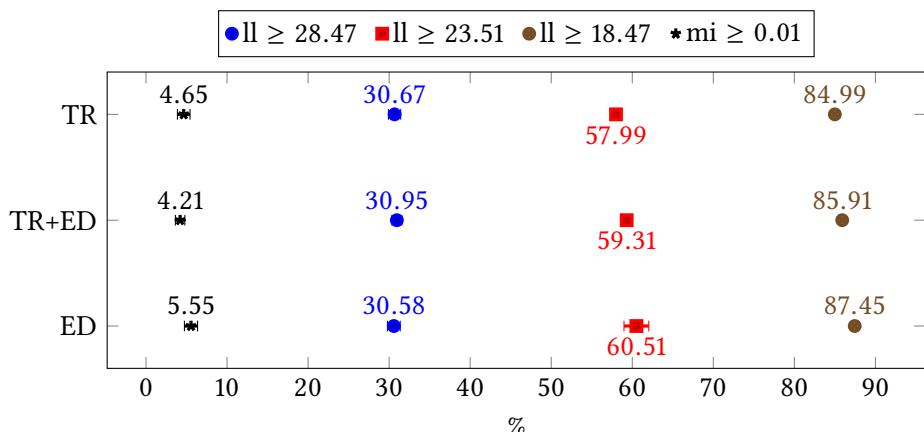


Figure 8: Mean percentages of trigrams at or above the log-likelihood ratios 28.47 ($F(2, 78) = 0.07, p = .9325$), 23.51 ($F(2, 78) = 5.04, p = .0087$), 18.47 ($F(2, 78) = 13.23, p < .0001$), and the mutual information score 0.01 ($F(2, 78) = 0.87, p = .423$)

confidence level. The non-translated texts also have a higher mutual information score than the translations.

The statistical tests confirm this observation. For the lowest cut-off point in the log-likelihood ratio, a score of 18.47, the ANOVA reports a highly statistically significant difference, confirmed by the Kruskal-Wallis test ($H = 22.48 (df = 2), p < .0001$). The post-hoc Tukey test confirms that the percentage value of the non-translations is significantly higher than those of both manuscript and published translations at the $p < .01$ level.

For the next cut-off point, 23.51, the ANOVA shows a highly statistically significant difference, confirmed by the Kruskal-Wallis test ($H = 8.53 (df = 2), p = .0141$). The post-hoc Tukey test reveals that the value of the non-translations is still significantly higher than that of manuscript translations at the $p < .01$ level, but not higher than that of edited translations. Also, there is no statistically significant difference between the two translated subcorpora.

Regarding the highest cut-off point in the log-likelihood ratio, a score of 28.47, there is no significant difference between the corpora. In the case of the mutual information score, the ANOVA yields no significant difference either.

The results from the collocational analysis support the tendency observed so far in this section, that translating creates a greater similarity between texts than editing. However, the results do not seem to confirm the hypothesis that translations use more collocational and thus normalised language, which was supported

by the finding that translations use a set of very frequent trigrams more often than non-translations. A technical explanation may be that the values yielded by the lower cut-off points are simply not very meaningful; after all, at the highest cut-off point, the difference disappears.

Another possible explanation might be that the use of translation memories favours a set of fixed, recurring phrases which are then used with a high frequency in the translations. That would explain why the set of trigrams chosen above occurs more often in translated than in non-translated texts. The latter, however, make more use of collocational language in general, which provides evidence against the hypothesis that translators use more normalised language. An explanation for this might be that writers have greater lexical freedom, and thus adopt specific collocations while translators are bound to the source text and thus less free in their language use.

To sum up this section, the analysis of unconventional language use and of lexical bundles argues that there are greater differences between the two translated texts on the one hand and the non-translated articles on the other. In other words, the editing process does not significantly change the features of the language of translation, which make the text differ from a non-translated text.

4.3 Simplification

4.3.1 Lexical diversity

For the analysis of lexical diversity, Kruger (2012) uses the standardised type-token ratio. I use the moving-average type-token ratio (MATTR) instead, which is a more robust measure of lexical diversity than the STTR because it is not affected by text length and takes into account changes within the text (Covington & McFall 2010: 96). I adopt a 500 word window as suggested for stylometric analyses by the authors (Covington & McFall 2010: 97). The MATTR was calculated using the R package koRpus by Meik Michalke.⁶

The ANOVA yields a highly statistically significant difference between the corpora (see Figure 9). The distribution of the TR+ED subcorpus is skewed, but the Kruskal Wallis test confirms a highly statistically significant difference among the corpora ($H = 18.88$ ($df = 2$), $p < .0001$). A post-hoc Tukey test reveals that the mean MATTR of the manuscript translations is significantly lower at the ($p < .01$) level than the mean MATTRs of both edited texts. The edited texts among themselves do not show a significant difference in mean MATTR.

⁶<http://reaktanz.de/?c=hacking&s=koRpus>

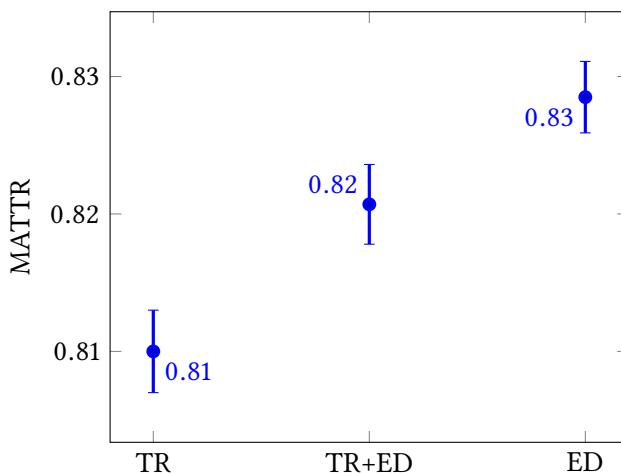


Figure 9: Moving-average type-token ratio ($F(2, 78) = 10.76, p = .0018$)

The findings argue that the manuscript translations are lexically less diverse than both non-translations and their published versions, which shows that the editors have intervened significantly to increase lexical diversity. The assumption that translations have a less varied vocabulary and are therefore simpler is supported. This analysis exemplifies the value of comparing manuscript and edited translations, as in a traditional corpus design, the fact that the actual translations have a much lower lexical diversity value would not have surfaced.

4.3.2 Word and sentence length

Word and sentence length were also calculated with the R package *koRpus*. Word length operationalises simplicity because more specific or formal words are usually longer while more frequent words are shorter (Kruger 2012: 366; Biber 1991), which seems especially true in the case of German (Bengt et al. 2004: 46).

Sentence length is usually considered to be an indicator of simplification, as sentences in translated texts tend to be shorter (Laviosa 2002). As longer sentences are deemed harder to understand (though this may be problematic generalisation; see the discussion in Bisiada 2013: 165–169) it is assumed that translators split sentences to improve readability (Vintar & Hansen-Schirra 2005: 212; Bisiada 2014: 21). Simplification as a translation universal may therefore be operationalised by measuring sentence length.

In terms of the mean word length, the ANOVA reports no statistically significant difference between the three subcorpora (see the graph on the left in

Figure 10).

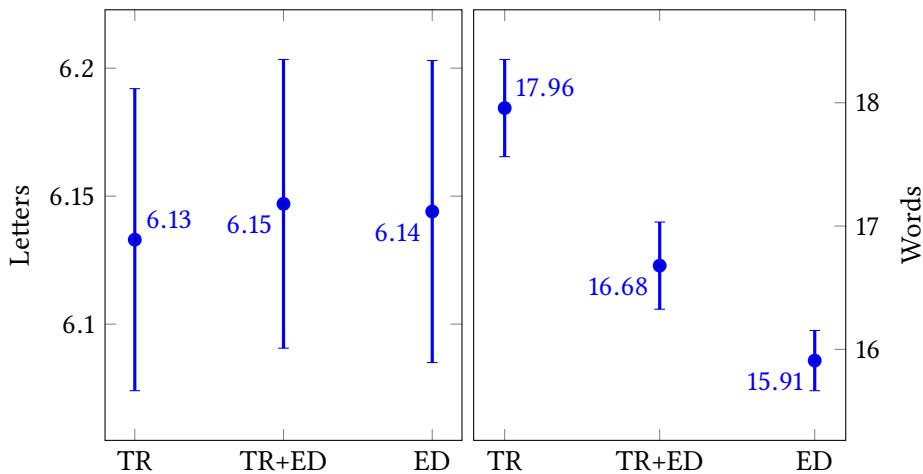


Figure 10: Left: Mean word length ($F(2, 78) = 0.01, p = .9901$); Right: Mean sentence length ($F(2, 78) = 9.44, p = .0002$)

For the mean sentence lengths in the subcorpora, contrary to what is usually assumed, it seems that the sentences in the manuscript translations are longer than those in the edited translations, and even more so than those in the non-translations (see the right graph in Figure 10).

The difference is highly statistically significant according to the ANOVA, and confirmed by the Kruskal-Wallis test ($H = 20.64 (df = 2), p < .0001$). A post-hoc Tukey test shows that the manuscript translations differ from both edited texts. Sentences in manuscript translations are highly significantly ($p < .01$) longer than in the non-translations and significantly ($p < .05$) longer than in the published translations. The two edited texts do not exhibit a statistically significant difference to each other.

It appears that the editors have brought the translated texts closer to the average sentence length that is exhibited by the non-translated texts. An analysis of the manuscript non-translations would be useful here to see whether editors have shortened the sentences in those texts as well. The strong editorial influence with regard to sentence length further underlines the need to differentiate manuscripts from edited versions when making statements about the features of translated language.

This section has produced results that contrast with those from the two sections on explicitation and normalisation/conservatism in that there seem to be

greater similarities between the edited translations and the non-translated articles. This suggests that, with regard to simplification, the editing process has rendered the language in the translated texts more similar to that encountered in the non-translated texts.

5 Summary and discussion

The analysis in this chapter has produced a large amount of data and claims which I hope will be checked and confirmed or rejected by other scholars, so that we discover more about the effect of editing on translation. Table 5 provides an overview of the mean values that have resulted from the analysis in this chapter. For completeness' sake, standard deviations are also supplied in brackets.

Cells in colour represent values that are different from the values of the other corpora. If the colour is blue, it means that the value behaves as expected under

Table 5: Overview of values with standard deviation in brackets

Variable	TR	TR+ED	ED	p
<i>dass</i> present	17.48(12.68)	17.41 (11.03)	9.3 (6.33)	<.01
<i>dass</i> absent	8.52(10.59)	9.47 (7.60)	7.48 (7.98)	>.05
PAV	9.43 (1.68)	9.45 (1.74)	7.99 (2.69)	>.05
Linking	9.22 (2.21)	9.21 (2.65)	8.52 (3.06)	>.05
Conj vs Prep	0.63 (0.13)	0.68 (0.11)	0.65 (0.12)	>.05
Passive alt.	28.26(15.40)	25.43(12.02)	25.34(13.69)	>.05
Unconv. (unatt.)	4.84 (4.10)	4.36 (4.21)	18.5 (18.19)	<.01
Unconv. (21–24)	5.44 (4.15)	4.52 (4.55)	11.7 (8.30)	<.01
Unconv. (18–20)	2.42 (2.55)	3.07 (2.84)	7.6 (5.87)	<.01
Trigrams	3.62 (1.07)	3.53 (1.27)	2.1 (0.99)	<.01
Trigr. (ll, cut-off low)	84.99 (2.07)	85.91 (1.51)	87.4 (1.68)	<.01
Trigr. (ll, cut-off mid)	57.99 (3.37)	59.3 (2.55)	60.5 (2.75)	<.01
Trigr. (ll, cut-off high)	30.67 (3.92)	30.95 (3.23)	30.58 (4.11)	>.05
Trigr. (mi)	4.65 (4.04)	4.21 (3.05)	5.55 (4.22)	>.05
MATTR	0.8 (0.02)	0.82 (0.02)	0.83 (0.01)	<.01
WL	6.13 (0.31)	6.15 (0.29)	6.14 (0.31)	>.05
SL	17.9 (2.05)	16.6 (1.84)	15.91 (1.27)	<.01

the universal in question; if the colour is orange, it means that the value runs counter to expectations and does not support the usual hypothesis attributed to that universal (the hypotheses attributed to each universal are discussed for each operationalisation in Sections 4.1, 4.2 and 4.3). The lighter colour means that the difference is statistically significant and a darker colour means that the difference was shown to be highly statistically significant. Values in the colourless cells are not significantly different to each other.

In the case of explicitation, most variables analysed here show no difference to each other, so that the features across the three subcorpora are mostly the same, except there are fewer explicitations using *dass* clauses in the non-translated articles. The differences are thus restricted to cases of less economical surface realisation, a “borderline case” of explicitation that may more usefully be considered as “expansion” (Krüger 2015: 239). Alternatively, the more frequent presence of *dass* in translated texts may be a sign of conservative language use if we accept the claim that a German finite *dass*-clause is preferred over a non-finite construction (Fischer 1997: 215; 2013: 337), though this claim has not yet been backed up by evidence.

As the use of normalised or conservative language is concerned, the operationalisations analysed here suggest that there is a difference between translated and non-translated language. The latter makes more use of unconventional language and differs in the use of collocations. As regards the latter, it seems that translators use a set of recurring trigrams more frequently than writers of non-translated articles, but overall, the latter seem to use more collocational language.

In terms of the universal of simplification, differences have been observed between manuscript translations on the one hand and edited translations as well as non-translations on the other. This seems to show that editors’ influence has been strongest in this respect, arguing for simplification to be an editing universal. An explanation for this might be that simplification is operationalised by mainly quantitative features, which makes it easier for editors to change the text in order to approximate its language to the non-translated articles. More research on other genres and text types should test editors’ influence on sentence length. This may explore the question of whether the finding that (published) translations have shorter sentences on average can actually be related to translated language, or whether it should instead be attributed to the influence of editors who try to improve the readability of a text.

As for the hypothesis of universals of mediated discourse, the study produces little evidence in favour of “mediation universals”. Verifying that theory in the present study would have required the data to show more similarities between

the TR+ED and the ED subcorpora, and for there to be more differences between the TR and the TR+ED subcorpora.

Instead, and similarly to what was reported by Kruger (2012), the editing stage seems to have little effect on the features measured here. That does not mean that changes to the text are negligible, but rather that editors do not intervene in such a way to make the articles more like the non-translated articles. With regard to simplification, however, my findings differ from those reported in Kruger (2012), as editors have made significant changes in this respect.

Based on the present findings, it could be argued that editing is largely a simplifying activity, with editors trying to apply quantitative strategies to make the text more comprehensible (on this issue, see also Müller-Feldmeth et al. 2015). The general direction of editorial behaviour seems to incorporate changes that are thought to “improve” the text from the editor’s point of view, and mainly focus on superficially identifiable features such as shortening sentence length (on editorial sentence splitting in translation, see Bisiada 2014) or effecting lexical changes that lower the type token ratio. The editorial style of course depends to a great extent on genre. Texts edited for commercial publications need to be more reader-friendly than, say, reports or parliament communications. The editing activity here is heavily guided by the in-house style guide, which does stipulate simple language (Bisiada 2014: 3).

From a practical perspective, the findings show that editors’ intervention is restricted to three features: they make sentences shorter (by splitting them, as reported for German in Bisiada 2014)), they increase lexical diversity and they increase collocational language use to some extent. They also seem to reduce the frequency of alternative passive constructions, though the difference in this case is not statistically significant. I discuss this issue in more detail in a monograph currently in preparation.

With regard to the omission of *dass* and the unconventional words, editors seem to have made the text more unlike the non-translated texts. While again the differences are not statistically significant, this may mean that when editing translations, editors are actually more conservative and restrictive in terms of the non-standard expressions they let pass than when they are editing non-translated articles. In this respect, translations may improve or at least be more consistent with non-translated articles if editors gave translators some more freedom and allowed more unconventional language use.

To empirically strengthen the discipline of translation studies, more transparent and replicable research is needed. I have tried to provide such a study in this chapter, and hope to have offered a range of avenues for further research. As

was shown in this chapter, the study of editing can greatly enhance our view of the translation process by differentiating features that really are attributable to translation from those that are introduced by other agents who have influence on the text.

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Chapter 10

News Translation: Text analysis, fieldwork, survey

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In this study, we investigate the practice of news translation in order to examine the participation of actants who play a role in the production of a translation and who contribute to defining what translation is or should be. The conceptual framework applied in the study combines the generative semiotic theory and a hybrid methodological approach based on semiotic discourse analyses with textual corpora, think-aloud protocols with news editors and a survey among the readers of the translated texts. This triangulation of data sheds light on the publishing workflow and on the reception of translations, and helps understand how the various ways in which different actants conceptualize translation come together, which one prevails and on what grounds.

1 Background: Translating news

Translation studies scholars have shown that translation is a crucial factor in disseminating news in the (inter)national arena. Researchers have focused on news agencies and have mapped local and global networks of journalists in order to understand how news is gathered and distributed and how translation is performed by and for news agencies (Bielsa 2007; Bielsa & Bassnett 2009). The norms and



style of the journalistic genre have been investigated in order to identify how the original text is restructured, shaped, transformed or even merged with other news sources into a different target text that better suits a different linguistic, cultural and geographical context (Stetting 1989; Bielsa 2007; Tapia Sasot de Coffey 1992; Bielsa 2007; Brownlie 2010; Caimotto 2010; Tsai 2010; Federici 2010; Gumul 2010). Case studies show that when translation is integrated into journalism, it is governed by norms that fall into the category of news production, that it is performed by trained and specialized journalists who are not translators and usually remain invisible (Tapia Sasot de Coffey 1992; Bielsa 2007; Bielsa & Bassnett 2009; Schäffner & Bassnett 2010; Hernández Guerrero 2011) and eventually that concepts such as equivalence and faithfulness are of minor importance compared to journalistic norms, medium constraints and adjustments to the target audience (Stetting 1989; Anthony 2004; Bielsa & Bassnett 2009).

With the study of news translation practices, scholars have raised questions as to who decides what news is published in newspapers and how news is translated and approved before publishing, which techniques are adopted so as to better fulfill media goals, and how all of this affects the modern theory and practice of translation. From a methodological perspective, these contributions are mostly, though not exclusively, based on text analysis, as they apply critical and political discourse analysis. Some field research is also carried out in order to investigate daily work in news agencies (Bielsa & Bassnett 2009; Tsai 2010) or via face-to-face interviews (Brook 2012).

This study tries to address some of the above questions by investigating a specific practice of news translation, in the Italian magazine *Internazionale*, using a new conceptual framework – generative semiotic theory – and a hybrid qualitative methodological approach, i.e. by combining semiotic discourse analysis with textual corpora, think-aloud protocols with the editors of *Internazionale* and a survey among the magazine's readership. The idea here being that by using different types of analyses the results become more rigorous and the phenomenon will be more fully understood. In fact, authors from other disciplines have stressed the importance of methodological triangulation, helping to strengthen the trustworthiness of the findings. Triangulation consists in the use of multiple data sources by multiple researchers espousing multiple theoretical perspectives and methods (Leech 2007; Jensen 2008).

The main goal is to describe as accurately as possible, and with the use of different sources of data and data gathering techniques, the voices of the actants who play a role in the practice of translation and contribute to defining what translation is or should be.

The sociological turn in translation has shed light on the study of the multiple actors involved in the production of translations. Some authors adopt a Bourdieu-sian approach to translation, where it is seen as an artistic product with a symbolic capital (Inghilleri 2005; Gouanvic 2005; 2007); other authors bypass purely textual approaches to translation in order to understand how the circulation of texts depends on power relations between agents that participate in the practice (Heilbron & Sapiro 2002; 2007; Sapiro 2008); others apply Latour's actor-network theory to identify and describe the role of actors participating in the generation and circulation of translations (Buzelin 2005; 2006; 2007a,b; Bögic 2010). Most of these studies are based on qualitative methods combining fieldwork, interviews and observations with the analysis of written documents.

Although social studies have focused mainly on the book industry and on literary translation (little attention has been devoted to the translation of other text typologies), the sociological approach has the great merit of having unveiled the presence of hidden actors taking part in the translation process, thus contributing to defining – or blurring– the boundaries of translation.

In consonance with recent studies in the field of news translation, and acknowledging the need to understand translation practices in a broader way, this study adopts a semiotic approach that makes it possible to:

- identify shifts in translated and edited texts containing voices of different subjects that transform these texts;
- identify these voices as *actants* that operate in manipulative, performative and sanctioning modalities, according to specific systems of values.

2 Conceptual framework: The semiotic perspective

A semiotic model of the practice of translation and a semiotic definition of the concept of translation are adopted here as a conceptual framework.

As stated in Troqe (2014b,a), the semiotic¹ concept of *narrativity* is considered to be the organizing principle of discourses, including scientific discourse. Narrativity allows for a description of translation as the result of the manipulation, performance and sanction by two main actants:² the Initiator and the Translator.

¹Here we are referring to Greimassian semiotics (Greimas 1970; 1983; Greimas & Courtés 1979; Fontanille 2003)

²In the semiotic perspective, an actant accomplishes or undergoes qualifying acts. An actant may be an individual or a group of individuals.

In the semiotic perspective, the action of somebody doing something is called *Manipulation*³. In our approach, Manipulation, in Translation, qualifies the actant Initiator, who acts on another actant, the Translator, for him/her to carry out a given translational programme. The Translator actant may or may not adhere to specific programmes of translation. Manipulation and adherence set the stage for a contractual situation where translational requirements are to be fulfilled by the Translator. These requirements influence the performance of the Translator and the result of his/her action. Sanction follows performance: the Initiator assesses the compatibility of the performance with the contractual requirements and with his/her system of values by accepting, revising, amending, adapting, altering, reshaping and aligning the translated text with a specific system of values. The investigation of interactions between the Initiator and the Translator is performed by another actant, the Researcher, whose stance, beyond any claim of objectivity, must be included in the semiotic model that is presented here (Figure 1).

Regardless of what the translational practice is, what steps the actants may take and what the specific translation requirements are, from a semiotic perspective, two concepts must be considered inherent to any practice or idea of translation: *equivalence* and *difference*. *Difference* refers to the concept of contrast: in order for it to be and emerge as an individual and unique entity, the Translation must first be different from the thing to which it refers – the Original, the other. Translation is a different subject, a different linguistic expression, a different practice. The term *equivalence* refers to a condition of derivation, to the need for the Translation to emerge as a reference, an analogy, a simulation or a copy of something else (the Original)⁴. In this perspective and as formulated, in

³ According to Jeremy Munday, in Translation Studies, the concept of ideology has a negative connotation involving distortion, concealment and manipulation; thus, translation is seen as manipulative distortion and rewriting (Munday 2007: 196). By adopting a Semiotic perspective, we consider any act of Manipulation as a triggering act of translation, performed by an actant called Initiator on an actant called Translator. This outlook allows for a neutral stance on manipulation and sees it as a prerogative of the Initiator.

⁴ The concept of *equivalence* is an immanent feature in the theoretical discourse on translation and translating; implicitly or explicitly, and regardless of how it has been defined, the term *equivalence* has influenced and regulated the practice and theory of translation over time, becoming a supermeme (Chesterman 1997) and an immanent condition to translation. However, recent developments in the field underline the paradoxical condition that characterises the concept of translation. The undeniable non-equivalence of translation compared to the original, whether conceptual, ontological, pragmatic, semantic, in the medium, in the finality and so on, is evident, and the idea of *difference* is clearly theorised by translation scholars: In particular, the “similar but different” concept in Nida A. (2004), “divergent similarity” in Chesterman (1996) but also in the semiotic writings of Stecconi (2004); Gorlée (1994); Petrilli (1992), translation is seen as a purposeful equivalent but different activity.

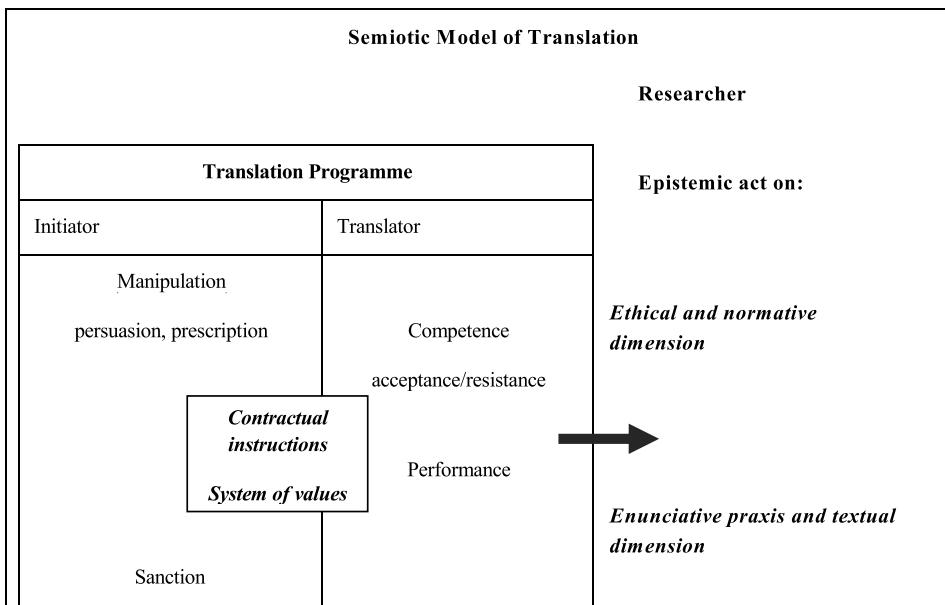


Figure 1: Semiotic model of translation

a similar way, by Gideon Toury, *equivalence* entails a certain interference of the underlying source structure – in terms of linguistic and textual conventions and decision not to adapt the translation to the target system requirements, while on the other hand, *difference* yields “subjugation” to the recipient system, involves suppression of source specific features, or even recreation or addition of new features in order to enhance acceptability in the target system (Toury 1995: 171).

The question of confrontation of identities (I vs. Other) represents a third inherent aspect in the study of translation. It refers to the derivation, exchange, resistance, compatibility or incompatibility between the Translation-I – the translating identity – and the Original-Other.

Those terms are adopted in the Greimasian semiotic square⁵ to formalize the translation paradox – the simultaneity of equivalence and difference and the confrontation of the identity Translation-I vs. Original-Other (Figure 2).

The semiotic square of Translation depicts virtual and abstract values that emerge from different translation practices by different actants, who operate in different contexts and cultures.

⁵As an elementary structure of meaning, the semiotic square defines the fundamental conditions of existence of a concept, an individual or society (Greimas & Rastier 1968, 87).

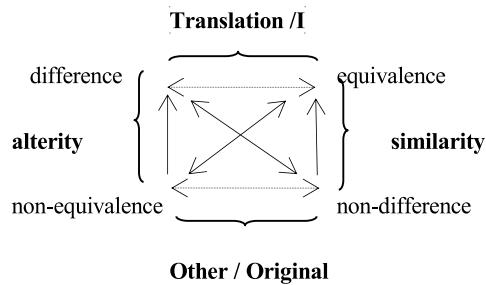


Figure 2: Semiotic square of translation

The conceptual framework – the semiotic model and the semiotic square of translation – is adopted here to investigate the translation practice of written news published by the Italian magazine *Internazionale*.

Theoretical reasoning is backed up by empirical research designed to gather data from:

- the analysis of a sample of original, translated and edited texts published by *Internazionale* with the label translation;
- verbalisations by four *Internazionale* editors while working on translated texts and thinking aloud;
- a survey among readers of *Internazionale* who expressed their opinion on translation in general and on translation by *Internazionale* in particular.

3 Results and discussion

3.1 Text analysis

Internazionale is an Italian weekly magazine founded in 1993 that publishes translated articles (from all languages from Asian to African languages, but mainly from European languages) from the international press, the main goals being to inform and provide the readers with a more nuanced and richer perspective compared to other Italian periodicals. According to one of the four deputy directors⁶ of the magazine, three main criteria are of importance in selecting articles worthy of being published in *Internazionale*: respect for journalistic standards (clarity and accuracy in facts and style); impact and appeal; variety of sources.

⁶Interview of 28th June, 2013 with a deputy director of *Internazionale*.

Another important criterion is the feasibility of shortening texts: usually articles are only chosen if it is possible to carry out editorial cuts without “changing the meaning”.

The publishing workflow consists of different phases:

- Original texts are usually selected and often treated (i.e. shortened) by in-house editors. Each editor is a specialist for specific geographical areas and topics.
- Selected texts are discussed and chosen at the weekly editorial board meeting. The number of pages in the magazine to be assigned to each text is also discussed.
- Texts are sent to freelance professional translators with deadlines ranging from 24 hours to a week.
- Translations are edited by the editors and reviewed by the copy editors and the director general before publishing. Revision by the copy editors is only done on the edited texts and is mostly aimed at coherence of content, consistency and accuracy in the Italian language.

The first part of this study focused on 28 articles published by the magazine in the period 2011–2012. A semiotic analysis was performed on the translations (from English, French and German) and edited translations. Comparisons with the originals allowed major cuts and other types of shifts to be identified. QDA Miner qualitative data analysis software⁷ was used to annotate texts manually and extract information from the corpora.

An initial exploration of the textual data gives us an overview (Figure 3) of the percentage of words in the original, translated and edited texts. Regarding the total number of words in the original texts (35'596 words in total), there were 2.2% fewer words in the translated texts (34'837 words in total) and roughly 22% fewer words in the published articles (27'908 words in total).⁸

For a detailed analysis, semiotic categories (Fontanille 2006; Fontanille & Zilberberg 1998: 200–202) were used to identify variations in the translated texts

⁷<http://provalisresearch.com/products/qualitative-data-analysis-software/>

⁸These figures aggregate the English results (89.79% of words in the translated texts and 77.07% in the published articles compared to the originals), the French results (98.23% of words in the translated texts and 73.93% in the published articles compared to the originals) and the German results (118.79% of words in the translated texts and 84.79% in the published articles compared to the originals).

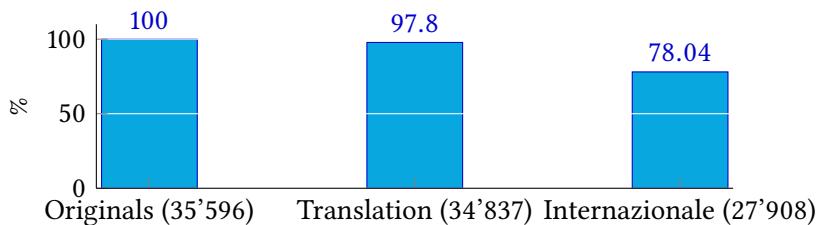


Figure 3: Average words in translations and originals

and published articles. Below is a description and a few examples of the semiotic categories used to annotate shifts in the textual corpora.

3.1.1 Omission

Disappearance of forms and dilution in virtual structures – the elimination of expressions, sentences and paragraphs in the target texts.

3.1.2 Revolution

Major variations that radically change the meaning of the original text. Revolutions may occur concomitantly with other types of variations, e.g. original contents are omitted and replaced by new sentences that cause shifts in the argumentative positions. Table 2 provides an excerpt from the article “The Chemistry of the Suppression of Desire: What is going on in the brain of a cheater?” published by Slate Magazine and translated into Italian by Internazionale. The translated version appears in the second column; it is common practice for the original texts to be “edited”, i.e. shortened, before being sent to the translator, in fact, in Table 3, the central paragraph (“But there’s a problem [...] to satisfy fleeting desire”) is missing in the translated version. An illustration of the “revolution” variation can be found in the last paragraph in Table 2, which encapsulates the take-home message. It is transformed in the edited version as follows “In spite of the genetics, we are responsible for our actions”, a sentence that contradicts the argumentative stance of the original, which aims at maintaining a rather nuanced stance towards infidelity and evaluating the role that genetics plays in human behaviour.

3.1.3 Emergence

Transitions from the virtual to the actual status – additions of content that does not occur in the original text but appears in the target text. In example 3, third col-

Table 1: Omission

Original	Translation	Internazionale
(..) A spokesperson for MINUSTAH did not respond to e-mailed questions, but the United Nations has denied that soldiers were sick. Waldor says he finds Piarroux's evidence "suggestive but not absolutely conclusive." There are ways to collect more evidence – for instance, by testing the Nepalese soldiers for antibodies against <i>V. cholerae</i> . "It may be getting late for that," Waldor cautions, because antibodies peak after about a month. Some scientists don't believe foreigners introduced cholera at all, despite the molecular clues. Most prominent among them is Rita Colwell, a veteran microbiologist at the University of Maryland, College Park. Colwell believes that most cholera outbreaks are caused by bacteria that lurk locally and proliferate when conditions are favourable – in this case, perhaps a climate event called La Niña. To Waldor, the idea that a microbe so closely resembling a South Asian strain would emerge in Haitian waters is "frankly absurd." (Colwell e-mailed Science that she was "in Bangladesh working on cholera and unable to respond" to questions.)	(...) "Un portavoce della Minustah non ha risposto alle domande inviate per email, ma le Nazioni Unite hanno negato che i soldati fossero malati. Per Waldor le prove di Piarroux sono "indicative ma non definitive". Esistono modi di scovare altre, per esempio testando i soldati nepalesi alla ricerca di anticorpi contro il vibrione del colera. "Tuttavia potrebbe essere troppo tardi", avverte Waldor, perché gli anticorpi raggiungono il picco massimo dopo circa un mese. Malgrado gli indizi molecolari, alcuni scienziati non credono affatto che siano stati gli stranieri a portare il colera. La più importante tra loro è Rita Colwell, un'esperta microbiologa della University of Maryland, a College Park, convinta che la maggior parte delle epidemie di colera sia causata da batteri che si annidano sui posto e proliferano in condizioni favorevoli, in questo caso forse per l'evento climatico chiamato La Niña. Per Waldor l'ipotesi che un microbo così simile al ceppo dell'Asia meridionale possa emergere nelle acque haitiane è "francamente assurda".	Un portavoce della Minustah non ha risposto alle domande inviate per email, ma le Nazioni Unite hanno negato che i soldati fossero malati.

Table 2: Revolution

Original	Translation	Internazionale
<p>[Larry believes that kissing], hugging, caressing, and intimate small talk can all help to keep a man's oxytocin high, too</p> <p><i>[But there's a problem with this takeaway message. The longer we're with our social partner, the less intimacy and sex we have. When new mates are first introduced, they have sex like crazy. After a time-in marmosets, for example, it's about 80 days—they won't be having much sex at all. Less sex does not mean we're less devoted. We have other powerful reasons to maintain the social relationship, not least CRF. But depending at least partly on our genetic makeup, our motivation to seek erotic reward can be more or less powerfully awakened by a new potential partner. If the circuit shouts loudly enough, we'll risk the committed relationship, our careers, and our reputations to satisfy fleeting desire.]</i></p> <p>We're not automatons. We are responsible for our actions. But our baked-in biases can make us susceptible to infidelity. Our brains can be a battlefield of competing interests, and sometimes desire wins. It may win more often in people like Petraeus whose bold, creative thinking we so admire can come with a bias toward behavior we don't. That doesn't make him special, it makes him human.</p> <p>The Chemistry of the Suppression of Desire What is going on in the brain of a cheater?, Slate, 27.12. 2012</p>	<p>[...] Ed è anche possibile che baci, abbracci, carezze e confidenze intime servano a mantenerla alta. [...]</p> <p>Ad ogni modo non siamo automi. Siamo responsabili delle nostre azioni, eppure le inclinazioni ormai radicate rischiano di renderci infedeli. Il nostro cervello può essere un terreno di scontro tra interessi conflittuali e a volte vince il desiderio. Forse vince più spesso in quelli come Petraeus, il cui modo di pensare audace e creativo che tanto ammiriamo può essere accompagnato dalla propensione a un comportamento che invece non apprezziamo.</p>	<p>Malgrado la genetica, siamo responsabili delle nostre azioni.</p>

umn of the table, the edited version explains that “many investors have decided to take away their money from Europe and move it into emerging economies. The problem is that this has made their currencies stronger and *damaged their exports*”. By contrast, the original in German only says “ihre Währungen werden wegen des Rückzugs aus Euroanlagen nämlich immer stärker” (“their currencies are in fact becoming stronger due to the withdrawal from euro investments”). This is a typical example of a modification that aims at rendering the target text more explicit by adding content or by explaining logical connections and thus channelling the interpretation.

Table 3: Emergence

Original	Translation	Internazionale
<p>Einzelne Schwellenländer sind dafür, da sie indirekt bereits mit den Folgen der europäischen Krise kämpfen; ihre Währungen werden wegen des Rückzugs aus Euroanlagen nämlich immer stärker.</p> <p>G-20 erhöhen Druck auf Europa, Der Standard, 16.11.2011</p>	<p>Alcuni paesi emergenti sarebbero favorevoli, in quanto già si stanno confrontando indirettamente con le conseguenze della crisi europea: a causa della rinuncia agli investimenti in Europa, le loro valute si stanno infatti rafforzando progressivamente.</p>	<p>Alcuni paesi emergenti sarebbero favorevoli, perché già subiscono le conseguenze della crisi europea: molti investitori hanno deciso di portare via i loro soldi dall'Europa e li hanno spostati nelle economie emergenti. Il problema è che in questo modo le loro monete si sono rafforzate, danneggiando le esportazioni.</p>

3.1.4 Apparition

Forms that receive an expression and status of reality that allows for further reference – expansions, clarifications and amplifications of the original content and form in the target texts. In the example in Table 4, in the middle of the original article, there is a reference to an Inuit meeting in the city of Ottawa (“Kuupik Kleist, Greenland’s prime minister, said at a meeting in Ottawa”) but in the excerpt (“Yet it was the Inuit success stories...”), there is no clear reference to the place where the delegates were at that time. Of course one might think that the Inuit delegates met in Ottawa at the already mentioned meeting, and this is, in fact, the information that is made explicit and appears in the edited version (third column).

Table 4: Apparition

Original	Translation	Internazionale
Yet it was the Inuit success stories that most grabbed delegates. One example is the Red Dog Mine in northern Alaska. Created as a joint venture between the operator, Teck Alaska, and the local Inupiat, it has fed much cash—\$146m in 2010 alone—into the Inupiat's coffers.	Eppure sono state le storie a lieto fine a colpire di più i delegati. Un esempio è quello della Red Dog Mine in Alaska settentrionale. Creata come joint venture tra Teck Alaska e gli Inupiat del posto, la miniera ha riversato molto denaro – 146 milioni di dollari nel solo 2010 – nei forzieri dei nativi.	Ma a Ottawa i leader inuit si sono interessati soprattutto alle storie a lieto fine. Un esempio è quella della Red Dog Mine, nell'Alaska settentrionale. Creata come joint venture tra Teck Alaska e la tribù degli inupiat, la miniera ha fatto affluire molto denaro – 146 milioni di dollari nel 2010 – nelle casse dei nativi.
The Inuit prepare to defend their rights. The Economist. 03.03 2011		

3.1.5 Decline

Transitions from realised to potentialised status – synthetic formulations, shortened versions and summaries of the source text’s contents and forms. In the following example, the original explains that; in the adolescents, healthcare and psychological situation can affect their health and *the malnutrition rate*; this last piece of information does not appear in the edited version, and is subsumed in the expression “condizioni di salute” (“health condition”).

Table 5: Decline

Original	Translation	Internazionale
La situation sanitaire et psychologique des adolescents peut influer sur leur état de santé et leur taux de malnutrition. Les filles moins bien loties en cas de crise alimentaire, Le Monde, 26.02. 2011	La situazione sanitaria e psicologica degli adolescenti può influire sulle loro condizioni di salute e sul loro tasso di denutrizione.	la situazione sanitaria e psicologica influisce sulle loro condizioni di salute.

3.1.6 Fluctuation

Shifts in the vocabulary and semantic fields – variations due to idiosyncrasies or internal lexical and stylistic norms. The French “saltimbanque *moustachu harangue le garde...*” (“the moustachioed entertainer harangues the guard...”) is translated as “il saltimbanco dal baffetto si rivolge alla guardia” (“the entertainer with the *moustache* speaks to the guard..”) and edited as “il saltimbanco baffuto provoca la guardia” (“the moustachioed entertainer *provokes* the guard...”). In particular, the focus is in the French verb “haranguer”, downplayed in the translation as “speak to” and emphasised in the edited text as “provoke”.

Table 6: Fluctuation

Original	Translation	Internazionale
Tandis que son compère Falâncio joue de la guitare, le saltimbanque moustachu harangue le garde du ministère des Finances. Portugal Rires de crise, Libération, 7.05.2012	Mentre il suo compare Falâncio suona la chitarra, il saltimbanco dal baffetto si rivolge alla guardia del Ministero della Finanza [...]	Il suo compare Falâncio suona la chitarra, il saltimbanco baffuto provoca una guardia davanti al ministero delle finanze [...]

3.1.7 Distortion

Variations in the use of adverbs, in passive-active structures, shifts from general to particular expressions, shifts referring to changes in point of view. In the example in Table 7, the original explains how Google Translate works, that it can go through all the documents produced by the EU in two dozen languages, as well as through articles and books available in a bilingual form. Distortion is found in the translated version, which refers specifically to 24 EU languages but also in the edited translation, which refers to “articoli e ai libri inseriti nel

Table 7: Distortion

Original	Translation	Internazionale
The corpus it can scan includes all the paper put out since 1957 by the EU in two dozen languages , everything the UN and its agencies have ever done in writing in six official languages, and huge amounts of other material, from the records of international tribunals to company reports and all the articles and books in bilingual form that have been put up on the web [<i>by individuals, librarians, booksellers, authors and academic departments</i>]. How Google Translate works, Independent.co.uk, 13.09. 2011	Tra la mole di informazioni a sua disposizione ci sono tutti i documenti in ventiquattro lingue inseriti dall'Unione europea a partire dal 1957, tutto quello che l'Onu e le sue agenzie hanno scritto in sei lingue ufficiali e un'enorme quantità di altro materiale, dai verbali dei tribunali internazionali fino ai resoconti delle imprese e a tutti gli articoli e i libri inseriti nel web in due lingue .	Tra la mole di informazioni a sua disposizione ci sono tutti i documenti tradotti in decine di lingue dall'Unione europea a partire dal 1957, tutto quello che l'Onu e le sue agenzie hanno scritto nelle sei lingue ufficiali e molto altro materiale, dai verbali dei tribunali internazionali ai resoconti delle imprese fino a tutti gli articoli e ai libri inseriti nel web in almeno due lingue .

web in almeno due lingue” (“articles and books placed on the web in *at least two languages*”).

3.1.8 Adjustments

Corrections by editors of mistakes and typos in the translated texts. In the example in Table 8, the mistaken 27.8 billion (US-\$) of the translated version is corrected, following the original, into 27,800 billion in the edited version, and accompanied by an information specifying the amount in euros.

Table 8: Adjustments

Original	Translation	Internazionale
[And, lest we begin to think of China as a dynamic market economy,] the latest data showed that of the 27.8 trillion yuan in fixed asset investment, 15 trillion was accounted for by investment undertaken by state-owned enterprises or investment in real estate. China's Highly Unequal Economy, The Diplomat, 01.03.2011	I dati più recenti mostrano che dei 27,8 miliardi di yuan investiti in beni fissi, 15 miliardi corrispondono a investimenti realizzati da imprese statali o nel settore immobiliare. Lo stato controlla ancora la fetta più grossa degli affari.	I dati più recenti, inoltre, mostrano che oltre la metà dei 27.800 miliardi di yuan (circa tremila miliardi di euro) investiti nelle immobilizzazioni appartengono alle imprese di stato e riguardano il settore edilizio.

3.1.9 Intensity

Shifts in translation or edited texts that increase or decrease euphoric or dysphoric intensity. In the example in Table 9, the original expression “unfortunately”, rendered as “purtroppo” (literally “unfortunately”) is downplayed into a more plain version as “ma” (but) in the edited text.

Table 9: Intensity

Original	Transalton	Internazionale
Unfortunately, their findings were largely overlooked. My two minds Mon esprit partagé, New Scientist, 05.05. 2012	Purtroppo queste scoperte sono state largamente ignorate.	Ma queste scoperte sono state largamente ignorate.

The extraction of codes associated with semiotic categories describing variations in the translated texts and published articles (Figure 4) shows that *Omission* is the most frequent code, accounting for roughly 3,000 original words elided in the translated texts and more than 5,500 translated words omitted in the edited texts. Eliminations from the original and translated texts have only been coded

as Omissions; however, as shown in Table 2, omissions determine variations that radically change the argumentative positions.

In the translated texts, the most frequent codes after Omission are (see also Figure 5):

In the translated texts:

- Appearance: extensions and explicit formulations;
- Intensity: thymic⁹ (euphoric and dysphoric) shifts;

In the edited texts:

- Fluctuation: variations in the semantic field;
- Decline: shorter formulations, summarizing strategies;

This data shows two tendencies: on the one hand, the translational practice by the translator that tends to expand or explicitate (on a conceptual or a thymic level) excerpts that might be obscure or allusive in the receiving culture; on the other hand, the editorial practice which tends to reformulate (on a semantic or syntactic level) by avoiding ‘unfamiliar’ expressions in Italian, by reinforcing cohesion and rendering the text more fluent and readable, more catchy and journalistic. In the light of the semiotic square (Figure 1), the translator meets the criterion of equivalence if he/she never attempts to introduce profound changes, as compared with the original, but rather tends to stay close to it; meanwhile, the variations by the editor (as acts of sanction by the Initiator, see Figure 2) transform the look and identity of the original so as to make it fit better into the receiving system.

The elision of original segments in the translated texts (Figure 4) is due to the fact that the original articles are chosen and pre-edited, i.e. shortened prior to transmission to the translators.

Major variations in the edited texts may be due to internal norms, as explained in the interview with one of the deputy directors of the magazine. The main constraint may be space and graphical limitation, which could explain the need to shorten texts.

⁹The thymic dimension refers to processes and states of attraction (euphoria) and repulsion (dysphoria): in an enunciation, thymism is associated with the value scale of the subject of the enunciation, with what the subject is attracted to or repulsed by Greimas (1970: 93).

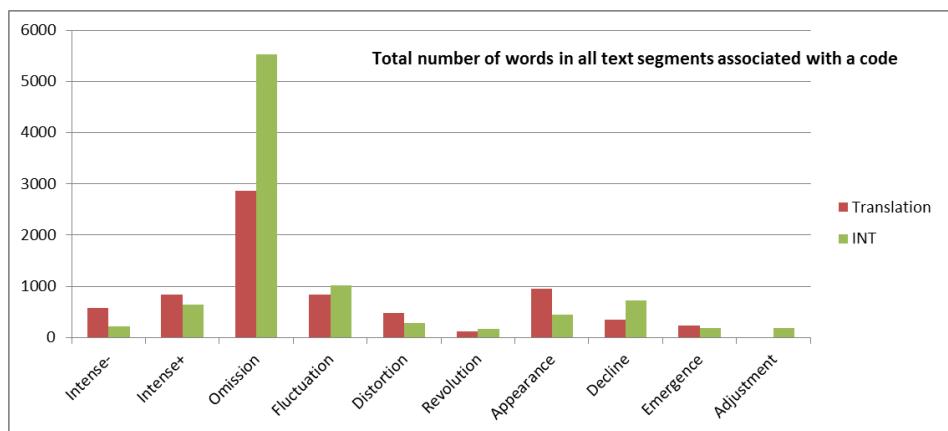


Figure 4: Total number of words in all text segments associated with a code

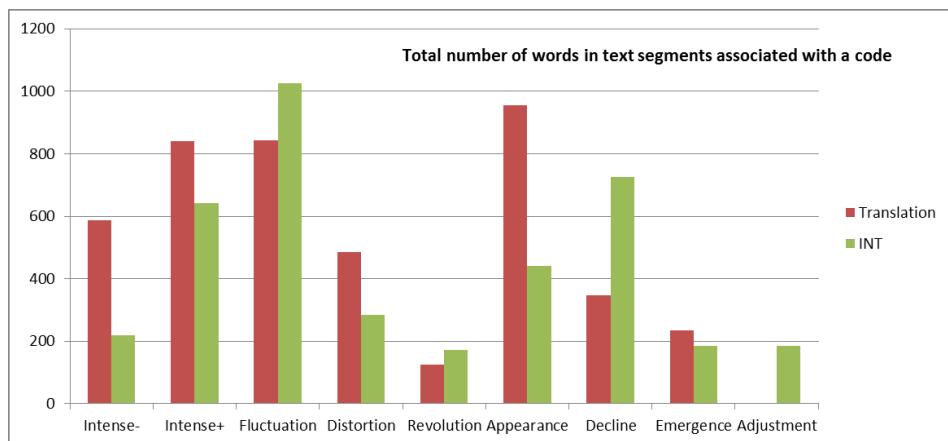


Figure 5: Total number of words in text segments associated with a code (except the code *omission*)

Other editorial norms mentioned in Internazionale's editing style guide are:

- avoid long sentences and unusual and awkward syntactic constructions;
- avoid using special verbal tenses (i.e. pluperfect);
- avoid excessive use of pronouns and adjectives, and obsolete words;
- maintain, to the greatest possible extent, the specificities of the original language, while ensuring an enjoyable and smoothly readable Italian.

Of course, these recommendations are not restrictive or binding and editors are free to edit texts as they find appropriate. In fact, as shown by the data, it is true that variations such as Fluctuation and Decline are aimed at avoiding redundancy, long sentences and awkward expressions, but at the same time, downplaying nuances and omitting whole paragraphs does not speak in favour of “maintaining the specificities of the original”, unless one specifies what is meant by “specificities”.

Thus, a question naturally emerges: how do editors reshape and transform the translated texts before the editorial board publishes them as *translations* overtly bearing the translators' names?

3.2 TAP with Editors

A think aloud protocol is a method for gathering data by asking people to perform a task while stating directly what is going on in their heads/minds. This method was first used in psychology studies (Ericsson & Simon 1993) but was quickly and widely adopted to collect raw data on translation, as demonstrated by the annotated bibliography on TAPs in translation by Jääskeläinen (2002). TAPs have mainly been collected while subjects perform translation or translation-related tasks, i.e. problem solving activities while translating texts from one language to another. Recently, TAPs have also been employed to investigate processes by translation proofreaders and have dealt with issues such as fidelity, time and quality in the revision of draft translations (Künzli 2007; Robert 2013). Among the biases of the TAP method, there is the difficulty of making sure that the verbalisations actually reflect mental states without distortion, but also the degree of automation performed by subjects experienced in the task which leads to fewer verbalization of conscious mental states in the short term memory compared to subjects who are less experienced and therefore more prone to verbalize a higher

amount of information (Ericsson & Simon 1993: 127). Notwithstanding these disadvantages, in our case, this method proved to be a useful addition to our tool set: our understanding of translation is enhanced by pooling results derived from the analysis of texts (as provided in §3.1 of the present study) and responses by those who are involved in the process of making the final products.. In particular, we focus on the responses of the Initiator actant (Figure 2) in order to understand which values (Figure 1) are implemented.

We have therefore utilized the TAP vocal recording method to collect data while four Internazionale professional editors performed the editing of translated texts.

The test was carried out at Internazionale's offices and was executed in two experiments:

Test 1: a trial test, presented as a warm-up exercise, with TAPs collected while editors worked on translations (by translators they usually work with) to be published in the following issue of the magazine;

Test 2: TAPs were collected while editors worked on a translation performed by a professional translator with the fictitious brief that the output would be published in the magazine. In Test 2, no layout limitations were given.

Verbalizations of both experiments were coded according to categories that group together similar information provided in the TAPs referring to particular constraints (editorial norms), to references to the translator's performance, to the readership, or to personal preferences:

- i. Editorial constraints: semantic and syntactic preferences for smooth reading, clarity, concision, simplification and space limitation, as well as online research for terminology and fact-checking
- ii. Subjectivity
- iii. Reference to the translation or translator
- iv. Reference to the readership

In both tests, a large number of verbalizations referred to **online research**, mostly made to check facts, double check sources, but also to verify terminology in bilingual or monolingual dictionaries. Sometimes the sources were Wikipedia or online news websites; sometimes expressions were googled to see if the expressions translated had a high rate of occurrence in Italian.

- (1) verifico...allora ...quindi cerco...ehm/ manus island detention center...cerco online per verificare se ce ne uno o ce ne sono di più...vediamo...allora / qui guardo wikipedia in inglese ...
I'm checking it...so...I'm looking up...um / the manus island detention centre...I'm looking online to see if there is one or more than one...let's see...so / I'm looking up Wikipedia in English...¹⁰
- (2) che dal monastero di santa caterina nel Sinai / questa frase la googlo per controllare se in italiano ci sono delle occorrenze e se è un posto consciuto, ecco... dice monastero di santa caterina...
the one about the *monastero di santa caterina nel Sinai* / I'm googling this sentence to check if there are occurrences in Italian and if it's a known place, here we go... it says the *monastero di santa caterina*...
- (3) *of petty... petty defiance* com'è *defiance*? Insubordinazione? [Cerca *defiance* su un dizionario bilingue online] Di ribellione...insubordinazione.. / evidentemente c'è una differenza enorme tra questi piccoli atti di ribellione e...
of petty... petty defiance what is *defiance*? Insubordinazione? [He looks up *defiance* in an online bilingual dictionary] ribellione...
insubordinazione... / obviously there's a huge difference between these small acts of rebellion and...

30.7% of the coded verbalizations refer to editing operations such as changes in the translations motivated by a concern for **brevity, clarity, simplification** and **reader engangement**.

- (4) Qui io comincerei a togliere qualcosa perché è una frase molto lunga.
(Test1 P2)
Here I'd start cutting something out because the sentence is very long.
- (5) Allora guardo quanto posso tagliare/quanto devo e posso tagliare / Un po' / Per fortuna perché / insomma ci sono un sacco di ripetizioni / e particolari/anche un po' superflui. (Test 1 P3 30.7%3)
Well, I'm looking at how much I can cut out / what I should and what I can cut out / A bit / Luckily, because / well, there are a lot of repetitions / and details/ that are also a bit unnecessary.

¹⁰The verbalizations in Italian are translated here as clearly and faithfully as possible in order to make them accessible to readers who do not understand Italian.

In Example 4, one of the editors expresses the need to shorten texts because she thinks the sentence is too long according to editorial constraints, which are not overtly expressed. In Example 5, another editor is verbalizing while having an overall look at the computer screen and assessing that something must be cut out in order to ensure that the text will fit into the space allowed.

- (6) Sto rileggendo perché secondo me per fare una cosa ben fatta va completamente ristrutturato. (Test2 P1)

I'm rereading it because I think that to do it well, it has to be completely restructured.

- (7) È problema dell'articolo e non della traduzione. Pero è un problema. (Test2 P1)

This is a problem with the article, not the translation. But it is a problem.

- (8) Io ho fretta... (sospira) e quindi faccio la cosa più rapida... / e quindi tolgo un bel pezzone. (Test2 P1)

I'm in a hurry... (sighs) and so I'm doing the fastest thing... / and removing a large chunk.

In Example 6, the editor is reading a paragraph and going back and forth between the translation and the original, and he is facing a comprehension problem due to the original text, as verbalized in Example 7. He first tries to solve the problem by doing some online research. Then, having failed to find satisfactory online information, he solves it by completely restructuring the entire paragraph, and by doing away with some unclear information as Example 8 shows time is a constraint factor as well ("I'm in a hurry ... and so I'm doing the fastest thing").

- (9) il precedente governo federale... tolgo precedente perché è chiaro è nel 2012 / eh, tolgo *federale* perché per noi che non siamo australiani la distinzione fra governo federale... centrale... e i governi dei singoli stati / a meno che non si parli dei singoli stati / non interessa... del governo si capisce. (Test1 P3)

il precedente governo federale... I'm removing *precedente* because it's obvious that it's in 2012 / um, I'm removing *federale* because for us, who aren't Australian, the difference between the federal government...the central...and the state governments / unless we don't speak of state governments / doesn't matter...*governo* is clear enough.

- (10) *gli agenti antisommossa della G4S sono intervenuti / allora qui parla della zona Oscar / zona Oscar / guardo l'originale e...parla di Oscar compound / potrei cercarlo / ma lo tolgo semplicemente perché è un dettaglio che non ci interessa... non è determinante.* (Test1 P3)
gli agenti antisommossa della G4S sono intervenuti / well here it talks about zona Oscar / zona Oscar / I'm having a look at the original and...it says Oscar compound / I could look it up / but I'm removing it simply because it's a detail that isn't of interest to us... it's not relevant.

In Example 10, one of the editors decides to simplify something by transforming “previous federal government” into “government” and leaves out some culture specific information because she thinks it is not of any interest to “us”, while addressing the researcher. Perhaps “us” refers to the Italian readership, but this is just a hypothesis. Again, in Example 10, she decides to remove a piece of information (*Oscar compound*) that is said not to be of any interest to “us” (“I could look it up / but I'm removing it simply because it's a detail that isn't of interest to us”). Examples 9 and 10 are significant in terms of showing how far an editor can go with the purpose of rendering the translated text ‘more readable’.

- (11) *ehheh.. no, vorrei mettere questa cosa insomma ma in maniera più semplice..* (Test2 P4)
umm...no, I'd like to put this more simply...
- (12) *Una frase lunghissima che vorrei spezzare... allora forse posso trasformarla così..* (Test2 P2)
A very long sentence that I would like to break up... so maybe I could transform it like this...

Example 11 and Example 12 are verbalizations that express the need to reword or change syntactic structures to allow for smooth reading.

Although 30.7% of the editing is done in the name of editorial needs, 28.8% of the coded verbalizations refer to rewording, shortening and reshaping based on **idiosyncrasies**, as expressed in the following verbalizations. In example 13, the editor says he wants to put “c’è” (“there is”) in a “better place” in the paragraph, but we do not know based on which specific criteria this modification is really better and is really an improvement compared to the translated version. In Example 14, a personal preference is overtly expressed (“I still *don’t like* this sentence...”), but again we do not know on which basis the editor justifies the likes and dislikes. The idiosyncratic nature of modifications is even more patently

manifested in Example 15 and Example 16 (“to me it sounds better”; “It sounds awful”).

- (13) *C’è evidentemente una differenza enorme* a questo punto mettiamo questo *c’è* in un posto che mi piace di più (sospira). (Test2 P1)
C’è evidentemente una differenza enorme now I’ll put this *c’è* in a place that I like better (sighs).
- (14) Continua a non piacermi questa frase perché *c’è* qualcosa che non va con...(Test2 P2)
I still don’t like this sentence because there is something wrong with ...
- (15) va beh, io tolgo *possiamo* e scrivo *è possibile* che già dà l’idea della domanda, o comunque / non lo so / a me suona meglio. (Test2 P3)
Ok, I can take away *possiamo* and write *è possibile*, which gives the idea of the question or anyway / I don’t know / to me it sounds better.
- (16) *esercizio di associazione di idee?* Ha un bruttissimo suono. (Test2 P4)
esercizio di associazione di idee? It sounds awful.

The TAPs of the first warm-up experiment only show 7.7% of the coded verbalizations by the editors concerning the **translators**. However, there is one reference to the translator (Example 17) by one of the editors in Test 1 that sheds light on the relationship between translators and editors.

- (17) Io non lo leggo continuamente il testo inglese nel momento in cui l’italiano scorre e mi torna/ questo anche perché mi fido del traduttore/ di lui come persona che traduce questa pagina da tanti anni e / si è abbastanza tarata sul tipo di cose che mi piace che ci siano e che non mi piace che ci siano...(Test1 P1)
I don’t read the English text all the time when the Italian reads smoothly and looks Ok to me / also because I trust the translator / as a person who has translated this page for many years and/ she’s quite tuned into the type of things that I do and I don’t like...

The TAPs of Test 2 reveal that when asked to edit a translation by an unknown professional translator, editors refer to concepts such as freedom and literality. A total of 15.4% of the coded verbalizations refer to the translator’s performance, the following Examples (18 to 30) are samples of such verbalizations.

- (18) Leggo l'inglese perché a questo punto non mi fido veramente più / Il test...(legge l'inglese) (sospira) / dire *consisteva nel fissare una candela* la fa più facile / di quella che è evidentemente mentre lui qui me la presenta in una maniera più complicata/cioè c'era *indovinare, to work out*, capire come fare a fissare una candela... (Test2 P1)

I read the English text because at this point I no longer really have any trust / The text...(reads the English text) (sighs) / to say *consisteva nel fissare una candela* obviously makes things easier / while here he presents it in a more complicated way / that is to say, one must *indovinare, to work out*, understand how to fix a candle...

In Example 18, one of the editors first expresses general mistrust (the Italian verbalization “*non mi fido veramente più*” is an impersonal form where the direct object is not expressed) then checks the English texts and concludes that the Italian translation is simplified compared to the original English.

- (19) Quindi questo lo levo / perché *tra creatività e disonestà* non c’è se le inventato il traduttore.
So I'll leave this out / because there is no *tra creatività e disonestà*; the translator has invented it.
- (20) Qui è davvero così? Secondo me si è preso troppe libertà il traduttore.
Is it really like this? In my opinion the translator took too many liberties.
- (21) ehm sto cercando...siccome è molto diversa dalla...ci sono molte libertà... il traduttore si è preso molte libertà.. sto cercando di capirle fino a che punto posso tollerarle.... e dove devo intervenire per ripristinare...
umm I'm trying to...since it's very different from the...there is too much freedom...the translator has taken a lot of liberty...I'm trying to understand to what extent I can accept...and where should I intervene to restore...
- (22) Io direi più / sarei più...vicino al testo...
I would say more / I'd be more... like the text...
- (23) è *la mancanza di onestà*? Cheating lo vogliamo tradurre così? Cheating è più che...probabilmente guarda se avessi il tempo andrei a guardare in un vocabolario...
is the *mancanza di onestà* right? *Cheating*, shall we translate it like this?

Cheating is more likely to be...probably if I had the time, I'd go and look it up in the dictionary.

- (24) No, qui no, oddio, va totalmente riscritta! / più che scriver / io chiamerei il traduttore e gli direi, senti, me lo rivedi perché non capisco bene com'è fatto.

No, not here... oh God, it has to be completely rewritten! / I wouldn't rewrite it / I'd rather call the translator and say, look, can you check this because I don't really understand it, the way it is.

- (25) No, mi sa che qui è proprio sbagliato l'italiano! Oddio! È totalmente un'altra cosa!

No, I think the Italian's wrong here! Oh my God! It's completely different!

In Example 20 to Example 25, taken from the TAP of the participant 4 shows dissatisfaction with a translation considered to be free and loose compared to the original. There are also some comprehension problems due to information implicit in the original text, as signalled in Example 24; here, the editor would rather call the translator and ask him/her to review his work or explain what the original means. However, participant 4 decides to rewrite the text himself in a way that is considered closer to the original. Quality assessment is not discussed in this paper, however, it must be said that some mistakes were made while rewording the translation.

- (26) Sì, è una traduzione un po' libera però mi sembra che possa andare bene.
Yeah, it's a bit of a free translation but I think it might be Ok.

- (27) Forse così è più simile a quello che dovrebbe essere.
Maybe this way it's more similar to what it should be.

- (28) Forse lo metterei più simile...
Maybe I would make this more similar...

Verbalizations by participant 2 also refer to the fact that the translation is somewhat free – though not incorrect – compared to the original; she seems to be fine with it and changes the translation only a few times to render it closer to the original (Example 27, Example 28).

- (29) Allora io lascerei più letterale possibile.
So, I would leave this as literal as possible.

- (30) Allora qui, il traduttore ha tolto la frase.... che però è carina...eeehhhm A long... *it is a long way from such acts of petty defiance to building a lair inside an extinct volcano and threatening Washington from it...* l'ha riassunta dicendo tra un atto si sfida al governo statunitense come quello perpetrato da Ernst Stavro Blofeld .. Allora io metterei...

So, here, the translator has taken this sentence away... which is a nice sentence... uuumm *A long...it is a long way from such acts of petty defiance to building a lair inside an extinct volcano and threatening Washington from it...* he's summed it up by saying *tra un atto si sfida al governo statunitense come quello perpetrato da Ernst Stavro Blofeld...* So I would put...

Verbalizations 28–30 also reveal that participant 3 would like the translator's work be closer to the original and to transform the translation into a more literal version.

- (31) OK qui la traduzione ehm non è letterale / cioè che va bene...però forse io la cambierei, la metterei un po' più vicino all'originale.

Ok here the translation is umm not literal / that's fine... but maybe I'll change it, I would make it a little more like the original.

- (32) allora, eh, sì, no, qui ha proprio il traduttore ha diciamo riassunto, un po' troppo forse.

well, um, yes, no, here the translator has summed it up a little too much, perhaps.

- (33) L'idea...è in realtà... del genio malvagio, non è ...*da james bond*... ehhm l'idea del genio malvagio...è stata al centro... il genio malvagio, sì metto più aderente all'originale.

The idea...is actually.... *del genio malvagio*, it isn't... *da james bond*.. ehhm the idea of *genio malvagio*... was at the centre ... *il genio malvagio*, yes I'll make it closer to the original.

Only 0–9% of coded verbalizations refer directly to the readership and these are found exclusively in the TAP of participant 1 during the experiment. In the original text, there are many examples of typical English lexical items and oral expressions; in fact, the author discusses the use and evolution of the English language. The translator has decided to keep all the original examples in English and give an Italian translation in brackets. Here, the editor reflects on the fact that

all the expressions left in English in the Italian translation may be too difficult or boring for the readership.

- (34) trovo molto faticoso per il lettore / questo pezzo enorme tutto di cose in inglese.

I think this is very hard for the reader / this huge chunk of things, all in English.

- (35) fa fatica a me e quindi penso cha faccia fatica anche al lettore.

it's very hard for me and I think it's hard for the reader as well.

- (36) e se il lettore non sa l'inglese...sbatte contro una serie di ostacoli che gli rendono questa cosa molto noiosa...gliela rendo lo stesso, non ci posso fare nulla... però cerco di rendergliela un po' meno noiosa...manipolando un po' la cosa.

and if the reader doesn't know English... they come up against obstacles that make this thing very boring... I'll do the same, I can't do anything... but I'll try to make it a bit less boring... by manipulating it a bit.

- (37) Io non voglio che il mio lettore debba fermarsi per fare mente locale su che libro sta parlando...

I don't want my reader to stop and think about which book is being discussed here...

Investigation of the think-aloud protocols from four Internazionale editors shows interesting data that would not have been available if only the published articles had been looked at. In fact, participants scrupulously read the translations and originals in order to check the source of information, monitor the correspondence between the translations and their originals and then intervene with the internal editorial requirements. Space and layout are the major constraints that account for summarizing and cutting strategies and this can partly explain the high number of omissions found in the text analysis in §3.1. Changes in the semantic and syntactic features in the translation, as well as variations in information flow (the order in which events are presented) occur due to the need to render the text smoother, simpler and more direct, and these data explain the fact that one of the predominant category found in §3.1 was none other than Fluctuation. The significant presence of Fluctuations in the text analysis is also explained by the fact that the degree of subjectivity seems to be high, and participants change the translations on the basis of their personal preferences, shaped

by their experiences of several years. As discussed above, experience and automation are often considered to bias the results derived from the use of the TAP method (all editors have at least four years of experience). Here, these two factors seem to prompt genuine verbalizations concerning common and widespread editorial practices. It might be interesting to further address the process of translation editing from a routinized perspective, i.e. by comparing results derived from TAPs by young editors and TAPs by experienced ones.

In the verbalizations, the relationship with the translators is clear: editors probably tend to work with the same translators and establish a relationship of trust. This means that translators are trusted as far as fidelity to the source text is concerned, giving editors a free hand in editing. In fact, when faced with the work of an unknown professional translator, they tend to be suspicious and assume rigid positions demanding more literality and fidelity to the source text. Very few verbalizations take into consideration the readership; editors do not seem to openly consider the reader factor as an argument that might explain their editorial choices. In terms of our theoretical background, this part of the study confirms the major role played by the Initiator (Figure 1) in setting the translational agenda with the contractual instructions (what is to be expected by the Translator), the normative environment (what has to be included or omitted), but also the ethical dimension (how to relate to the others, including the author/culture of the source texts as well as the readership/culture of the receiving system). As this part of the study shows, his/her role is preponderant in the making of the final product and thus, in establishing the equivalence/difference profile of the translation compared to the original (Figure 2).

3.3 Survey among the readership

The third part of the study involved an online survey carried out over the course of February 2014. The aim of this survey was to find out what the readership thinks about the magazine's translated articles and their opinion about translation in general.

Internazionale has 123,000 readers, of whom 33,000 have subscriptions and 90,000 buy copies at a newsstand. 167 readers participated in this study and, although it cannot be said that the population of respondents is representative of Internazionale's readership (the editorial board did not give access to the subscriptions list, which would have ensured appropriate sampling), the data nevertheless reveals interesting patterns.

With regard to the respondents' socio-demographic profile – Gender distribution among respondents is almost equal (48.5% male, 51.5% female) and the average

age is 32. The majority of the respondents is highly educated (91.2% attend or have attended university; 42% have Master's degrees) and most of them live in northern Italy (46.7%). The majority of the respondents is Italian (93.4%), consider Italian to be their mother tongue (92.2%), claim to know at least one other foreign language (64.1%) and have travelled outside Italy at least once during the last year (81.4%).

With regard to the respondents' reading habits – The majority prefers reading books (93.5%) and read more than 7 books in the last year (67.6%); they also read magazines (69.4%) and a few of them indicate online information and websites as other items they like to read. The majority of respondents read in Italian (88.6%) but also in foreign languages (53.9%).

We are in presence of a public of cultivated readers who are familiar with foreign languages, we can therefore expect from them a certain sensitivity or responsiveness concerning the issue of translation.

With regard to the respondents' attitude towards the question of translation in general – 29.3% of respondents say to be very interested in the issue of translation, 47.9% of respondents are quite interested and 21.6% are little or not very interested.

Respondents state that the translated articles by Internazionale are easily readable (98.2%); 93.4% affirm they convey the thoughts of the authors of the articles written in the original language and 88.0% say translations by Internazionale reflect cultural differences. To test if the participants have ever compared translations with the originals, we asked if it has happened to them to read an article that was poorly translated: 32.3% say "sometimes", 24% "never", while 51.5% admit that they do not know.

When asked to give an open definition of what they think an ideal translation should be – 35.3 % of the coded responses refer to "fidelity" and "absolute respect for the author and the original"; 12% refer to "smooth reading", "nice and fluid", "adapted to the target audience"; 27% give more elaborate and tempered responses that call for "fidelity to the source text" and, at the time, "adequacy to the Italian language and/or to the Italian readership". 25.7% did not answer this question.

When asked what a good translation should ideally be – Respondents agree (95.3%) with the fact that, ideally, a good translation must be smoothly readable, it must respect the original in its totality (88%) as well as the style of the original text (89.8%) and it has to be comprehensible to the Italian readers (79.6%). When asked if they agree with the statement that "Ideally a good translation must be suited to the Italian context", respondents are very divided on this point: 53.7% disagree and 47.3% agree with the statement.

When asked about Internazionale's translations – The majority of the respondents (83.9%) agree with the fact that translations done by the magazine are close to the ideal translation.

All the respondents (100%) say that the quality of the translation is important for the quality of the information. However, when asked if they have ever read a bad translation in the magazine, one in every two people say “I do not know”. This tends to demonstrate – if the trend is confirmed in a larger population – that actually readers are not very sensitive to the issue of translation and that they trust the translators.

The survey is obviously affected by limitations¹¹ due to the difficulty in accessing the readership (respondents are volunteers), lack of sampling and a relatively small number of respondents. However, the findings shed some light on the opinions of readers who read a magazine publishing translated material every week. In fact, the majority of respondents say they are interested in the issue of translation and agree with the fact that, in general, translation must adhere to the original in its totality and respect its style. When asked their opinion on what an ideal translation should be, more than a third clearly refer to fidelity; for less than a third, a good translation must be faithful to the original but also smoothly readable. Perhaps the most interesting result is the fact that an overwhelming majority of respondents say that the quality of the translation is important for the quality of the news but, when asked if they have ever read a bad translation in Internazionale, the majority admits that they do not know. This may be explained by the fact that the respondents believe in the completeness and accuracy of the information given by Internazionale and claim to be satisfied with the magazine's translations, and are therefore not interested in checking the quality.

In terms of the semiotic square (Figure 2), undoubtedly the part of the readership we surveyed values equivalence in translation, adherence to the contents and style, and loyalty to the source language and culture; with other words, they value the respect of “otherness”. However, the readers are unfamiliar of the complexity of the Initiator-Translator relation (Figure 1) and therefore unsuspecting of the translational and editorial process texts go through before publication (as in §3.1 of this study) and unknowing of the backstage and the criteria supporting that process (as in §3.2). This unawareness could be seen in terms of trust towards a media outlet that promises to voice unique and fresh perspectives on news –

¹¹We do not address here the issue of the construction of public opinion through polling (Bourdieu 1993: 149–157), however with a filter question we measured respondents' attitudes towards translation with a filter question and redirected those who were interested in the issue of translation to the more specific questions.

compared to other Italian newspapers and magazines – which is the credo of Internazionale. Now, this is partly the case, however in terms of degree, in this case, the Initiator of the translation process tends to give to the readership what the readership needs (or what is supposedly needed, as demonstrated in §3.1 and §3.2) rather than nourishing it with that otherness (i.e. the fresh and unique perspective of quality foreign news reports) to which the magazine owes its lustre. In other terms, the Initiator feeds the readers in the way and with the information they expect (creating textual products that are profoundly *different* from the original, see Figure 1) rather than changing them in a real confrontation with the other, by promoting products that *adhere* to source language/culture (see Figure 1).

4 Conclusions

This piece of research reveals the complexity of the object of study and the manifold problems arising when it comes to describing the practice of translation. The semiotic approach provides a conceptual framework that allows for the identification of the actants involved in the practice of news translation by Internazionale.

The analysis of the parallel corpora addresses the enunciative praxis of translation, i.e. the appearance, disappearance and transformation of utterances in the field of discourse. The analysis of translated and edited texts shows that, regardless of language pairs, word or paragraph-cutting strategies and editing techniques that tend to harmonize lexicon and privilege directness and simplicity may result in deviations in the argumentative flow.

The analysis of the think-aloud protocols addresses the motivational drive of the Initiator actant, his/her system of values, expectations regarding the translator's performance and sanctions applied to achieve his/her goals. TAPs with four senior editors confirm that – in alignment with internal editorial norms – editing made on translations is aimed at smooth reading, concision, simplicity and reader engagement. The degree of subjectivity in rewording and summarizing strategies seems to be high; that also applies to the choice of whether content deserves to be omitted or to reach the reader. “Journalistic standards” and “appeal” values possibly guide the editing process. Interestingly, verbalizations in the think-aloud-protocols reveal that editors perform translation and revision-like activities such as re-reading the original in order to control the accuracy of the translation, consulting monolingual and bilingual dictionaries, and carrying out online research for occurrences of specific expressions in the target language. Unsurprisingly, relationships between translators and editors are based on trust

and confidence: verbalizations reveal that editors expect the translators to be faithful and adherent to the original. In the present case, this expectation seems to be an implicit contractual requirement, and failure to fulfil it triggers sanction-like interventions by the editor as shown in the verbalizations of Test 2.

Despite the limitations mentioned above, the survey data provide an interesting picture of the readership's image of the magazine and expectations. Most of the respondents are obviously satisfied with the product they buy and say that translation by Internazionale corresponds to their ideal concept of translation which is, in a more or less nuanced formulation, based on the concept of fidelity. However, most of them trust the magazine to the point that they are not able to say if they have ever read a text which was not well translated.

The different parts of this study are complementary perspectives that shed light on a complex translational case study and at the same time account for a multilayer analysis – on both a quantitative and qualitative basis – of the different instances and practices of meaning generation. In the first part of the study, we derive data from the translated texts and we formulate hypotheses concerning the reasons for such results, which lead us to further investigate the actions and the working environment of the Initiator actant. Actually, in the second part of the study, we see how and why editorial interventions are carried out, and confirm the underlying logic behind our textual results; furthermore, the TAP data allows to enrich the knowledge regarding the social relation between the main actants involved in the translational process, and see how editors position themselves in relation to translators and readership. Our theoretical model, as well as the textual analysis and the TAP study, suggest that the readers' idea of translation does not substantially impact what happens in real terms; this assumption is corroborated by the survey we present in the last part of the study. We believe that, in our study, the triangulation of data derived from apparently different objects of study and by means of different methods yields genuine added value and honours the semiotic perspective favouring deeper and broader approach to complex meaning-making and meaning-generating activities.

Referring to the general definition of translation, as in the semiotic square, it can be said that, despite singularities, the voice of the translator realizes the *equivalence* value (as described in Figure 1): translators do not and are not expected to erase content, alter the narratives and the order in which events are presented in the original, and possibly adhere to the style of the original texts. Because of this attitude, translators seem to endorse the so-called Toury's interference law (Toury 1995: 276), where the make-up of the source text is transferred to the target text; in other words, the more the specificities of this make-up are taken into account the more the target text will show interferences.

By contrast, the voice of the Initiator tends to realize the value of *difference* (as in Figure 1) since contents are shortened, narratives reshaped, semantic and syntactic features altered in order to conform to specific values, which, in this case, correspond to the magazine's norms and needs. Because of this policy, the Initiator seems to endorse what Toury (1995: 268) calls the law of standardization, where textual relations in the original are often modified in favour of habitual options offered in the receiving system; in other words, actualization of the *difference* value amounts ignoring the specificities of the source text's otherness and showing a high level of resistance to interference, by converting specific source features into the target repertoremes, i.e. signs of an institutionalized systemic repertoire.

Finally, in the studied case, the specific way of telling the readership that "this is a translation" causes some other questions to arise, which deserve to be further investigated: what is the degree of covertness of these kinds of practices? What is the translators' degree of awareness and acceptance of these practices? Does translation fulfil its objective if the objective pursued by experienced journalists and editors in the news industry is fulfilled and the public is satisfied?

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Part IV

Modelling interpreting

Chapter 11

Audiovisual speech decreases the number of cognate translations in simultaneous interpreting

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A large body of research suggests that audiovisual speech facilitates listening comprehension, especially in adverse conditions like noisy environments or hearing impairment, but previous studies on simultaneous interpreting focusing on the interpreting performance failed to demonstrate the benefit of visual input. One explanation might be that conference interpreters increase their cognitive effort to maintain the quality of their rendering. Hence, the impact of visual input might not directly be visible in the interpretation. In order to elucidate this question, I concentrated on self-monitoring in simultaneous interpreting and analyzed the number of cognate translations in a 2×2 factorial design with presence/absence of lip movements and presence/absence of white noise as levels. The results showed an increase of cognate translations when the interpreters worked without visible lip movements, indicating a less effective monitoring in this condition. The findings of this study point out the importance of visual input in simultaneous interpreting and its integration in models of simultaneous interpreting.

1 Simultaneous interpreting as interaction of auditory and visual information processing

Conference interpreters engage in a highly complex task, the oral translation of live speech, where several processes take place more or less simultaneously: comprehension of the source text, storage of the message, retrieval and integration of general knowledge or other previously stored information, rendering of the message in the target language, and (speech or error) monitoring (see for example Seeber & Kerzel 2012; Gile 2009; Setton 1999; Gerver 1975. Beside the



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auditory input of the speaker, the interpreter processes a wide range of different visual information: lip and head movements of the speaker, facial expressions and gestures of the speaker and the audience, presentations or projected images, graphs and text elements, written information on a screen or on printed documents like a handout or glossaries and more.¹ While interpreters in general claim to rely on visual input and especially, on the visual contact with the speaker,² process models of simultaneous interpretation failed so far to fully integrate this aspect (see for example Seeber & Kerzel 2012; Gile 2009; Gerver 1975). So the question arises how visual information affects the interpreting process and the interpreting performance and whether interpreters benefit from visual input or not.

A small number of studies have been conducted to elucidate the impact of visual input in simultaneous interpreting. Rennert (2008) opted for a rather direct approach: she asked student interpreters to translate two live speeches and deprived them from any visual information during one speech each. On the whole, she observed no difference in their interpreting performance, except of very few moments where visual input provided necessary complementary information. The author admitted:

“In many instances, visual information was quite redundant, since the information was contained in the verbal message as well. Here it was often difficult to judge the influence of visual input, as the information was conveyed by subjects from both groups. There are several cases where the group with visual contact and the blind booth conveyed information present in both the verbal and the nonverbal material, but it cannot be determined conclusively whether the visual nonverbal information was helpful.” (Rennert 2008: 214)

Despite the fact that participants delivered comparable renderings in terms of quality, they expressed a considerable unease when they had to interpret without visual input and rated the speech as being more difficult than when they had visual contact (Rennert 2008).

¹ISO 2603 states that “booth shall be located at the back and/or the sides of the hall, making sure there is good visual contact between all booths and with the control booth. They shall be raised no further above the floor of the hall than is necessary for a clear view [...] of all proceedings in the hall, i.e. all participants, lecturers, the chairman, etc. as well as visual aids (projection screen, etc.)” (International Organization for Standardization, 2603:1998: 3) Further, booths should be equipped with work-lighting that cover the whole working table and that is “positioned as to avoid shadows being cast by the working interpreter, on the working surface: on documents, equipment, fixtures, etc.” . (International Organization for Standardization, 2603:1998: 7)

²The largest professional association of conference interpreters, the AIIC, recommends for example to position the booth so that interpreters have visual contact with the speaker, the audience and the screen (AIIC 2016).

Her results are in line with an earlier experiment conducted by Anderson (1994) who found that a video of the conference setting (no further information about what exactly the video showed are provided) did not improve intelligibility nor “informativeness” (Anderson 1994: 106) of the translations (Anderson 1994). According to a review of several remote interpreting studies by Moser-Mercer (2005), interpreters suffered from concentration difficulties and fatigue when visual input was limited due to the video recordings of the conference setting (Moser-Mercer 2005). A candidate for visual input that improves performance might be the written speech manuscript, provided that the speaker does not deviate from his manuscript (Lambert 2004; but see De Laet & Plas (2005) for the influence of preparation time on performance during simultaneous interpreting with text). To sum up: contrary to what interpreters might expect, these studies did not reveal any differences between interpreting with or without visible input. However, they highlight the unease conference interpreters experience when they have to work without or with limited visual input.

These counter-intuitive results might be due to multiple reasons. First, in most studies the sample is very small with a large variability between subjects that could have covered the effects of the independent variables (Anderson 1994: 108). Appropriate statistical techniques that account for this variability may provide a solution. Second, simultaneous interpreting is a very complex process and visual input covers a range of different information of varying complexity. That is, while some kinds of visual information might facilitate source language comprehension or interpreting in general, for example lip movements of the speaker, others might require additional resources or processing capacities, even if they provide useful information, like presentation charts or additional written information. Researchers studying simultaneous interpreting need to be very careful in their experimental set-up and control for possible confounds in order to tear apart the effects of the various factors. Third, experiments with interpreters usually use the interpreter’s performance, the target text, as dependent variable. This is problematic because common standards of how performances are to evaluate, are lacking. Consequently, target text evaluations might consider different aspects (intelligibility, information content, use of terminology, intonation, etc.) or use different methods (source text analysis, expert judgements, and subjective ratings) and therefore the studies might not be comparable. Moreover, effects of visual input might be absent on a semantic or syntactic level because interpreters increase their cognitive effort to maintain interpreting quality even in adverse conditions. If this is the case, effects would then either be visible at a more fine-grained level, for example in the richness of their vocabulary or in

effective speech monitoring, or under higher cognitive load, for example when working in noisy conditions.

In order to deal with these shortcomings and eliminate as far as possible potentially confounding variables, I opted in the present study for a more systematic and controlled approach and chose to concentrate on lip movements only. A large body of psychological research demonstrates that listening comprehension clearly benefits from visible lip movements, especially in adverse listening conditions, like noise or hearing impairments (Calvert & Thesen 2004; Giraud & Truy 2002; von Kriegstein et al. 2008; Lewandowski 1993; McGettigan et al. 2012; Matthey 2011; Rosenblum 2008; McGurk & MacDonald 1976). According to connectionist models of bilingual speech processing, correspondent visual information at a phonological level (lip movements) enhance phoneme recognition by reducing phonological ambiguity and limiting the number of possible candidates (Shook & Marian 2013). If interpreting with visible lip movements facilitates listening comprehension, more resources should be available for other internal processes in simultaneous interpreting, like self-monitoring.

2 Cognates and speech monitoring in bilinguals

One way to assess how visual input might affect self-monitoring in simultaneous interpreting is to check for cognate translations. Cognates are words that share the same etymological roots in two languages and whose orthographic and phonetic representations overlap considerably. According to Paradis (2004), they are immediately understood, even in a foreign language (Paradis 2004). For instance, an English native speaker will immediately understand the German word *Haus* without any knowledge of German because *Haus* resembles very much its English equivalent *house*. A somewhat special case are false friends that are orthographically and phonetically very similar but do not have the same meaning, for example *bekommen* ('to get') and *become*.

In the last years, researchers have made extensive use of cognates to understand bilingual language processing. Their studies have revealed a cognate facilitation effect in a large variety of paradigms, such as lexical decision tasks, priming or picture naming. That is, participants respond faster and more reliably to cognates than to non-cognates or false friends (Peeters et al. 2013; Christoffels et al. 2007; Costa et al. 2005; Christoffels et al. 2003; Dijkstra et al. 1999; van Hell & de Groot 1998; de Groot & Nas 1991), especially in the L2 (Starreveld et al. 2015). This is even the case in sentence processing (Van Assche et al. 2011; 2009; Schwartz 2006). For simultaneous interpreting, a marginal cognate facilitation effect has been shown in the L2 (Dong & Lin 2013).

Cross-lingual interference may also have the reverse effect. In a lexical decision task, Dijkstra and colleagues found significantly lower reaction times for false friends than for non-cognates or cognates. The authors attributed this effect to the inhibition of false friends (Dijkstra et al. 1999). A similar inhibitory effect for cognates was especially observed in mixed language paradigms and in language decision tasks where participants needed to distinguish between both languages (Dijkstra et al. 2015; Acheson et al. 2012; Dijkstra et al. 2010; 1998) see also Christoffels et al. (2007). This cross-lingual interference has not only been shown at an orthographical, but also at a phonological level (Costa et al. 2003; Jared & Kroll 2001). These findings are taken as evidence that competition between cognates is particularly strong and that inhibition mechanisms are necessary to block inappropriate lexical candidates.

Taken together, these findings may indicate that cognates are more strongly activated and therefore, more easily accessed, but also more difficult to inhibit. In order to offer an interpretation of high quality and intelligibility, interpreters need to avoid false friends or cognates that are not very common in the target language (low frequency cognates). This requires them to closely monitor their output so as to detect these inappropriate cognates and to block them. In this view, inhibition can be seen as the result of successful monitoring. However, research so far suggests that monitoring depends on the amount of available resources (Postma 2000; Kessel et al. 2014). For instance, participants made more filled pauses in a story telling task while concurrently exploring figures, compared to a single task condition (Oomen & Postma 2001). In a recent study, Oster (2017 [this volume]) demonstrated that cognate translations reflect the degree of self-monitoring in translation tasks. She observed that translators realize fewer cognates in a written translation than in a spontaneous oral translation where self-monitoring is lowered due to time constraints (see her publication in this volume, 23).

In the present study, I made use of cognate translations in a simultaneous interpreting task to assess the impact of visible lip movements of the speaker and of background noise (white noise) on self-monitoring in simultaneous interpreting. Based on the aforementioned studies demonstrating the benefit of visible lip movements for listening comprehension especially in adverse listening conditions, I hypothesized that

1. interpreters might be able to spend more of their resources on speech production and monitoring when working with visible lip movements, and therefore, might more effectively inhibit low frequency cognates or false friends,

2. masking the source text by adding white noise on the audio track of the source text (signal to noise ratio approximately -10 decibel) should further impact listening comprehension and lead to an increase of cognate translations,
3. the benefit from visible lip movements should be larger in adverse (noise added to source text) than in normal listening conditions (no noise added).

The experiment described below was a pilot study and part of a larger research project on the impact of visual input on cognitive load in simultaneous interpreting. I used different methodologies to assess cognitive load. In this paper, I will focus on cognate translations.

3 Experiment

3.1 Experimental material

The experimental material consisted of four speeches chosen from the basic level of the EU speech repository that makes test speeches available for candidates who prepare to be admitted as freelance interpreter at the European Union. The chosen speeches covered four different topics (air travel, the Greek economic crisis, work conditions and the demographic change). They were in great parts rewritten and edited in order to reduce text complexity as far as possible and obtain a higher comparability between the texts. Words that did not belong to the 5000 most frequent words of American English (Davies 2009) were substituted (mean word length 4.63, SD=0.2). Passive sentence constructions were omitted (with one exception: “born” in “Many children were born.” was accepted, as it is the most frequent form of this verb). Long sentences were split up in order to obtain sentences with maximally one subordinate clause (mean number of words per sentences: 12.5, SD=2.2) The number of functional words (articles, prepositions and other words with a purely grammatical function) and type token relation served as indicator for information density. In every text, functional words made up approximately 40 % of all words (ratio functional words mean=0.4, SD=0.03; mean type token relation: 0.48, SD=0.05). Finally, every text was shortened to approximately 590 words (mean= 588, SD=5.23).

The speeches were read out by an American native speaker and recorded on video. A training session with a metronome helped to ensure a constant speech rate of 140 words per minute within and between texts. When necessary, smaller

adjustments of the speech rate were made by slowing the video down or accelerating it. In the end, all video were 3'30 to 3'50 minutes long, much less than the speeches of twenty minutes length the participants were used to.

These videos were used to create a 2×2 factorial design: lip movements/ no lip movements x noise/no noise (see Table 1). The video (condition with visible lip movements) showed the whole face of the speaker. In the audio condition (no visible lip movements), the video stream was replaced by a freeze image of the speakers face (audio condition). This method allowed to keep screen brightness in all four conditions constant and to reduce light adaptations of the pupil. In the noise condition, white noise was added to the audio stream in the same volume. In order to reduce potential effects of the speeches, I created two groups and inverted the speech in the audio/video-condition. Moreover, I randomized the order of presentation of the conditions for each participant.

Table 1: Experimental conditions

		Group 1		Group 2	
		Audio	Video	Audio	Video
No noise	No lip movements	Lip movements	No lip movements	Lip movements	
	no noise	no noise	no noise	no noise	no noise
	S1	S2	S2	S1	
Noise	No lip movements	Lip movements	No lip movements	Lip movements	
	noise	noise	noise	noise	noise
	S3	S4	S4	S3	

3.2 Participants

8 interpreting students in their final year at the Johannes-Gutenberg-Universität Mainz agreed to participate.³ Participants were assigned randomly to one of both groups and interpreted each of the four experimental texts. Due to missing voice recordings, two participants were excluded from the analysis. Participants received 10 euro for participation (and a bar of Swiss chocolate, which was for most of them the main incentive for participation).

³The low number of participants is due to the preliminary character of the study. A follow-up study will be conducted to confirm the results reported in this paper.

3.3 Procedure

Participants received explanations about the procedure beforehand. The experiment encompassed four blocks. Participants pressed a key to start the video and orally translated the speech they heard, while their pupil sizes were measured. Participant's translations were recorded on a second computer with the program audacity (Audacity 2015). After having translated the speech, participants were asked to rate the sound and video quality, the text difficulty, the speech rate and the clarity of the speaker's articulation on a scale from 1 to 4.

3.4 Analysis of cognate translations

For analysis purposes, I extracted all words from the English source texts that showed considerable phonological or orthographical similarity with an existing German word. 77 % of all cognate pairs shared more than 66% of their orthographic forms. The remaining 23 % were phonologically very similar, even if their orthographic form differed (for example: *techniques* – *Technik*) For each English cognate, all possible translations were checked on two online dictionaries (linguee; dict.cc) and their frequency class according to the corpus of the University of Leipzig (Quasthoff et al. 2013) was noted. A cognate translation was considered as “high frequency cognate” if the German cognate was indeed the most frequent translation or only one frequency class below the most frequent translation (example: *international* – *international*). If another translation was considerably more frequent, e.g. at least two frequency classes higher, the cognate translation was judged to be a “low frequency cognate” (example: *to implement* – *implementieren*, the more frequent German translation in this context is *einführen* or *umsetzen*). If the meaning of the cognate translation did not correspond to the contextual meaning of the English source word, the cognate translation was categorized as “false friend” (example: *company* – *Kompanie*: the German word to designate a ballet group or a military unit). The raw figures are displayed in Table 2.

Using R (R Core Team 2014) and the lme4 package (Bates et al. 2015), I constructed a generalized linear mixed model. The dependent variable was the number of cognate translations. It describes if an English cognate has been translated as a German cognate or not. As recommended by Barr et al. (2013), I specified a maximal random effect structure covering intercepts for word category, speech, and participant. Fixed effects included visibility of lip movements, presence of noise, cognate category, the interaction of cognate category and presence of noise, and the interaction of visibility of lip movements and presence of noise.

Table 2: Total number of items in each cognate category and in each experimental condition. 428 cognates were not translated (missing data).

	audio			video			NA
	high frequency	low frequency	false friend	high frequency	low frequency	false friend	
no noise	220	110	34	182	84	32	428
noise	164	110	34	160	94	38	

P-values for the fixed effects were obtained by comparing the full model against the reduced model without the effect in question with Laplace approximation.

Variability between participants ($SD < .001$), speeches ($SD = <.001$) and word category ($SD < .001$) was low.

The model revealed main effects for the video condition ($z = 2.47$, $p < 0.05$, standard error: 0.247, log odd estimate: 0.5167), low frequency cognates ($z = -8.99$, $p < 0.05$, standard error: 0.256, log odd estimate: -2.295), false cognates ($z = -6.72$, $p < 0.05$, standard error: 0.459, log odd estimate: -3.0866) as well as an interaction between presence of noise and false friends ($z = -2.038$, $p < 0.05$, standard error: 1.126, log odd estimate: -2.2952). The addition of background noise ($z = -2.23$, $p < 0.238$, standard error: 0.24, log odd estimate: 0.283) failed to be significant.

The transformed estimates for the fixed effects show that the probability for cognate translation decreases in the video condition by approximately 8 %. The strongest effect is observed for the cognate category: the probability of cognate translation decreases by 52 % for low frequency cognates and by 64 % for false cognates compared to frequent cognates in the video condition without added noise.

Contrary to our expectation, participants did not make significantly more cognate translations in adverse interpreting conditions where noise was added to the source speech than in normal interpreting conditions. This is surprising in the sense that noise was expected to hamper listening comprehension and therefore to drain more cognitive resources to listening comprehension which should have affected the monitoring of cognate translations. In fact, the interaction between cognate category and addition of background noise estimated by the statistical model indicates that background noise had the opposite effect for high frequency cognates on one hand and false friends on the other hand (see Figure 1), as can also be seen in the observed data (Figure 2). This paradoxical pattern is certainly due to the imbalanced distribution of cognate translations in the three categories:

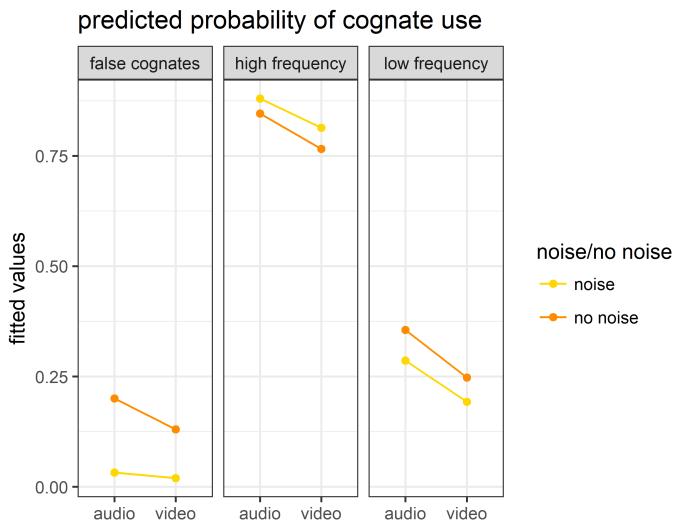


Figure 1: Estimates for cognate translation in the different conditions as predicted by the generalized linear mixed model. The estimate for the noise condition was not significant. For reasons of readability, the log odd estimates are transformed to probability estimates.

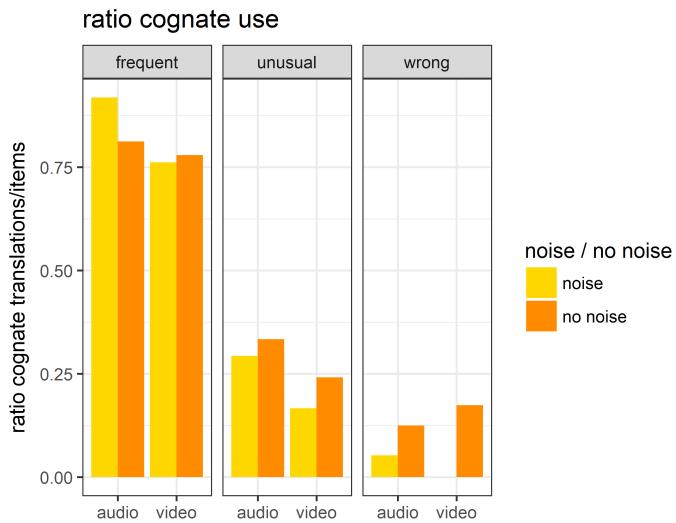


Figure 2: Observed ratio of the number realized cognate translations and the total number of cognates in each cognate category and for each condition.⁴

the number of low frequency and false cognates was substantially lower than the number of high frequency cognates. Each text counted only five to six false friends, but 25 to 35 high frequency cognates. The probability for translating a false friend was thus much lower than for translating a high frequency cognate. A more balanced design with an equal number of cognates in each category and a higher number of participants should help to counter this problem.

4 Discussion

The purpose of the study was to investigate the impact of audiovisual speech, e.g. visible lip movements, and white noise on self-monitoring in simultaneous interpreting by analyzing the number of cognate translations in each condition. On the whole, participants produced very few false friends, regardless the experimental condition. This is in line with research by Van Assche et al. (2011) and by Schwartz (2006) who noted that semantic information influences lexical competition and contributes to suppress lexical candidates that do not fit the semantic context.

Conforming to our hypothesis, participants translated more English cognates as German cognates in the audio condition without visible lip movements than in the video condition with visible lip movements. Compared to the effect of the cognate category (a decrease of cognate translations by 52 % for low frequency cognates and 64 % for false friends), the effect of audiovisual speech (a decrease by 8 % for visible lip movements) seems rather small. Nevertheless, the effect is reliable and is not covered by the larger effect of the cognate category which underlines the importance of audiovisual speech. Participants seemed to be less able to detect and to inhibit cognate translations when they interpreted the source text without seeing the lip movements of the speaker.

One possible explanation is that visible lip movements facilitate listening comprehension in simultaneous interpreting and allows freeing resources for self-monitoring. Researchers observed that listening comprehension benefits from lip movements, especially in adverse listening conditions (cognitive load, background noise, hearing impairment) (Matty 2011; von Kriegstein et al. 2008; Brancazio et al. 2006; Bernstein et al. 2004; Massaro & Light 2004). To account for this observation, Massaro developed a Fuzzy Logical Model of Perception 1999. He assumes that neither auditory speech nor visual speech inputs are unambiguous, or to put it in other words: no signal, whether it comes from the eye or from

⁴Plot created with ggplot (Wickham 2009) in R (Venables et al. 2017)

the ear, is perfect. According to his model, a fuzzy value expresses the extent to which the new sensory information (auditory, visual, haptic or else) corresponds to a certain *prototype*. A prototype describes the features of a perceptual unit of language. Auditory features for language could for example include voicing or formant information; visual features could describe the articulatory movements you see when someone pronounces a sound. The value 1, for instance, corresponds to a complete match, while the value 0 corresponds to a complete mismatch. For example, if the auditory information is ambiguous and corresponds with a value of 0.6 to prototype A and with a value of 0.5 to prototype B, but the visual input is clearly assignable to prototype A (match of value 1), the decision is taken in favor of the prototype A and against prototype B. In this example, the visual input provided complementary information and contributed to disambiguate the auditory input (Massaro & Cohen 1999).

If the auditory and visual input provided complement each other and thereby provide a clearer signal, speech perception processes may need fewer cognitive resources and leave more resources for other processes in simultaneous interpreting. In his effort model for simultaneous interpreting, Gile (2009) describes four efforts which, summed up, indicate the overall resource requirements during simultaneous interpreting: listening and comprehension, speech production, memory and coordination. He presents several examples that illustrate how increased demands of one effort affect the other ones. For instance, a foreign accent or bad pronunciation constrains the interpreter to allocate more resources on the listening and comprehension effort. As a consequence, speech production suffers (clumsy formulations, errors) or memory gets overloaded (information loss) (Gile 2009: 173). A similar account could hold for cognate monitoring. Detecting inappropriate cognates needs cognitive resources. If the signal is “noisy” or blurred, the interpreter might devote too much of his resources to the listening and comprehension processes, which leaves insufficient resources for speech production and monitoring. Inversely, if the signal is clearer or less ambiguous, as it is the case audiovisual speech, interpreters may need fewer resources for listening and comprehension and can monitor more closely their output in order to detect and inhibit uncommon cognate translations or false friends.

In addition to its implications for audiovisual speech in simultaneous interpreting, the findings reported in this paper, even though preliminary due to the low number of participants, have also methodological implications. Previous translational studies using a global evaluation of the interpreting performance, like the informational content of the interpretation or other aspects of interpretation quality, failed to demonstrate a benefit for audiovisual speech or visual input in

SI. The present study proposes a new method that succeeded in demonstrating a benefit for audiovisual speech in SI. If these results can be confirmed with a larger sample, the cognate translations analysis could prove itself a suitable method to analyze the influence of other types of visual input or even more global problem triggers in SI, such as high source speech delivery, foreign accent, and concurrent use of other media.

An important limitation of the study concerns the assumptions underlying our hypotheses. For instance, I assumed that interpreters can better monitor low frequency or false cognate translations in audiovisual speech because they benefit from visible lip movements and have more resources available for monitoring in the video condition. However, the experimental set-up does not allow distinguishing between self-monitoring and other processes that could explain a decrease of cognate translations, like for example a larger activation of the semantic networks or a deeper understanding of the source text. In this respect, our study hints towards a benefit from lip movements in simultaneous interpreting but is non-conclusive when it comes to the nature of this effect.

Furthermore, I would like to stress that the study reported in this paper was a pilot study and that the participants were student interpreters. During the years of their professional activity, interpreters acquire a certain expertise that may have an influence on how they process visual input. For instance, their knowledge of their working languages and the ability to discriminate the sounds of these languages improves over the years. Consequently, the benefit of visible lip movements could diminish. Further research is necessary to extend the findings to professional interpreters and to confirm them with a larger sample.

To summarize, the results showed an increase of cognate translations when the interpreters worked without visible lip movements. One explanation might be that self-monitoring is less effective in this condition because conference interpreters need to allocate more of their resources to the comprehension of the source text. The findings of this study point out the importance of visual input in simultaneous interpreting and its integration in models of simultaneous interpreting.

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Chapter 12

Making the impossible possible, or how to research in specific settings in public service interpreting

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In the last decade public service interpreting (PSI) has gained greater visibility and has become a thriving field of research evolving towards a specialization according to settings. Different studies and research projects focus more and more on specific contexts like medical interpreting in emergency departments, interpreting for victims of gender-based violence or interpreting for women in penitentiaries. The aim of this article is to describe the positive impact and promote the awareness of combining several empirical methodologies during the data collection process especially in contexts where confidentiality and special protocols turn the access to data into a tedious process. The article describes different research projects developed by the members of Group FITISPos-UAH which have combined several types of questionnaires, interviews, focus groups, recordings, direct observation and field notes. A more detailed description of these typologies of research is presented and it is argued that the empirical framework must be shaped or modeled in such a way that it serves to overcome institutional obstacles.

1 Introduction

Research (and training) within the field of public service interpreting (also known as community interpreting) has evolved towards a specialization according to settings. Thus, nowadays we can find articles or research projects (as well as training proposals) dealing with medical interpreting in emergency departments,



interpreting for victims of gender-based violence or interpreting for women in penitentiaries. The number of studies carried out on interpreting and mediation in these specific fields is usually scarce not only because of their innovative character, but also because of the many difficulties in gathering data for empirical research.

It is well known that, in order to achieve the ecological validity of a study, it is necessary to base the results of the research on real data, which, within the field of public service interpreting, are often gathered from the *analysis of excerpts of natural speech*. However, the compilation of recordings of actual dialogue being physically present during the course of real interactions or even carrying out interviews or gathering answers with the help of questionnaires is becoming more and more challenging. The reality is that in some countries or regions the compilation of information in order to assess the quality and characteristics of interpretations is particularly difficult due to national or local legislation regarding the protection of data or because institutions, organizations or companies are obliged to maintain total confidentiality. Besides, investigating how the process of communication is achieved in situations where people are undergoing difficult personal episodes, as is the case in gender-based violence contexts, particularly when the victims of this kind of violence are of foreign origin, represents indeed a very special and delicate situation, based on the fact that these subjects are very difficult to access, both because of their reluctance to take part in research and the protection which they receive.

Through this paper we intend to offer a brief overview of the use of public service interpreting with a special focus on specialized contexts, such as gender-based violence cases, emergency situations or prison settings. The aim of this article is to examine several methods that are being applied in this kind of cross-cultural social research. Given the characteristics of these settings in which confidentiality and other ethical issues are paramount, emphasis is placed on the need to model and design a specific empirical methodology that best suits and allows researchers to gather information which is very difficult or even impossible to access. The use of several research methods, such as questionnaires, interviews, ethnographic field work (observation guides and field notes), focus groups, and video and tape recordings amongst others will be examined. Examples from different research projects developed by the members of Group FITISPos-UAH will be given to illustrate these different methods of data gathering.

2 Need for research in public service interpreting in specific fields

Even though in earlier times Interpreting Studies focused primarily on conference interpreting and especially on the cognitive processing aspect of interpreting, in the last decades, due to migration and an increase in human mobility as well as the free movement of citizens within the Member States of the European Union, the importance of interpreting performed for public services has gained greater visibility.

Public service interpreting consists of face-to-face or remote interactions in which at least two parties that need to communicate (public service providers and migrant users) do not share the same language and culture. This kind of interpreting can be described according to Gentile et al. (1996) in terms of the setting where it takes place and the techniques used by the interpreters. Public service interpreting is performed in a variety of contexts, such as courts, hospitals, jails, schools or police stations. The interactions mediated by interpreters in these contexts share some general characteristics:

- They are usually personal for the foreign speaking person and professional for the public service providers.
- They are asymmetrical and sometimes quite tense (Hale 2007; Cambridge 2002).
- Interpreters may be present, together with the main interactants, or interpretation may be performed remotely, that is, one or several of the participants in the interaction (the interpreter or any of the other speakers), joins the conversation via telephone or videoconferencing.
- Interpreters interpret bilaterally, using mainly short consecutive or *chuchotage* (although sometimes also simultaneous) interpreting, and they sometimes take notes.
- Interpreters often have to perform other roles or tasks, such as sight translation, summarizing or explaining (expanding) utterances and concepts.

Most of the studies conducted in the field of public service have mainly focused on court (Atkinson & Drew 1979; Edwards 1995; Hale 2004; Mikkelsen 2000; Moeketsi 1999; Shlesinger & Pöchhacker 2010) police interpreting (Ortega-Herráez & Foulquié Rubio 2005), interpreting in hospitals and health-care centers

(Angelelli 2004; Bischoff 2006; Davidson 2000; Raga Gimeno 2006; Pöchhacker & Shlesinger 2007; Lázaro Gutiérrez 2012; Valero-Garcés 2014) but there is very little research dedicated to other specific settings such as for example gender-based violence, emergency situations or women in prison settings. The goal of this paper is to present some specific empirical methods that can be used in settings in which access to information represents a serious burden, as the ones which have been mentioned above.

3 Research in interpreting as social research

Researching interpreting as a face-to-face interaction (Wadensjö 1998) can be included in the category of *social research* as it “focuses on gathering information about society and social issues” (Adams & Brace 2006: 6).

Although research is carried out with the specific purpose of achieving new insights, accurately portraying the characteristics of a particular situation or group or testing a hypothesis (Kumar 2008: 3) there are four main pairs of recognized types of research design (see Figure 2).

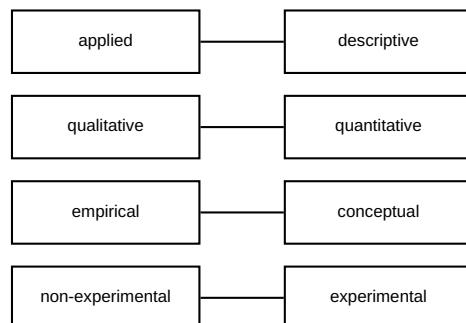


Figure 1: Type of research according to Kumar (2008)

Williams & Chesterman (2002) also make a clear distinction between conceptual (theoretical) research and empirical research, and according to Borja et al. (2009) every research project includes three fundamental phases: conceptual, empirical and interpretative which in the opinion of Halverson (2009: 102) correspond to other “particular components of vital importance: the research question, research design and assessment of research quality”.

Independently of the classification of research, what is truly important is to be aware of the distinction between two fundamental concepts: *research methods* and *methodology*. The first term (research methods) refers to the techniques and

strategies adopted by a researcher while the second term (methodology) represents “a way to systematically solve the research problems” (Kumar 2008: 5).

For this paper, it is the empirical phase (or research design) that is of interest to us, as it represents the stage in which the methodological grounds are defined (Borja et al. 2009: 62) and the researchers are involved in a continuous meta-level of awareness and decision-making (Halverson 2009: 80) while modelling their research methods. In what follows, the different research methods used when researching in the field of public service interpreting in specific contexts will be described and illustrated using several examples of studies carried out by the authors in the last five years.

4 Characteristics of the research carried out in specific contexts

Analyzing different aspects of the process of interpreting or of the interpreter’s role in situations in which the person who does not understand and speak the language of the host country is under a particular pressure or undergoing any kind of traumatic situation turns out to be a very challenging experience and, at the same time, it can pose a risk to the research as the methodology of data collection might have to be adapted to comply with both ethical and sensitive issues.

One of the first steps that any researcher has to undertake in the incipient phase of gathering data is applying for an official permission. In order to do so, it is necessary to write a formal letter with a brief summary of the project and the kind of information needed as well as an outline of the method or methods to be used. A reply to an official request for permission to be given access to information by a public institution is usually not issued immediately, but can take up to several weeks or even months as sometimes special committees must be formed for this purpose.

However, an official permission from the institution where the research will be carried out is usually not sufficient, as it is also necessary to count on the acceptance of each and every patient, victim, client, offender, etc. Sometimes, in spite of the official permission from the institution, it is also necessary to obtain consent from the individual employees whose talk will be object of study, as well as from the interpreters, being they employed by the institution or hired by the patient/victim/client/offender.

As it has been mentioned before, many of the settings where public service interpreting is performed are tense situations, as one of the interactants (patient/

victim/client/offender) is using a public service driven by a personal need or circumstance (a gender-based violence victim making a complaint at a police station, a patient who has just had a car crash and is in hospital, a person who finds herself in prison after being charged with theft, etc.) Both the immediacy of the encounters and the personal situation of the speakers make these interactions mediated by an interpreter extremely difficult to research.

Some of the general characteristics of such communications that take place in specific contexts and which will be analyzed for the purpose of our research are outlined below:

- They take place within an institutional setting.
- The parties do not share the same language.
- The presence of an interpreter is needed in order to enable communication.
- The relationship between the two parties is asymmetrical (both from a linguistic –one party speaks the official language of the country where the encounter takes place and the other one speaks a foreign language- and an educational perspective).

All of these characteristics are found in most public service interpreting encounters, but, apart from them, there are also others that are more specific to the contexts that will be taken into account for our research:

- Formal language uttered by service providers.
- Informal language (free narration of the acts, symptoms) uttered by users of public services.
- Strict institutional protocols.
- Anonymity and confidentiality are crucial.
- Different professionals who assist the user (policemen, psychologists, social workers, lawyers, judges, forensic doctors, nurses, general practitioners, clerks, trainers, etc.)

In what follows, different research methods used in projects where members of the Group FITISPos-UAH took part will be presented. All of these projects have in common that they dealt with specific contexts within public service interpreting. One of them is a Ph.D. dissertation on interpreting in gender-based violence

trials (Bodzer 2014), which combines interviews, questionnaires, and observation guides.¹ Also within the field of gender-based violence is the project *Speak Out For Support (SOS-VICS)* (2012–14),² aiming at facilitating efficient communications between women who are non-native speakers and victims of gender-based crimes, and the agents who intervene in such acts of communication through well trained interpreters, which was funded by the Directorate-General of Justice of the European Commission. The following two projects were developed in the healthcare setting and included the emergency departments of three different hospitals. The project *Intercultural Mediation for the Healthcare Assistance to Migrant Population: Analysis of Communicative Problems and Suggestions for Training* (2004–07) was funded by the Spanish Ministry of Science and Education and aimed at analyzing the quality of communication between clinical staff and foreign patients, at a time when interpreting or mediation services were not available in hospitals or healthcare centers. Some years later, the project *InterMed* (2012–15), funded by the Spanish Ministry of Economy and Competitiveness, set out to monitor healthcare mediators in order to assess the quality of mediated healthcare encounters and to establish best practice. The last of the projects involved is *Interpreting and Translation in Penitentiaries* (2013–14), which was funded by the University of Alcalá under the supervision of the Spanish Ministry of Economy and Competitiveness and consists of a pilot project aiming at analyzing communicative problems of female inmates in a particular prison located in the vicinity of our university.

5 Empirical research methods and instruments adopted for specific fields

Most of the research which has been or is being carried out in the field of public service interpreting is designed with the purpose of testing a hypothesis or to describe and analyze the *status-quo* of the profession or other issues related to it (ethics, role of the interpreter, etc.). In order to achieve this, both quantitative and qualitative methods can be used. Each one of methods follows particular objectives, has certain advantages and poses specific problems. For most of research projects, particularly for our descriptive projects, a combination of qualitative and quantitative methods is desired. Several authors, such as Krolokke & Sorensen (2006), suggest the need of using several research methods which are

¹Anca Bodzer was awarded a Ph.D. Fellowship by the University of Alcalá for 4 years (from 2010–2014).

²<http://cuautla.uvigo.es/sos-vics/>

deliberately recombined. Creswell & Plano Clark (2011) offer a convergent parallel design model, which is a data triangulation model which implies the parallel application of at least two methods in order to reach the triangulation (Denzin 1989) or the crosschecking (Douglas 1976) of the results of the research or, in Morse's words (1991: 122), "to obtain different but complementary data on the same topic".

Based on Kumar's (2008) *quantitative* versus *qualitative* type of research, throughout the following paragraphs we will describe some methods used in our research on interpreting in specific contexts and which are also summarized in the figure below:

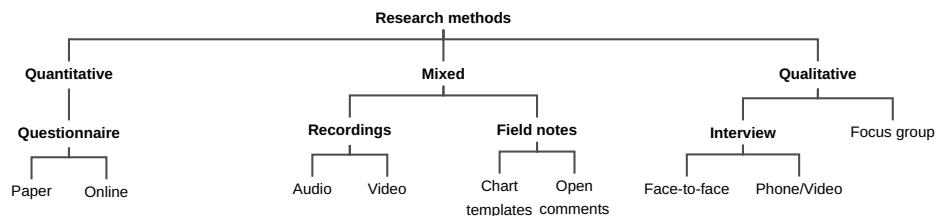


Figure 2: Research methods in interpreting specific settings

5.1 Quantitative methods

Quantitative research is concerned with the measurement of quantity, that is, the relationship among quantifiable variables. One of the most frequently utilized methods consists of using questionnaires. Through this method, researchers try to determine the strength or importance of the correlation between variables and to establish to which degree the results obtained from a sample are objective and general and can be applied to its original population. After this, further analysis aims at explaining the results, which means describing why things happen or do not happen in a particular way.

5.1.1 Questionnaire

Questionnaires are a communication instrument used between the researcher and the group of interest for the investigation. The design of a questionnaire may vary from one research project to another both in length as in form but all of them have some characteristics in common: (1) a brief description of the study including some recommendations on how to complete it, the approximate time

needed and the deadline, (2) some initial questions that are geared towards gathering socio-demographic data of the respondents (sex and age) (3) even though they are anonymous. Questions must be clear and specific and questionnaires must be piloted in order to assess their efficacy. Questionnaires can be administered in different ways: in person or remotely, either by sending them to the target population in an envelope and providing at the same time a pre-paid return envelope (Ortega Herráez 2011) so that the participants can send it back to the researcher by postal service or to be filled in online through the use of specific questionnaire design tools (Bodzer 2014).

Apart from these initial questions designed to profile the respondents, questionnaires may include closed or open questions or a mixture of both. Closed questions can be single or multiple choice questions. Some of the most popular measurements methods used are (Oppenheim 2000; Gillham 2008):

Likert scale used to measure attitudes generally expressed in terms of agreement or disagreement although it also allows for measuring a certain degree of neutrality and also the experience of the subject, for example, when questioned about the frequency with which occurrence of a particular fact occurs. The most common form of the Likert scale goes from 1 to 5 (it is symmetrical), but longer scales may also be found, which can be either open (eg. Rate your experience from 1 to 10, 1 being “very bad” and 10 “very good”), or semantically expressed (eg. 1 meaning “always”, 2 meaning “often”, 3 meaning “sometimes”...)

Delphi method is a method designed for experts which is applied in a repetitive manner since it is used as a prediction tool. The phases of a Delphi questionnaire are represented in Figure 3:

As for the current design of questionnaires, it is more common to use specific electronic tools rather than to adopt the classical form of completing questionnaires on paper. Nevertheless, the option chosen for the design of any questionnaire will directly influence its circulation and, if necessary, the possibility of translating it into other languages should be considered in case an extended sample is needed.

The Internet and new technologies are of great help both with regard to the design of questionnaires but especially with respect to their distribution, storage of information and even analysis of data. Even though there are a lot of free questionnaire design tools available on the Internet, it is very important to be aware of the fact that they do not offer any guarantee and data may be lost without the

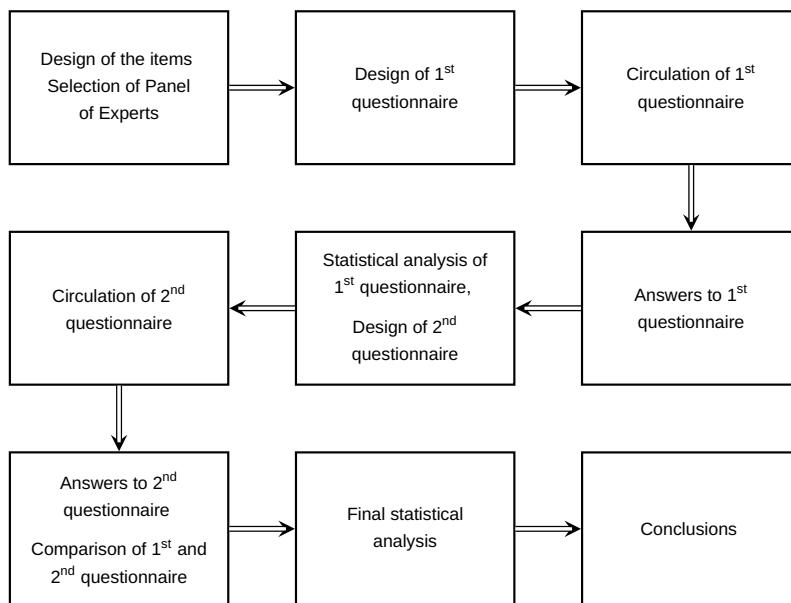


Figure 3: Phases of a Delphi questionnaire

possibility of recovering it. For this reason, it is strongly recommended to choose a specialized tool and sign up for a paid account.

Finally, the researcher may consider the option of compensating the respondents for their time and collaboration by giving them the opportunity to leave an e-mail address if they are interested in receiving a summary of data analysis gathered with their help. If this kind of agreement is entered into by the researcher, it must be fulfilled once the data has been analyzed.

Questionnaires were used for all of the aforementioned projects, either to measure opinions about the quality of communication or to survey personal experiences regarding how communication was carried out. They were usually distributed among all the people involved in the communication process, that is patients/clients/victims/offenders, public service providers, and interpreters or mediators. Two different experiences will now be described: the questionnaires passed on to interpreters by Anca Bodzer as part of her Ph.D. research because of the technical difficulties which arose in the process, and the Delphi questionnaire distributed amongst interpreters with experience in gender-based violence contexts as part of the SOS-VICS project.

For the Ph.D. dissertation there were five different questionnaires designed as they were addressed to different groups of respondents: interpreters, lawyers,

social workers and psychologists and finally non-Spanish speaking victims. The first questionnaire designed and piloted was the one directed to the interpreters. It was made up of two parts: the first one included questions that could help establish the profile of the interpreters (sex, age, studies, motivation to be interpreters, etc.) and the second part was more specific as it aimed at gathering information regarding the impact of the gender factor in the process of interpreting and analyze the importance of it together with other factors like religion or culture in the specific context of gender violence. For the piloting phase the questionnaire was translated into three languages (Spanish, English and Romanian) and it was designed using a free specific electronic tool which was previously used for a research at a smaller scale. Unfortunately, because of an internet attack to the page and server of the survey tool the data gathered in two weeks was lost and there was no chance of getting it back. According to this piloting experience it was totally decided that a paid account of a specialized well known tool should be used in during the entire data collection phase in order to guarantee the safety of the data.

Within the SOS-VICS project, a group of expert translators and interpreters was surveyed in order to find out about the contents that, in their opinion, should be contained in a training program for interpreters and translators working in gender-based violence contexts.³ The survey was carried out in two main phases. During the first phase, professionals were openly asked about three aspects: the contents which a training program should cover, the obstacles which prevented them (or other colleagues) from receiving such training, and the most suitable training techniques and strategies to solve this lack of training. Once all the open answers were compiled, a list was elaborated and returned to the professionals. This time, they were asked to rate the items in the list according to their relevance or importance.

The questions were chosen by a team of five people, all of them researchers involved in the project, but belonging to different fields: translation and interpreting, sociology, statistics, and journalism. The respondents were selected by researchers of the nine Spanish universities taking part in the project. This made it possible to find experts from all around Spain, thus ensuring the representativeness of the sample. The questionnaire was distributed via email together with the presentation of the project and instructions regarding its completion (including ethical issues related, for example, to the anonymity of the answers).

One of the first obstacles encountered was the difficulty involved in finding respondents with the required profile (translators and interpreters with experience

³The whole study is published in Del Pozo Triviño et al. (2013)

in gender-based violence contexts). The second main problem can be attributed exclusively to the nature of the Delphi questionnaire: as it has to be completed in two phases, nearly half of the respondents failed to respond to the questionnaire distributed during the second phase. Two reminders were necessary for each of the phases. Here we can see the aspect of the questionnaire:

Another challenge of this method was to group, reformulate and classify the answers of the respondents for the second phase. A list of 154 items was sent back to the interpreters so that they could rate each of them following a Likert scale (1–5 being 1: “not important at all” and 5: “very important”). This time, a piece of software was used to gather the answers: AdobeFormsCentral. The aim of this phase was to identify the level of importance of each of the items, and also the level of agreement between participants. A third phase had been projected in case the level of agreement had not been high enough after the second phase, but it was ultimately not necessary to carry it out.

5.2 Qualitative methods

Qualitative research focuses on the qualitative phenomenon avoiding quantification and is typically carried out in a natural setting. Adopting a qualitative approach implies the use and collection of a variety of empirical data like participant observation, case studies, personal experiences and interviews, to name just a few (Denzin & Lincoln 1994: 2). Qualitative research tries to identify the deep nature of realities, their system of correlations and their dynamic structure. In the following sections two qualitative methods will be described: interviews and focus groups.

5.2.1 Interview

Interviews are particularly useful if one desires to understand opinions or behaviors of a specific group concerning a topic, “to get the stories behind a participants’ experience” (McNamara 1999). They are conversations based on the researcher’s need for data. In other words, it is one of the most frequently used research instrument applied to collect relevant information for the purpose of research. They represent the most common instrument for qualitative research.

Normally interviews are conducted on a face-to-face basis but, with the explosive growth of new technologies, telephone and video interviewing have become more and more common. The only difference between these two kinds of interviews is that the face-to-face interview is synchronous in both time and space while interviews conducted by telephone are asynchronous in terms of space

(Opdenakker 2006). Regarding the interviews done via internet there is a debate whether they are asynchronous regarding space or not, as the Internet is considered to be “no place” (Morse 1991 in Opdenakker 2006).

As concerns this paper focused on research done in specific fields in which access to information is extremely difficult, the use of technologies such as the phone or the Internet can be of great help during the data collection process. For example, in the special case of gender violence getting to interview victims personally may be impossible for several reasons:

- The victim does not want to reveal her experience to an unknown person.
- The victim might feel ashamed in a face-to-face interaction.
- The presence of an interpreter might be needed and in this case the victim would have to cope with the presence of two unknown persons (researcher and interpreter).
- The total anonymity (in the majority of the cases) of the victim is crucial for her protection.

5.2.2 Focus group

Focus groups may be more appropriate than personal interviews for some topics which require further reflection. They represent a discussion with a group of people so that the analysis of data takes place at a level of a group interaction. The participants are chosen because of their expertise, their experiences or their background. Some questions are posed to the participants, who give their individual opinions while listening to the others’ opinions, which might serve as an inspiration for the moderator of the focus group to elaborate further opinions.

The main objective of project *InterMed* was to monitor teams of healthcare mediators in order to identify and subsequently be able to recommend best practice for a communication mediated by an interpreter/intercultural mediator. One of the tasks of mediators working in Spain is usually providing assistance in the elaboration of multilingual materials for a foreign population. Within project *InterMed*, a small scale research project was carried out on health promotion videos addressed to foreign population. The aim was to find out more about their effectiveness and several aspects concerning the levels of adaptation to the audience were studied: linguistic adaptation (dubbing or subtitling), cultural adaptation (communicative styles, proxemics, etc.), and topic adaptation, amongst others. After a first analysis, the study was completed by means of focus groups. Some

videos which had been studied by a single researcher were later evaluated by a group of intercultural communication experts and by individuals belonging to the target population (the audience). The evaluation was articulated based on a qualitative and subjective methodology, such as the responsive evaluation model (Stake 1976; Abma 2005). This model suggests an evaluation of materials addressed to particular subjects by these same subjects. It is based on qualitative (non-quantifiable) comments and team participation and seeks to capture the singularity of particular situations, allowing for the understanding and evaluation of both processes and results of the health promotion programmes (Gámez Requena & Márquez Aragónés 2004).

Although finding experts in intercultural communication and members of medical staff with experience or specialization in interculturality was not a difficult task, finding members of the videos' target community was particularly challenging. *These participants* had to be as close to the target culture as possible, and should not be strongly influenced by the host culture (Spanish culture, in this particular study). However, most of the people willing to evaluate the videos, although originally belonging to the target culture, were already very much imbued with the host culture, or were cultural experts themselves, posing the risk that their contributions might be influenced by this fact. This problem was solved when these individuals, instead of participating in the focus group themselves, found other people with the required characteristics within their circles of relatives and acquaintances.

5.3 Mixture of qualitative and quantitative research

Apart from the above mentioned, there is a variety of methods which can be useful both for qualitative and quantitative analysis, as both kinds of data can be compiled and extracted from them. In this article, we would like to mention the analysis of video and audio recordings and the elaboration of observation guides to compile field notes.

5.3.1 Recordings

During two of the above mentioned projects, video and audio recordings of medical consultations were compiled. Within the project *Intercultural Mediation for the Healthcare Assistance to Migrant Population: Analysis of Communicative Problems and Suggestions for Training*, carried out from 2004 to 2007, more than 100 recordings were compiled, whereas the researchers of the *InterMed* project, carried out from 2012 to 2015, managed to record around 40 medical consultations.

The difference in the number of recordings compiled is striking, taking into account that the duration of both projects was similar and that the methodology which had to be developed for the first project was simply intended to be applied to the second one, without the need of further design. The obstacles encountered in the course of implementing this methodology were manifold, but they were easier to solve in the case of the first project.

The difficulty revolved around obtaining the informed consent of all the participants in the study and all the speakers whose conversations were to be recorded. First of all, the researcher needs the authorization of the institution in which the conversations are to take place. For the first project, this was obtained after a number of interviews with the managers of the hospital departments and healthcare consultations were the study was carried out. In the case of hospital departments, the head of each department (emergency, pediatrics, and gynecology) was contacted and the project was explained to them. After receiving their verbal authorization, an agreement was signed between the hospital and our university in order to allow for the project to be developed. In turn, the head of the departments held a meeting with their respective department staff to explain the protocol for data compilation. In the case of healthcare centers, several general practitioners were contacted and asked for permission to record their consultations. After they had consented, an agreement form was signed between the healthcare area to which the healthcare centers belonged and our university.

The second step was to obtain permission from the patients to be recorded. A consent form was written by the members of the researcher's team and later translated into several languages (the most common languages of the patients of the area where the study was carried out: English, French, Chinese, Arabic, Polish, Romanian, Russian), so that foreign patients could read them in their own language. One researcher was present during the consultations and was in charge of explaining the content of the consent form to the patient (objectives of the study, what would be done with the recordings, and how personal data would be processed) and obtained consent from them. It was also the researcher who started and stopped the recorder. The researcher remained silent and as unobtrusive as possible during the consultations.

Apart from the difficulties which arose before the recording phase took place, there were two major problems encountered during the recording phase: the reluctance to participate from both members of staff and patients, and the influence of the presence of the researcher. Some members of staff were concerned about the possibility that their performance might be assessed in terms of quality. On the other hand, patients were afraid that their irregular status of residence in the

country would be discovered. Both parties were given explanations about the aims of the study and about the data management process, but reluctance was not completely eliminated.

As the presence of the researcher sometimes influenced the interactions, for example, to the extent that the speakers addressed her and she sometimes became another member in the conversation, some mechanisms were identified to try to minimize this influence. The most effective approach consisted of the members of staff (doctors and nurses) recording the conversations themselves. However, other issues arose: the members of staff forgot to initiate the recorders, or they started it too late, or forgot to stop it, or decided to delete some conversations for a number of different reasons. In the end, this measure was not particularly advantageous, as it did not pose fewer problems.

Some years later, when the *InterMed* project started, a similar methodology was intended to be used. However, the process of obtaining authorization from the institutions was more complicated. Instead of giving their immediate consent, general practitioners and other doctors redirected our request to higher instances. When our proposal reached higher authorities without their prior consent, it was dealt with as an external request and additional documents were requested. We had to solicit an ethics report from the bioethics committee of our university, and our proposal had to be approved by the regional (Madrilean) bioethics committee. Amongst the many documents that we had to present, were the consents forms we planned to give to patients. After the committees' revision, the consent forms became long and complicated, and several patients refused to sign them because they did not want to take the time and go to the trouble necessary in order to become informed.

5.3.2 Field notes

As already mentioned this paper also includes part of the experience of a Ph.D. dissertation based on the analysis of interpretation for non-Spanish speaking gender-based violence victims during which access to information was decisive for the realization of the study. As access was denied to be present during the interviews with victims or to obtain audioslash video recordings the only approach that allowed for the realization of the research was an ethnographic one based on field notes because, as Koskinen (2008: 12) says, "the reality of research calls for flexibility, improvising, prioritizing and openness to new opportunities as they arise during the research process". That is why for this author "ethnography is a complex methodology which offers a robust and adaptable framework [...]

which allows for using of multiple sources, multiple methods of analysis, and for multiple sites and time-frames" (Koskinen 2008: 6).

Field notes represent one of the most famous instruments used during the observation period and they may be descriptive or analytical. Each and every field note should start with information about date, time beginning and time end as well as the location where the observation is carried out.

Contrary to other approaches that bring the field to the investigator, ethnography and the collection of data based on field notes requires that the researcher go into the field. Schwartzmann (1993: 3–4) states that "ethnographers go into the field to learn about a culture from the inside out".

The design and the process of writing field notes is very personal and adapted to each research, and that is why the following information is based on our own experience. Field notes were used along the compilation of data for Anca Bodzer's Ph.D. dissertation and for the project *InterMed*.

The Ph.D. dissertation carried out by Anca Bodzer in the field of gender-based violence is based on a corpus of 37 field notes gathered during the daily observation of public judicial trials which took place in specialized courts (*Juzgados de Violencia sobre la Mujer*) in Madrid over the course of seven months. Three of the seven months were in fact a period of accommodation to the field meaning that specialized knowledge about how different courts work, about the role of all the interlocutors (judges, lawyers, prosecutors, witnesses, forensic doctors, social workers and psychologists) and the different phases of a trial. At the same time, this period helped the researcher test and improve her ability to write down notes based on a very rapid discourse, long sentences and with short or no pauses at all, pay attention to what was happening in the room and also to the non-verbal communication. Last, this pre-official three month period of observation was of great help to shape and decide upon the information to be included in the *observation chart template* which would serve as an instrument to collect the same data from all the observed trials. Details like date, timing, type of crime, language(s), gender of interpreter, type of interpretation (simultaneous, consecutive, *chuchotage*, summarized, sight translation) according to each phase of the trial (introduction, victim's/accused/witness's testimonies, lawyers' reports, etc.) were reflected on the *observation chart template*. A section for open comments was also included with the aim to gather the specific information of each one of the observed trials. This data was extremely helpful to identify the barriers existing in a trial mediated by interpreters and the data was classified following the principles included in the professional code of ethics.

6 Final remarks

The purpose of this paper is to promote awareness for the fact that the empirical framework must be shaped or modeled in such a way that it serves to overcome institutional obstacles. At the same time prerequisites such as validity and reliability must be taken into consideration when designing the methods to be used. When conducting research in a specific setting, the use of mixed methods (quantitative and qualitative) represents the only possible way to gather the necessary information. In fact, sometimes adopting typical research instruments like questionnaires and interviews is not enough and other methods must also be taken into consideration and developed.

Throughout the paper we have presented some relevant methodological information about different typologies of research, while mainly focusing on cases from projects conducted in specific settings in which members of FITISPos-UAH Group took part, placing special emphasis on the difficulties which arose as well as on the methodological solutions that were finally adopted. As nowadays it seems very difficult to obtain access to audio or video recordings from specific settings or to interview persons of interest (gender violence victims) in order to conduct research, our experience showed us that the use of mixed methods and also mixed instruments (observation guides) are of great help.

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Chapter 13

On the achievement of question-answer sequences in interpreter-mediated interactions in healthcare: Some notes on coordination as mediation

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Following Wadensjö's well-known concept of coordination (1998: 6), we draw a distinction between what we have called basic and reflexive coordination. While basic coordination refers to unproblematic rendering of utterances where no communication problem is explicitly addressed, reflexive coordination highlights the process through which actions become relevant that make the participants' interpretation of what is going on in communication explicit and observable to the other participants. Reflexive coordination is thus the process of communicating about communication. While reflexivity is a characteristic of all types of communication, in interpreter-mediated talk it largely accounts for what is referred to as mediation. Here we look at naturally occurring audio-recorded data of doctor-patient interactions where a mediator participates with the function of providing bilingual interpreting service. We focus on sequences which include doctors' history-taking questions up to the patients' answers. Our data show that there are three sets of problems mediators need to deal with when translating history-taking questions. First, they need to address not only the content of the doctor's question, but also the purpose that is projected through that question. Second, they need to re-design the doctor's question in a way that it is likely to be understood and reacted to appropriately, by the patient. Third, they need to formulate the rendition of the patients' response for the doctor, in a way as to allow transition to the doctor's next question or to the conclusion of the history-taking session. Addressing these problems and clarifying the issues related to them, to the participants in the interaction, involves



forms of reflexive coordination and mediation. While the analysis of the renditions of history-taking questions does not cover all forms of reflexive coordination in the data, it is interesting to see how reflexive mechanisms of communication work inside this specific sequences.

1 Introduction

In the last 20 years, migration fluxes have changed the distribution of the population in Europe, enhancing the construction of multilingual societies. One of the consequences of this rapid change is that public institutions, like courts, hospitals and schools, have increasingly served people of varying provenances, speaking different languages. Institutional encounters mediated by bilingual professionals, helping providers and laypeople understand each other, have thus become overextended. In this context, the importance of understanding the effectiveness of interpreted talk has attracted the attention of many institutions. For their crucial importance for the population welfare, healthcare services were among the first to raise interest in language and social research (e.g. Angelelli 2004; Baraldi & Gavioli 2007; Bolden 2000; Davidson 2000; Hsieh 2007; Tebble 1999; Valero-Garcés & Martin 2008).

The “translators” involved in healthcare services have different backgrounds and training, ranging from qualified professional interpreters to “ad-hoc” family members or hospital staff (Bührig & Meyer 2004; Meyer 2002), providing language help occasionally. Although the selection of translators depends on a variety of circumstances (including the language spoken by the patients), a rough distinction can be drawn between countries with a long migration tradition, such as the Anglophone and Northern European countries, and those whose immigration experience is recent. While the former have traditionally relied on professional interpreters (Carr et al. 1997; Corsellis 2008; Hale 2007; Roberts et al. 2000), in Belgium, Italy and Spain, to quote just a few, the personnel in charge of interpreting are so-called “intercultural mediators” (Lizana 2012; Merlini 2009; Pittarello 2009; Verrept 2012). In Italian healthcare settings, in particular, intercultural mediators are preferred to interpreters as they are considered more competent in dealing with different cultural perspectives possibly emerging in communication between healthcare providers and migrant patients. Intercultural mediators thus participate in provider-patient interactions with two main explicit institutional requirements: translating talk between providers and patients, and mediating between their potentially different perspectives and views.

In this paper, we look at naturally-occurring interactions, collected in Italian healthcare settings, involving a healthcare provider, a patient and an intercul-

tural mediator. We look at the work of mediators with the purpose of highlighting some of the practices they use to manage bilingual talk and “mediate” it. Here we discuss the notions of coordination and mediation, taken from the literature. In particular, starting from a distinction between basic and reflexive coordination, we suggest that forms of reflexive coordination can enhance effective forms of mediation in interpreted talk.

2 Interpreting as coordination and mediation

The notion of coordination was introduced by Wadensjö in her seminal work published in 1998. Wadensjö shows that participants’ contributions in the interaction cannot be seen as individual contributions, but they “make sense together”. Participants in the interaction, including the interpreter, display their understanding of what is going on and thus contribute to make sense of it, in relation to each other’s contributions and understanding. According to Wadensjö, interpreters coordinate interactions both implicitly and explicitly. In Wadensjö’s terms, implicit coordination is carried out simply by translating, as the choice of language, in bilingual talk, normally selects the speaker of that language. Explicit coordination is instead carried out through actions which focus openly on the organization of talk or on talk dynamics. Contributions addressed to explicit coordination are not necessarily renditions and include requests for clarification, requests for time to translate, comments on translations, requests to observe the turn taking order, and invitations to start or continue talking (Wadensjö 1998: 108–110). Coordination, then, may include actions which do not mirror the textual form of utterances and turns but, instead, work on communication, making sense of utterances and turns in the context of the interaction and for the speakers involved. Coordination is also at the core of the notion that interpreting includes mediation. The interplay between coordination and mediation is not new in interpreting studies and research has shown that interpreters’ coordination of bilingual talk construes forms of mediation (e.g. Angelelli 2004; 2012; Penn & Watermeyer 2012; Pöchhacker 2008; Wadensjö 1998).

Mediation, intended as coordinating parties with different perspectives, is a concept central to, and possibly developed within, the professional context of conflict mediation. In conflict studies, mediation introduces a third perspective in the interaction, with the explicit aim of facilitating communication between the conflicting parties and re-contextualise it into a more positive form of relationship. In particular, two theories can help explain the function of mediation in conflict management: the theory of *transformative* mediation and the theory of *narrative* mediation. The theory of *transformative* mediation (Bush & Folger 1994)

suggests that rather than helping conflicting parties solve the practical problems that created their conflict, mediation has the function of transforming their relationship. Transformation of relations requires mediator' actions that promote, on the one hand, the parties' empowerment, i.e. their ability to express themselves and relate with others; on the other hand, the mutual recognition of validity of their different perspectives, although they do not share them. The theory of *narrative* mediation (Winslade & Monk 2008) argues that mediation means transforming the adversarial stories narrated by the parties. Narrative mediation aims to construe new narratives of both parties' equal rights and responsibilities, which substitute each party's attempt to propose narratives of hegemony, oppression and exclusion of the other party. Combining perspectives derived from these two approaches, conflictive interactions can be handled and transformed either by empowering participation (according to Bush & Folger), or by promoting new narratives (according to Winslade & Monk). In order to achieve either mutual empowerment or new narratives, mediators need to coordinate the parties; coordination of talk can thus be oriented to forms of mediation.

Elsewhere (Baraldi & Gavioli 2012), we have reflected on the relationship between coordination and mediation, starting from Wadensjö's distinction between implicit and explicit coordination (1998). In our contribution, we used a distinction taken from Social Systems Theory (Luhmann 1984), which provided us with a theoretical framework to integrate Wadensjö's implicit/explicit coordination concept into a communication system. Luhmann's distinction is between basic self-reference and reflexivity. Basic self-reference is needed in order to achieve communication (Luhmann 1984: 600-601). It means showing understanding through an utterance, which unproblematically refers to the previous one. A basic self-referential process of communication is a smooth process in which each utterance refers to the previous one, without analysing or contesting its meaning. Reflexivity is instead involved when participants are engaged in actions that make their interpretation of what is going on in communication explicit and public (Luhmann 1984: 601; see also Heritage 1985; Pearce & Cronen 1980; Weigand 2010). These actions make reference to the participants' perspectives, positions and attitudes and construe their meaning in the interaction.

On the basis of Luhmann's distinction, coordination of interpreter-mediated interactions can be considered "basic" when a turn is dealt with "smoothly" and "unproblematically" in following talk. This is normally the case when a turn is translated into a next turn. Basic coordination does not depend on the actual complexity of the interpreters' rendition of interlocutors' talk. A rendition can be very complex, but its complexity is "resolved" by the interpreting profession-

als in their rendered turns. This means that the rendition is not dealt with in following talk, but it is immediately provided. Reflexive coordination, instead, includes those cases where some interpreting problem or issue projected in the turn is addressed and dealt with in following talk. This may be a simple problem, like a problem of hearing (“can you say it again please?”), as mentioned by Wadensjö (1998), but, more interestingly, it may have to do with the possibility of communication to act reflexively on the communication process in terms of “what we mean” and “what we are doing here”, in this particular interaction or sequence. Reflexive coordination in interpreting includes actions like asking for clarification, glossing, commenting and showing understanding actively.

Discrepancies of understanding or acceptability inside mediated communication are thus observable through forms of reflexive coordination. These can be forms of talk which get back to the actions that might cause understanding or acceptability problems and address them. This talk-reflexive phase can take many forms, but following suggestions from theories of conflict mediation, they can be oriented to: (1) displaying an empowering sensitivity for participants’ perspectives (Bush & Folger 1994), and (2) fostering new narratives that are helpful to promote mutual understanding and acceptance on the part of the participants (Winslade & Monk 2008). In this way, reflexive coordination constructs forms of mediation in the interpreter-mediated interaction.

In what follows, we shall introduce the empirical part of our research and will look at examples of basic and reflexive coordination in doctor-patient interaction interpreted by intercultural mediators. We will see that, in the selected data, mediators display sensitivity for the participants’ perspectives and enhance new narratives, as mediators of conflicts are also invited to do. Actual “conflicts”, however are not visible in the data since participants’ (possibly divergent) positions and perspectives are made clear and relevant in the interaction and then treated in reference to the goals of the medical encounter. Mediators here “interpret” patients’ and doctors’ perspectives in ways that allow participants to understand each other’s contributions and react accordingly. In this sense, mediation can be considered a particular form of interpreting and can be helpful to interpreters and mediators alike, in their work in healthcare.

3 Data and methods

The analysis we present in this paper is based on a collection of around 200 consultations involving healthcare providers, migrant patients and intercultural mediators. The data were recorded in maternity/gynaecological settings with

Arabic-speaking or English-speaking female patients from North and West Africa. Some data involve male patients and were collected in general practice surgeries. The mediators are all women in their thirties, all with a migration experience. There are three mediators in the English set of data and five in the Arabic set. The data were recorded in the course of a long-term research project based on the collaboration between an academic team of researchers and a local healthcare institution, which is one of the most advanced in Italy as to ‘migrant-friendliness’ and services for migrants (Chiarenza 2008). Our data are transcribed following conversation analysis methods (Jefferson 1978; Psathas & Anderson 1990), which provide a graphic representation of some of the most common “sounds” of conversation, such as lengthening, “erms”, “mhm” and pauses. For Arabic data, we used Latin script, not only because it is more easily adaptable to bilingual conversation transcripts (think of e.g. the problem of representing overlap between a left-to-right written Italian turn and a right-to-left Arabic one), but also because: a. classic Arabic is not always appropriate to represent spoken varieties of Moroccan and some Moroccan words do not “exist” in classic Arabic, b. because the Latin transcript is commonly used by Arabic (young) speakers in digital “pseudo-spoken” communication, like instant messaging (see e.g. Palfreyman & al Khalil 2003).

The description of the practices discussed here makes reference to conversation analytic studies of doctor-patient interactions, as in e.g. Heritage & Clayman (2010: 51–169) and Heritage & Maynard (2006). In this paper, however, conversation analysis (CA) is combined with other methodological approaches such as those used in conflict mediation (Bush & Folger 1994; Winslade & Monk 2008) and in social systems theory (Luhmann 1984). According to CA research on doctor-patient interaction in monolingual talk, doctors’ questions can be split into different types (Heritage & Robinson 2006) projecting different sets of goals. Two of these types, possibly the most important ones, are “general inquiry” questions and “history-taking” questions. General inquiry questions “allow patients to present their concerns in their own terms” (Heritage & Robinson 2006: 92) and they are non-focused and open questions (Robinson 2001), like, “what’s your problem?”. History taking questions propose a precise setting of the medical agenda: they constrain patients’ responses and are “closed ended” (Heritage & Robinson 2006: 97), projecting patients’ short, e.g. yes/no, answers. Examples of history-taking questions are those about the age or profession of the patients, their life-habits, most significant diseases and the like.

What follows is based on a systematic analysis of those sequences in our corpus which include doctors’ history-taking questions up to the patients’ answers.

Our data show that there are three sets of problems mediators need to deal with when translating history-taking questions. First, they need to address not only the content of the doctor's question, but also the purpose that is projected through that question. Second, they need to re-design the doctor's question in a way that it is likely to be "taken-up", i.e. understood and reacted to appropriately, by the patient. Third, they need to formulate the rendition of the patients' response for the doctor, in a way as to allow transition to the doctor's next question or to the conclusion of the history-taking session. Addressing these problems and clarifying the issues related to them to the participants in the interaction, involves forms of reflexive coordination and mediation. While the analysis of the renditions of history-taking questions does not cover all forms of reflexive coordination in the data, it is interesting to see how reflexive mechanisms of communication work inside this specific sequence.

4 Mediators' coordination of history-taking sequences

4.1 Basic coordination

As mentioned above, basic coordination is achieved when the rendition is posed unproblematically, that is, when the mediator translates an utterance or a short series of utterances by posing their contribution as a repetition in the other language of what was said. Let us have a look at two extracts. In Extract 1, both the doctor's question (turn 1) and the patient's reply (turn 3) are rendered immediately in the next turn, with no hesitation. The Doctor's question is slightly summarized and the patient's answer is a bit adjusted showing the mediator's interpretation of a possibly ambiguous patient's turn (*I can't very eat* = "I can't eat very much").

- 1 D: Mangiare, bere, norma- tutto norm[ale? Riesce?
Eating, drinking, norma- all normal? Can he?
- 2 M: [Do you: eat (.) normally?
- 3 P: Sometimes (I can't very-) (.) eat.
- 4 M: A volte non ha l'appeti[to.
Sometimes he doesn't have appetite.
- 5 D: [Non ha fame. da- sempre da due settimane?
He's not feeling hungry. fo- this too for two weeks?

Extract 1

Even though the renditions are modified by the mediator in order to make their meaning and function clear, such meaning and function are a matter of the mediator's interpreting: they are not posed as a problem, nor do they seem to cause problems in the interaction.

In Extract 2, we have a similar example. The doctor's question in turn 1 is rendered immediately in the next turn with a repetition of the question and a change of pronoun (from "she", used by the doctor, to "you" used by the mediator). The patient's reply, repeating the mediators question with a confirming intonation, is summarised in a confirmation answer ("yes", turn 4), addressing the doctor's question very explicitly.

- 1 D: E' la prima volta nella sua vita che ha avuto un ritardo?
Is this the first time in her life that her period is late?
- 2 M: awwal marra [kai jik had taakhur?
Is this the first time that your period is late?
- 3 P: [awwal marra, dart liya had taakhur.
This is the first time my period is late.
- 4 M: Sì.
Yes.
- 5 D: Mch. quanti anni ha?
How old is she?

Extract 2

These two examples are interesting for a series of reasons, two of which can be mentioned here. First, they show the mediator's understanding of the participants' contributions and may suggest circumstances under which such interpretation can be considered plausible. Second, they show types of renditions (summarised, modified) and may thus lend themselves to reflections about whether these mediators' choices are good or whether they might be improved. So basic coordination is not "easy" in mediated talk since rendition choices are inherently "difficult" choices. Basic coordination though moves bilingual conversation forward and rendered utterances are unproblematically referred to previous talk, in a process where (possible) communication obstacles are not made observable to the participants in the conversation.

4.2 Reflexive coordination

Reflexive coordination is involved when actions become relevant that make the participants' interpretation of what is going on in communication explicit and

observable to the other participants. In these cases, aspects of communication (problems, goals, perspectives) are raised and dealt with in the interaction. In what follows, we will show three extracts. In all of them, a sometimes apparently very little detail is raised and explored with the patient in a direction that meets the goals projected by the doctor's initial history-taking question. While the "details" raised in these interactions may be considered small translating issues, we argue that the ways mediators coordinate talk empowers the patients' and the doctors' perspectives and allows their narratives to be produced in equal ways. This highly sophisticated work is what probably allows the raised "detail" to be rapidly treated and solved.

- 53 D: Vive qui da sola?
Does she live here alone?
- 54 M: Si.
Yes.
- 55 D: Non ha nessuno, [parenti, cugini]?
Does she have no one, relatives, cousins?
- 56 M: [You hav- do you live here alone, you don't have brother?]
- 57 P: I have a brother.^o
- 58 M: (.) Mhm.
- 59 D: [(Non ha -)]
She doesn-
- 60 M: [(Do) you live with your brother?]
- 61 P: Mh.
- 62 M: Sì vive [col fratello
Yes she lives with her brother
- 63 D: [Vive col fratello, benissimo.
She lives with her brother, very good.

Extract 3

In Extract 3, the doctor's history-taking question is posed initially in turn 53 ("does she live here alone?") and continued in turn 55 ("does she have no one, relatives, cousins?"), treating the mediator's "yes" in turn 54 as a continuer. As it is clear from previous turns in the interaction, this question from the doctor is important because the patient has lost a lot of weight and although she does not say it, the doctor believes the cause of this is that she does not eat enough. So he is exploring whether there is someone living with her who may possibly check that she has enough to eat. The mediator renders the doctor's question first in

turn 56. In turn 57, the patient answers that she has a brother, but does not clarify whether she lives with him. At this point the mediator suspends her rendition of the patient's turn and provides first a *continuer* (in turn 58) and then asks a more direct question to the patient who hesitatingly confirms that she lives with her brother. This information is rendered to the doctor, in a "yes"-format, answering the doctor's initial question. The doctor treats this information as sufficient for the moment (turn 63: "she lives with her brother, very good") and plans a complete check-up for the patient (data not shown).

In the extract, the significance of the doctor's history-taking question is negotiated first, between the mediator and the doctor (turns 53-55) and then rendered to the patient. In her rendition, the mediator addresses the specificity of the doctor's question ("do you live with your brother?", turn 60), re-designs the doctor's question in order to achieve a patient's appropriate reaction and eventually renders the patient's answer to the doctor in a way as to allow for the doctor's next action. Turn-coordination is thus constructed in a way as to display sensitivity for the participants' perspectives (even if this may produce just a feeble "mh" from the patient, as in turn 61) and to foster new narratives that are helpful to produce mutual understanding. By passing to a check-up planning, in fact, not only does the doctor go on with his medical schedule, but he also displays understanding that the patient may be in need of assistance although she hesitates to talk about it (there are in fact no more inquiries into the patient's life-style and a check-up is planned).

In Extract 4, we can see doctor's history-taking question in turn 57. In turn 58, the mediator re-designs the question for the patient ("have you got vaginal discharges?"). The patient's reply shows understanding of the word "discharges" and the patient describes some discharges she has ("like blood but dark ones", turn 59). The mediator then explores the patient's answer more in depth as to get a description, from the patient's perspective, that is meaningful in the doctor's perspective and such that it allows the mediator to answer the doctor's question ("brown?", turn 60). So the colour of the patient's discharges is described in turns 60-62 and rendered to the doctor in turn 63. The Doctor's next question shows understanding of the patient's description and also that the patient may not know how precisely vaginal discharges look like. In her new question in turn 64, then, the doctor clarifies what type of discharges she is asking about, which enables the mediator to explain it better to the patient in turn 65.

Here too, we have a rather elaborated coordinating work, where understanding of and perspectives on medical subjects are displayed and made clear by the interlocutors, who are also provided with access to "the other's" understanding

- 57 D: Pe:rdite?: Vagina:li?
Discharges? Vaginal?
- 58 M: Ka duz mnk shi haja?
Have you got vaginal discharges?
- 59 P: Kai duz mnni bhal dm wa lakin khl
I have discharges like blood but dark ones
- 60 M: =qhwi?
Brown?
- 61 P: =ah, [bhal marrone
Yes, they seem brown
- 62 M: [Ah.
Yes.
- 63 M: Mhm. Ha delle perdite marroni.
She has brown discharges.
- 64 D: Però perdite tipo bianche de:nse, con prurito o bruciore?
And like white viscouse discharges, itchy or burning?
- 65 M: Ma' byed, qasseh shi shwiya w ka ihrqk shi shwiya?
White discharges, a bit viscouse and that give you some burning feeling?

Extract 4

and perspective. Sensitivity to both the patient's and the doctor's perspectives is shown, which allows for these perspectives to be displayed in talk, and the patient's and the doctor's narratives to be produced. Even though these concern a small detail in the medical encounter, this detail is a very important one for the patient's state of health and needs to be focused on and dealt with adequately in the interaction.

In Extract 5, we have a slightly different and more problematic case. Here the doctor's question ("Last menstruation when was it?", turn 1) is rendered immediately in the following turn, by repeating it in Arabic. This question apparently poses no problem of understanding on the part of the patient, who answers immediately in turn 3 providing a date ("Twenty-fourth in the month of February"). The date the patient provides, though, refers to a period that is over a month ago. The mediator stops (see pause between turns 3 and 4) and in turn 4 a sequence is opened where understanding of the doctor's question and of the patient's answer are dealt with. It is made clear (turns 4-9) that the patient was referring to the date of the menstruation before the current one, that the patient had her last period on the day before (turns 10-11) and it is also clarified that the doctor's

- 1 D: Ultima mestruazione quando è stata?
Last menstruation when was it?
- 2 M: Akhir marra jatk fiha l 'ada shahriya?
Last time you had your period?
- 3 P: Rab'awa'ishrin (.) f sh'har juj
Twenty-fourth (.) in the month of February (2.0)
- 4 M: F sh'har juj? *In February?*
- 5 P: Ah, rab'awa'ishrin (.) f sh'har juj.
Yes, twenty-fourth of February.
- 6 M: F sh'har- f had sh'har ma jatksh?
In the month- in this month you didn't have it?
- 7 P: Majatnish, yallah jatni, ghlt lik dart liya retard tis' ayyam.
I didn't have, I have just had it, I told you I had a nine-day delay.
- 8 M: Yallah jatk?
You've just had it?
- 9 P: Ah.
Yes.
- 10 M: Imta jatk?
When did you have it?
- 11 P: Jatni:: el bareh.
I had it yesterday.
- 12 M: Ehm, ya'ni les regles tsamma dyal l bareh mush-
Ehm so yesterday menstruation don't-
- 13 P: Ah, ghlt dyal bareh, mashi lli ghlt dak sh'har
Yes I said yesterday, not that from last month.
- 14 M: Eh, no, akher marra. ma'natha nti daba haid?
Well no, last time. So you're having your period now?
- 15 P: Ah.
Yes
- 16 M: Allora, attualmente è mestruata. (.) Le sono venute ieri.
Well, she's having her period now (.) It came yesterday.
- 17 D: Ah! Allora bisogna che torni.
Ah! So she needs to come back.

Extract 5

use of the word “last” was referred to the most recent one, *including* the current one (not to the last *before* the current one). This enables the mediator to render a description of the physical conditions of the patient to the doctor, who displays her understanding and her new (consequent) narrative: the patient will have to get back to the surgery after her menstruation, since the pap-test, she was here to take, cannot be taken during patients’ menses.

In the above extract, a sensitivity for the participants’ perspectives is displayed through the mediator’s pause between turns 3 and 4, which signals that there may be something wrong in the current state of understanding in the interaction and the dyadic sequence she engages in with the patient, which explores what is the patient’s current understanding of the doctor’s question. New narratives are thus fostered, e.g., about the meaning of “last menstruation”, for the patient and the doctor, and about the ways in which medical procedures are carried out (i.e. a pap-test cannot be taken during menstruation).

5 Comments and concluding thoughts

Here, we have discussed a conceptual distinction between what we have called, after Luhmann (1984), “basic” and “reflexive” coordination. While basic coordination shows interesting aspects in terms of translation choices, reflexive coordination seems to involve forms of mediation activity where the mediators need to work on the participants’ perspectives and narratives in order to make them relevant and “treatable” in the interaction. Let us now conclude with some summarizing points and some final considerations.

As for the summarizing points, we can probably mention three. First, coordination is a highly contextualized concept, referring both to the general context of the interaction (e.g. the medical context) and the local, sequential one (e.g. history-taking sequences). Here, we have focused on the sequence including history-taking questions up to the rendition of the patient’s answer and we have looked at how interlocutors orient in pursuing a relevant patient’s answer to a doctor’s specific question. We have seen that although these sequences sometimes focus on very small details (who lives with the patient, a precise description of her discharges, the date of her menstruation), getting to the answer may involve a clarification of understanding which includes different perspectives.

Second, clarification of understanding and perspectives can take place in various ways. Here, we have examined some which seem to us effective in that they: a. display the participants' views, b. allow the interlocutors to recognize such views as possibly different from theirs, but as plausible and understandable, and c. react accordingly. Reactions may eventually enhance new narratives. Some that we have seen here have to do with a recognition on the part of the doctor that the patient will not say much more about her problem and it is probably better to examine her physically, with the observation that the patient might not know what "vaginal discharges" are like and a more precise question needs to be posed, or with a mutual realization that there may be mismatches about what can be understood with the word "last" in a doctor's question about the patient's "last" menstruation.

Third, we have suggested that effectiveness, in the extracts shown, is achieved through a mediator's orientation to: a. display an empowering sensitivity to the participants' perspectives, and b. foster new narratives of the patients' problems. These two orientations are strictly connected. We have seen the ways in which the mediators display sensitivity for the participants' perspectives, capturing the sense and purpose of the doctors' question and re-designing it for the patients, thus helping the patients provide answers in terms that are relevant to those projected by the doctors' questions.

Our final considerations are three. The first one is that while the notions of "perspective" and "narrative" have often been attributed to cultural specificities or to highly different, possibly deeply separating positions, no such "differences" can be observed in the data presented here. The reasons are possibly two. The first has to do with the context we have examined. Doctor-patient interaction is not a highly conflictive setting and doctors and patients normally collaborate in the process of providing/getting care. The second, is in our view more interesting and has to do with the approach to mediation that is taken by the bilingual professionals involved in our data. Sensitivity for participants' perspectives in our data is displayed by allowing these perspectives to be expressed and recounted. Interestingly, mediators here do not "say" that the patient hesitates, that she does not know what vaginal discharges are, or that she has misunderstood the question about the menstruation date. This emerges in the interaction *from the participants*, who are led and allowed to recognize each other state of understanding and deal with it "by themselves". This, we believe, suggests that forms of effective mediation have much more to do with the promotion of interlocutors' participation than with the explicit explanation of different positions.

A second final consideration regards basic and reflexive coordination. In this paper we have focused on reflexivity and have looked at ways in which forms of reflexive coordination can achieve mediation. We have also noted that basic coordination has to do with translators' choices that are posed as "unproblematic" in the interaction, that is to say, possible problems are solved in translation without further exploration or clarification and without getting back to the participants involved. While the translators' choices are often "difficult" and interesting ones and possibly contain forms of mediation (what Pöchhacker 2008 has called "linguistic mediation"), the dynamics in which participants engage in basic or reflexive forms of coordination is not clear yet and definitely needs further exploration.

The third and last consideration is that reflexive coordination can fail in promoting effective communication processes when the mediators' modified renditions reduce either the doctors' or, most crucially, the patients' opportunities to participate actively in the interaction. Particularly in the case the latter participation is impeded or limited, narrative construction fails with consequent disempowerment of the participants in the interaction, especially the patient (see e.g. Baraldi 2014; Baraldi & Gaviola 2008; Bolden 2000; Davidson 2000).

In conclusion, the relationship among the notions of interpreting and mediating is not an easy-to-establish one and involves active forms of coordination of the interaction. The point is not to define interpreting as mediation in general terms, but to identify the actual means and actions that characterize mediation as a form of interpreting activity, displayed in talk coordination. One characteristic of mediation we have looked at here is that mediation does not necessarily highlight "intercultural" forms of talk, even when the participants have different geographical and national origins and even though different perspectives and different states of understanding are issued. Talk-coordinated actions orienting to the promotion of participants' display of understanding and perspectives seem to act quite strongly in the achievement of their recognition by the participants. This allows for new narratives to be produced, which make the participants' perspectives plausible and relevant in the interaction. This, we believe, is the contribution of this paper to the definition of at least one form of mediation in interpreter-mediated talk.

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Part V

Learner-oriented modelling

Chapter 14

“All I know is that I know nothing”? Empirical evidence of self-confidence and inexperience in novice vs. professional translators

Carla Quinci

In the last few decades, translation competence (TC) has been largely investigated but “most of the proposals concerning TC have not been empirically tested and only a few of them have attempted to validate their models from an empirical-experimental perspective” (Hurtado Albir & Alves 2009: 64). Drawing on this, an empirical longitudinal study has been designed to investigate whether TC can be defined in terms of specific textual and procedural patterns shared by professional translators and observe whether such trends are being developed by trainee translators throughout their training. The investigation mainly relies on the contrastive analysis of multiple translations of the same six source texts produced at regular intervals over three years (2012-2014) by translators at different stages in the development of their TC and considers a variety of textual and procedural features in the attempt to identify possible patterns in the groups of participants. This paper focuses on some process-related results providing evidence of unawareness and self-confidence in novice vs. more experienced trainees and professional translators.

1 Introduction

Any learning process implies a progress from (relative) ignorance to the acquisition of knowledge. Any learner should thus be aware of being somehow lacking and in search of something she does not possess. This awareness can be considered the driving force behind the learning process, allowing the learner to



recognise and ultimately reach the final goal of her path. However, such consciousness is often gained through learning and experience since it is acquired knowledge itself that opens up new horizons in the learner's mind, making her aware of knowledge yet to be attained.

Empirical research in Translation Studies suggests that "novices are blissfully unaware of their ignorance" (Jääskeläinen 1996: 67) and tend to be more self-confident than their actual competence would justify. This paper will provide further insights into unawareness and self-confidence in novice vs. professional translators obtained through a longitudinal empirical study on translation competence (TC) and its development.

2 Preliminary theoretical remarks

Research on TC has been quite productive in the last few decades, devising a wide variety of possible definitions and models for both didactic and professional purposes. Still, despite the ever-increasing efforts put into the empirical analysis of TC and its development, little consensus has been reached in academia on the nature and modelling of such competence.

TC is generally assumed to be "qualitatively different from bilingual competence" (PACTE 2002: 44–45; cf. Lörscher 2012) and non-innate (Shreve 1997: 121) since a "basic translation ability is a necessary condition, but no guarantee, for further development of a (professional) competence as a translator, and possibly expertise in translation" (Englund Dimitrova 2005: 12). Except for these two widely agreed-upon assumptions, a considerable number of concurrent terms and conceptual frameworks have been devised in the attempt to identify the essential constitutive components of TC (for an overview, cf. Orozco & Albir 2002; Quinci 2015a). Most recent approaches tend to opt for a multicomponential conceptualisation of TC, which would be made up of a varying number of different or (partially) overlapping sub-competences that are generally deemed to be interdependent and interacting with one another. Recently, these have also been represented as individual vortices gradually merging in the larger vortex of translation supercompetence, in which the unpredictable number and types of linkages between the different sub-components increases with training and experience (Kiraly 2013).

Although empirical research on TC has still a long way to go, from the mid-1980s onwards, empirical studies have considerably contributed to the investigation of TC and have, in some cases, resulted in the development of empirically validated definitions and models (Göpferich 2009; PACTE 2003). Most em-

pirical evidence, however, relate to the translation process, i.e. to the analysis of behavioural and procedural features of (un)experienced translators, so as to identify possible common patterns which might be conducive to high (or poor) translation quality. To provide a complementary perspective to such mainstream methodology, an empirical longitudinal study has been designed adopting a combined approach, which is mainly product-oriented but also encompasses process-related data. Partial results from the aforementioned research project will be presented in the following sections, suggesting a higher degree of self-confidence and unawareness in novices as compared to (more) experienced translators.¹

Self-awareness and self-confidence are “two psychological features which are part of the make-up of a professional translator” (Kußmaul 1995: 32), with self-awareness (or self-concept) being often implicitly or explicitly included in most recent models of TC (Göpferich 2009; Kiraly 1995; PACTE 2003: 93). The two concepts are in fact “closely linked [as it] is through self-awareness that translators gain self-confidence” (Kußmaul 1995: 32) and ultimately “visualize themselves as text designers than as text reproducers” (Göpferich 2009: 34). Although these two psychological features should ideally be developed through specific training (Göpferich 2009: 34), it has been observed that when “students embark on a translator training course, they are quite self-confident young people, but in the course of their studies they lose their self-confidence as a result of the criticism of their teachers” (Kußmaul 1995: 32). This is in line with the results of this study, showing an unjustified higher level of self-confidence in novice translators (which is not supported by equally high-quality outcomes) which gradually decreases throughout their training. However, this is not necessarily due to teachers’ criticism, but may also result from a growing ability to assess translation quality and identify translation errors and problems, which is progressively developed throughout the training programme.

3 Research design and methodology

Given its longitudinal design, the study included six translation tasks which have been performed at regular intervals over a three-year period, so as to analyse from a synchronic perspective the discrepancies and similarities in the performances of translators with different levels of TC and monitor diachronically the evolution of such patterns in the same groups of participants. The 63 vol-

¹At the time of writing the PhD research project was still ongoing. Its final results and conclusions are now available (Quinci 2015b) and can be accessed at <http://hdl.handle.net/10077/10986>.

unitary participants at different stages in the development of their TC included BA, first- and second-year MA translation trainees and professional translators, falling into four distinct groups, i.e. Group N ('novices'), Group I₁ and Group I₂ (first- and second-year 'intermediates'), and Group P ('professionals') respectively. The internal composition of the four groups has remained almost completely unchanged throughout the duration of the study, even though the cohorts included in the groups of intermediates (i.e., Ia, Ib, Ic, and Id) have varied during the investigation alongside students' progress in their training programme, as shown in Table 1 below.

Table 1: Internal composition of the sample

	Academic Year		
	2011/12	2012/13	2013/14
BA Students (Novices)	GROUP N: 13 1 st -year students	GROUP N: 13 2 nd -year students	GROUP N: 13 3 rd -year students
1 st year MA Students (Intermediates)	GROUP I ₁ (Ia): 7 1 st -year students	GROUP I ₁ (Ic): 10 1 st -year students	GROUP I ₁ (Id): 12 1 st -year students
2 nd year MA Students (Intermediates)	GROUP I ₂ (Ib): 10 2 nd -year students	GROUP I ₂ (Ia): 7 2 nd -year students	GROUP I ₂ (Ic): 9 2 nd -year students
Professionals	GROUP P: 9 participants	GROUP P: 9 then 8 participants	GROUP P: 8 participants
Partic. per year	39	39 then 38	42

The tasks were specifically designed to gather both product- and process-related data and involved the translation of six non-specialist articles from English into Italian, the participants' mother tongue, as well as a post-task questionnaire investigating the translation process. Despite the study's primarily product-oriented approach involving twelve different variables (e.g. expansions and reductions, lexicometric measures, lexical density and variation, vocabulary analysis), this paper only focuses on some process-related data highlighting novices' self-confidence and unawareness, which are then contrasted with data on translation acceptability. Given its primary orientation towards product analysis, the study did not resort to think-aloud protocols (TAPs), screen activity recordings or other methods generally used for gathering process data, but only to a post-task questionnaire regarding different process-related issues, e.g. the first reading and the perceived level of difficulty of the ST, the revision process, the reference materials used, other training and working activities which could affect the development of TC.

The analysis outlined in the following sections integrates data concerning the use of reference materials, revision and acceptability into existing provisional results relating to delivery time, self-assessment and perceived text difficulty, which in this case also include new data from the fifth translation task. After a brief overview of previous results (Quinci 2015a), the analysis focuses on data about the use of reference materials and revision and finally relates all the above process-related data with the evaluation of translation acceptability, so as to point out the procedural features shared by all good-performing participants.

For a more reader-friendly representation of the patterns identified, the tables below simultaneously show the groups’ scores and ranking by means of conditional formatting using a colour scale from red to green to differentiate high, middle, and low values respectively. Finally, the thicker lines in the tables divide the tasks performed in the same academic year (and thus by the same cohorts of participants), i.e. 2011/2012 for tasks 1 and 2, 2012/2013 for tasks 3 and 4, and 2013/2014 for task 5.

4 Previous results: A follow-up

First results from the joint analysis of participants’ delivery time, self-assessment and perceived text difficulty scores showed a high level of self-confidence in novice translators. In particular, novices generally recorded comparatively low delivery time and high self-assessment scores which appear not to result from underestimating the task difficulty, but rather from overestimating their translation abilities and probably from their limited ability to assess translation quality.

Table 2: Average delivery time per group and task

	N	I ₁	I ₂	P
T1	01:26	01:47	01:39	01:25
T2	01:30	01:34	01:42	01:07
T3	01:28	01:43	01:28	01:00
T4	01:26	01:35	01:33	01:13
T5	01:29	01:33	01:36	01:14
mean	01:28	01:39	01:36	01:12

As concerns the average delivery time, professionals show the highest rates, followed by novices who consistently performed faster than both groups of inter-

Table 3: Average self-assessment scores on a scale from 1 to 10

	N	I ₁	I ₂	P
T1	7.4	6.9	7.0	7.2
T2	7.1	6.8	6.7	7.5
T3	7.4	7.1	6.7	7.5
T4	7.2	7.0	6.7	7.1
T5	7.2	7.0	6.8	7.3
mean	7.26	6.96	6.78	7.32

Table 4: Average perceived text difficulty on a scale from 1 (very easy) to 5 (very difficult)

	N	I ₁	I ₂	P
T1	2.53	2.85	2.70	2.66
T2	3.23	3.14	3.10	2.66
T3	2.76	2.90	2.85	2.66
T4	3.00	3.00	3.00	2.87
T5	3.15	2.75	2.78	3.25
mean	2.93	2.92	2.88	2.82

mediates (Table 2). Likewise, novices and professionals display similar patterns in self-assessment (Table 3), where they alternatively recorded the highest scores in the five translation tasks. Self-assessment also shows an interesting pattern as concerns the two groups of intermediates, who consistently ranked in the same order as their supposed level of competence, with first-year MA students preceding second-year trainees in all tasks except for task 1. This would suggest a sort of interdependency between the development of TC and the self-perception of the quality of the performance. Such relation could be described as a parabola opening upwards, as shown in Figure 1 below.

Higher scores in self-assessment are recorded by both the least and most experienced participants, i.e. novices and professionals. On the other hand, intermediates, who are (supposed to be) halfway through the development of TC, tend to record consistently lower self-assessment scores as compared to novices despite their longer experience and advanced training in translation. One of the

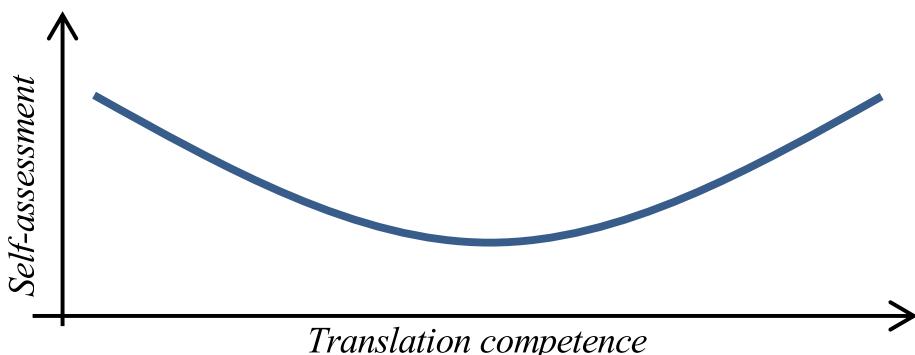


Figure 1: Relation between self-assessment scores and the development of translation competence

possible reasons for this trend might be sought in the lack of awareness of the actual level of difficulty of the task at hand in novice translators as compared to intermediates. Empirical data however do not seem to support this hypothesis.

As summarised in Table 4 above, novices did not in fact perceive the task as less difficult as compared to the other groups, given that they scored highest in two tasks out of five and their ranking considerably varied from one task to another. Also, self-assessment scores and the average perceived text difficulty appear to be mostly in inverse proportion, which means that the highest self-assessment scores of each group mostly correspond to the tasks perceived as the simplest, and vice versa. This implies that all groups of participants are somehow able to evaluate the difficulty of given tasks and tend to rank them accordingly.

Hence, given that novices’ comparatively high self-assessment scores cannot be ascribed to their inability to evaluate the level of difficulty of the translation task, the trends observed might more probably result from the overestimation of their abilities as translators or their limited ability of assessing translation quality – or ultimately from a combination of both.

The hypothesis of a limited ability to assess translation quality appears to be further supported by the correlation between self-assessment scores and the stage of development of TC outlined above. MA-level trainees’ lower scores in self-assessment might indeed suggest an increased awareness of and/or ability in evaluating translation quality which could result from their advanced theoretical and practical training in translation. Obviously, this assumption needs further confirmation found in the assessment of translation acceptability, the results of which are illustrated in a later section.

5 Other clues from process-related data: Reference material and revision

5.1 The use of reference material

The analysis of other process-related data elicited from the questionnaires has highlighted other patterns concerning the supposed level of TC of the different groups of translators. In particular, as concerns information literacy, participants were asked to specify the number and type of different reference materials used selecting one or more options among those included in the relevant multiple-choice question, i.e. bi- and monolingual paper/on-line/off-line dictionaries, glossaries, on-line general search engines and other possible reference materials to be specified.

From a mere quantitative perspective, i.e. considering the number of different resource materials used in each task (Table 5), professionals generally relied on a more restricted variety of reference materials, in contrast with Künzli's observations (2001:513). Also, they mainly used mono- and bilingual dictionaries, as opposed to students who also heavily relied on on-line search engines to look for parallel texts or occurrences.

Table 5: Average number of different reference materials used

	N	I ₁	I ₂	P
T1	2.25	3.14	2.80	2.22
T2	2.15	2.71	2.60	2.44
T3	2.77	2.60	2.71	1.89
T4	2.85	2.86	2.90	2.38
T5	2.92	2.75	2.44	2.38
mean	2.59	2.81	2.69	2.26

From a qualitative point of view, i.e. when considering the types of reference materials used, the analysis shows that bilingual dictionaries were used by 75-100% and are therefore the preferred type of reference materials, which would also confirm the findings of earlier TAP studies observing the frequency of use of bilingual dictionaries by (non) professional translators (Jensen 1999; Krings 1986; Künzli 2001). The second most commonly used reference materials are general-purpose search engines, followed by monolingual dictionaries which hold the

third and final position in the ranking being used on average by approximately 54% of novices and professionals and by nearly 69% of intermediates.

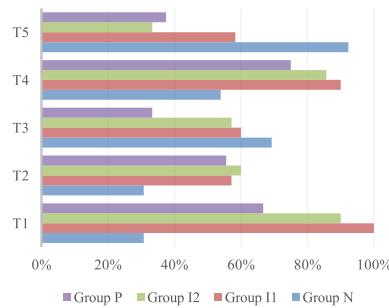


Figure 2: Percentage of participants per group using monolingual dictionaries

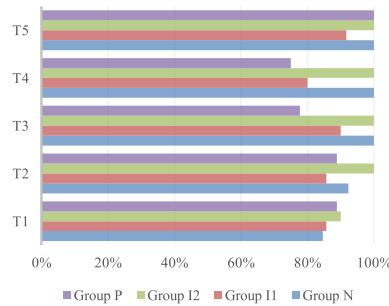


Figure 3: Percentage of participants per group using bilingual dictionaries

The data on the type reference materials used confirm the trends observed in the quantitative analysis, with professionals mostly ranking in the lower positions and thus referring to a lesser extent to either type of dictionaries. As concerns bilingual dictionaries, a higher average percentage of translation trainees – both novices and intermediates – resorted to bilingual dictionaries as compared to professionals.

Novices, on the other hand, ranked lowest in three out of five tasks as concerns the use of monolingual dictionaries, which are mostly used by intermediates and professionals. This appears to confirm the results from previous research where more experienced translator “showed a greater preference for monolingual print and CD/DVD dictionaries than the students did (5th vs. 9th rank)” (Massey & Ehrensberger-Dow 2011: 197–198; cf. Ronowicz et al. 2005: 590), although contrary evidence has also been found by Künzli (2001: 513–514).

Finally, data also suggest the existence of another pattern of association between age/competence/experience and the use of general Internet search engines, which seems more common among novices as compared to professionals, who consistently rank last (Figure 4).

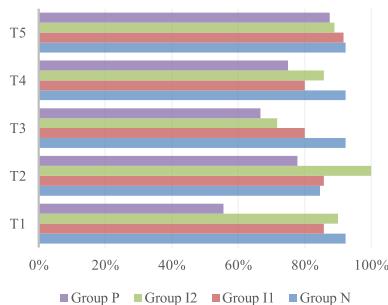


Figure 4: Percentage of participants per group using general search engines

This would support the claim that “age is related to the use of Internet resources [as] younger cohorts of translators (i.e. those under 50 years old) are more likely to say that they often or very often use search engines, online multilingual dictionaries, online encyclopedias, and terminology databases to solve linguistic problems than older translators do” (Massey & Ehrensberger-Dow 2011: 201). However, it should be pointed out that the professional translators in Group P had on average an age of 44, with only one of them older than 50 when entering the sample. Nonetheless, a relation between age and the use of online search engines seems to exist, although it could be equally attributed to the participants’ age or their level of TC for lack of direct evidence: trainees, in other words, might be compensating for the lack of information with an increased used of search engines.

It should also be noticed that professionals’ low rankings in the use of almost all reference materials (see Figures 2, 3 and 4) might in this case be related to their more restricted use of reference materials in general (Table 5). Other studies on the number of dictionary look-ups have indeed observed “a reduction in the number of dictionary searches as a function of expertise” (Lesznyák 2008: 200; cf. Jensen 1999: 113; Ronowicz et al. 2005: 588). Such limited use of reference materials, in terms of both variety and frequency, might result from professionals’ deeper knowledge of both the source and target language, or better from what Bell defined as “Frequent Lexis Store” (FLS), viz. the “mental (psycholinguistic) correlate to the physical glossary or terminology database, i.e., an instant

‘look-up’ facility for lexical items both ‘words’ and ‘idioms’” (1991:47, original emphasis). As pointed out by Ronowicz et al. (2005: 583), “[o]ne would [...] expect that more experienced translators will have a larger and more diversified FSS [Frequent Structures Store] and FLS, which should influence the speed and quality of their performance” – and ultimately foster the development of justified self-confidence and self-awareness. This hypothesis would be indeed supported by the higher frequency of dictionary searches in novices observed in the above-mentioned TAP studies, as suggested by Ronowicz et al. (2005: 589), as well as by the above results concerning the different reference materials used and the participants’ delivery time, where professionals consistently performed faster than the other groups.

5.2 Revision and supposed level of translation competence

As concerns the revision of the target texts (TTs) produced within the study, participants were asked to indicate whether they had self-revised their translations or not and, if yes, whether they carried out “unilingual” and/or “comparative re-reading” (Mossop 2014: App. 5), i.e. whether they checked their translations by reading only their TTs (unless in doubtful cases where comparison with the ST was needed) or by consistently comparing TT and ST.

Quantitatively speaking, all participants performed unilingual or comparative self-revision except for one translator in groups I₁ and I₂ in tasks 1 and 3 and 1 and 5 respectively. It should be noted that in the first task of Group I₁ and in the third task of Group I₂ it is the same participant of cohort Ia (Ia1) who did not carry out any sort of self-revision.

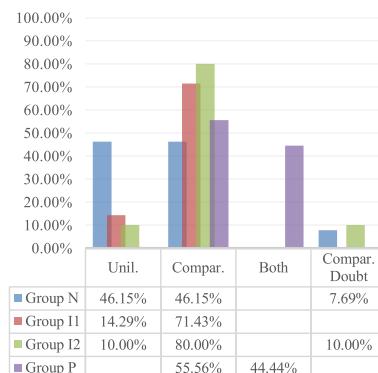


Figure 5: Types of self-revision in relation to the ST in task 1 (percentage of participants per group)

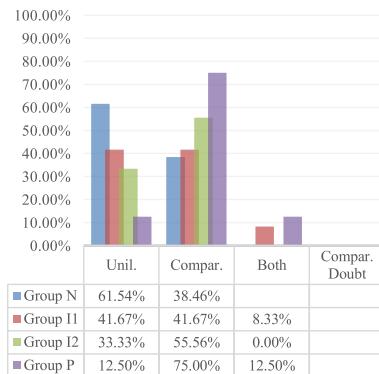


Figure 6: Types of self-revision in relation to the ST in task 5 (percentage of participants per group)

Conversely, the data on the type of self-revision carried out do show clear patterns. As is apparent from Figure 5 and Figure 6 above, the supposed level of TC seems to considerably affect the translators' approach to revision. None of the professionals relied on simple unilingual self-revision whereas novices tended not to compare the TT and ST and seldom carried out both unilingual and comparative self-revision. Data highlight a rather consistent shift from unilingual to comparative self-revision in (more) experienced translators, with unilingual self-revision being the preferred option for novices and first-year intermediates in four out of five tasks. Conversely, second-year intermediates and professionals mostly relied on comparative self-revision, which is the most-chosen option in four tasks out of five for Group I₂ and in all tasks for Group P. Also, professionals are the only group which carried out both unilingual and comparative self-revision in all tasks, though with a decreasing percentage of participants throughout the five tasks.

These trends once again suggest self-confidence in less experienced translators, who do not seem aware that their translations might need careful self-revision. As pointed out by Tirkkonen-Condit (1992: 439), “[t]he professional is more modest, and more sensitized to noticing those areas in her translation that may need checking. The non-professional, in contrast, seems to be more arrogant in her approach and does not voice a need to have her translation checked”.

Moreover, as reported by Mossop (2007), Brunette et al. (2005) found that “comparative revision [yields] a better quality final product than unilingual, not only (as one might expect) with regard to accuracy but also with regard to the readability, the linguistic correctness and the appropriateness to purpose and to

readership of the revised translations”. Such an inattentive and rather superficial approach to the final phase of the translation process might thus considerably affect translation quality, which is presumed to improve following more accurate checking.

6 Process-related data and translation acceptability

The research design of the empirical study also involved the quality assessment of the TTs produced by the sample, with the aim to find possible correlations between the supposed levels of TC of the participants, the textual and procedural patterns identified and translation quality, which was assessed in terms of both translation acceptability and translation error analysis. Given the considerable number of TTs produced (239) and the need for experienced external evaluators who could assess all the translations in order to ensure consistent assessment, the best option for evaluating translation acceptability was the use of the experimentally verified (Castillo Rincón 2010) method devised by PACTE based on the so-called “rich points” (PACTE 2005b, PACTE 2009). This method involves the identification of specific textual elements in the ST, i.e. rich points (RPs) which “provide variety in the types of translation problems studied, [and] do not lead to immediate and acceptable solutions” (PACTE 2005a: 614). Such RPs, which in this study have been identified by several participants from each group, have been evaluated as ‘acceptable’, ‘partially acceptable’ or ‘unacceptable’ by three translator trainers on the basis of the criteria identified by PACTE (2009: 217), so as to obtain a numeric ‘acceptability index’ (AI). Based on their AIs – ranging from 0 to 9, as the number of RPs identified in each ST –, participants were divided in five different performance levels: Level I (0-1.9); Level II (2-3.9); Level III (4-5.9); Level IV (6-7.9); Level V (8-9).

The ranking of the average AIs in Figure 7 below shows that professionals are the outperforming group in three out of five tasks and recorded the second highest AI in tasks 1 and 3.

On the other hand, novices do not hold a stable position in the ranking, scoring the lowest AIs in tasks 1 and 2, the second and third highest indexes in tasks 4 and 5 respectively, and the highest AI in task 3. Similarly, second-year intermediates fluctuate between the highest and the lowest position, whereas first-year intermediates consistently scored the (second) lowest AIs in all tasks. It should be noted that Groups I₁ and I₂ scoring lowest in the last three tasks correspond to the same cohort (Ic), which consistently recorded the lowest AIs in all the three tasks carried out, with about 50% of its participants scoring low to medium AIs

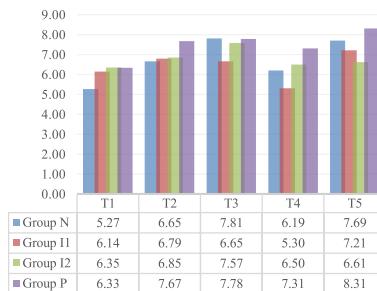


Figure 7: Average acceptability index per group

(between 4 and 5.5).² This might of course affect the analysis based on the final ranking shown in Figure 7, which thus needs to be supported by data on the distribution of the participants within the five abovementioned performance levels. The analysis considers the percentage of participants per group falling within each performance level (Table 6).

Table 6: Distribution of the participants within the performance levels in task 3

Task 3	N	I ₁	I ₂	P
PL I (0-1.9)				
PL II (2-3.9)				
PL III (4-5.9)	15.38%	40.00%		
PL IV (6-7.9)	38.46%	30.00%	71.42%	55.55%
PL V (8-9)	46.15%	30.00%	28.57%	44.44%

Table 6 above shows the internal distribution of the four groups in task 3, where novices scored the highest AI, followed by professionals and second- and first-year intermediates, respectively (see Figure 7). Despite their highest AI, however, only 84.61% of novices fell within the two highest levels of performance

²This does not imply that (all) trainees in cohort Ic have not developed their TC at all, but only that their AIs were *on average* lower as compared to those scored by the other groups. It should also be considered that students with different backgrounds and coming from different universities and degree programmes can enrol in the MA programme who might lack a proper training in translation. However, despite the presence of some consistently underperforming participants in cohort Ic, there was a general tendency for the whole cohort to score lower values, possibly because it simply comprised less trained, less motivated and/or less skilled translators.

(i.e. levels IV and V) as compared to 100% of both second-year intermediates and professionals. As in other tasks – the results of which are not reported here in detail for reasons of space – novices’ scores tend to cover a wider range of AIs (i.e. 5.5–9 in the third task) as compared to groups I₂ and P (i.e. 6.5–8 and 6.5–9 respectively in task 3), which means that more experienced translators tend to produce on average medium- to high-quality TTs, whereas novices include both out- and underperforming participants.

Hence, it could be concluded that professionals generally show a “consistently superior performance” (Jääskeläinen 2010: 215) as compared to less experienced translators, whose performances tend to spread across more performance levels.

7 Data triangulation: Painting the global picture

The comparative analysis of the variables examined in the previous sections suggests that novices’ comparatively lower delivery time and higher self-assessment scores do not result from an underestimation of the difficulty of the task to be performed. The almost consistent inverse proportion between self-assessment scores and average perceived text difficulty showed that all groups can assess the difficulty of the tasks and rank them accordingly. Hence, it seems that the development of TC and the self-perception of the quality of the performance are somehow related and that such relation may be represented as a parabola opening upwards – where TC is a continuum on the horizontal axis – with novices and professionals corresponding to the two ends of the branches and intermediates to the vertex in the lower part of the curve. This trend undoubtedly highlights a high level of self-confidence in novices, who seem unaware of their actual level of TC and/or the parameters for assessing translation quality.

Data on translation acceptability and self-revision seem to confirm this hypothesis since novices’ consistently high self-assessment scores do not always parallel high acceptability indexes. Also, novices tend to score lower AIs and distribute more heterogeneously among the five performance levels identified as compared to more experienced translators. In addition, novices seem to be the least careful revisers in the sample, as they tend to rely solely on unilingual self-revision, which does not allow for the easy detection of potential inaccuracies and omissions, as opposed to professionals who mostly performed comparative self-revision, followed in some cases by unilingual re-reading. Hence, the significant self-confidence displayed by novices appears unjustified and (at least partially) misplaced.

Their inexperience also emerges from the analysis of the number and type of different materials used, indicating that professionals generally needed a more restricted variety of reference materials and mainly used mono- and bilingual dictionaries, as opposed to students who also heavily relied on on-line search engines. This might suggest that, given that the STs were non-specialist articles dealing with well-known topics, professionals' wider FLS (Bell 1991: 47) allowed them to translate more effortlessly and quickly – and ultimately with better results as concerns translation acceptability.

The results of this analysis have been used to develop a model of TC describing the trends observed within the different stages identified in the development of TC (Quinci 2015b). In this model (Figure 8),³ TC is represented as a continuum extending from the initial stage of 'novice' to that of 'professional/competent' translator, thus describing the progressive evolution of the trends from one stage to the other.

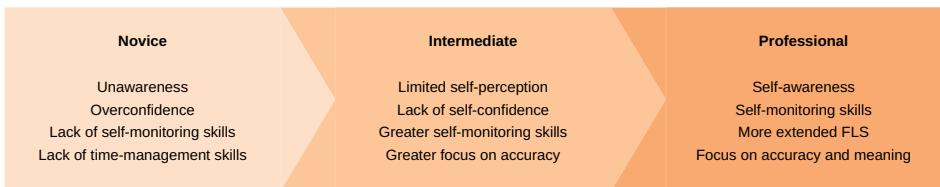


Figure 8: The trends observed within the three stages of TC

In the first stages of their training, inexperienced (and necessarily) incompetent trainees tend to be overconfident and openly unaware of their lacking experience and competence in translation. This emerges from their superficial and simplistic approach to revision, which is often combined with low delivery time and high self-assessment. The trends observed in intermediate participants show instead that they have developed a greater awareness of their abilities and limits. They generally spent the longest time on the task and gradually shifted from unilingual to comparative self-revision. In spite of this, their consistently lower self-assessment scores as compared to novices testify to a general lack of self-confidence, probably combined with a greater awareness of the quality standards required of professional translators. This appears to be confirmed by the fact that intermediates tend to perform comparative (vs. unilingual) self-revision and ultimately reach higher levels of accuracy than novices. Finally, professionals ap-

³This is an abridged version of the original model, where other trends relating to the additional variables investigated within PhD research project are also included (cf. Quinci 2015b; available at <http://hdl.handle.net/10077/10986>).

peared to be fully aware of their competence and display a level of self-confidence that is proportional to the quality of their performance.

Another key feature of increasing TC is the development of time-management skills, which in turn lead to higher efficiency. Novices tend to be faster than intermediates but evidently do not use the time at their disposal to improve the quality of their work, as suggested by the data on self-revision, as opposed to professionals, who are the group placing the greatest focus on accuracy and meaning. Apparently, their more extended FLS and FSS (“Frequent Lexis Store” and “Frequent Structure Store”, Bell 1991) allow them to select equivalents faster than trainees and to focus on revision and accuracy, which ultimately increased the quality of their performance.

8 Concluding remarks

This paper has presented a longitudinal analysis of some process- and product-related data highlighting features of self-confidence and unawareness in novice vs. more experienced translators. Data have been collected within an empirical longitudinal study carried out at the University of Trieste with the aim to investigate TC and its development through a combined approach, which is primarily product-oriented but also included process-related data. The analysis outlined in the previous sections focused on the trends observed in the sample concerning the participants’ delivery time and self-assessment, the perceived difficulty of the tasks performed, the reference materials used and the revision phase of the translation process, as well as translation acceptability.

The contrastive analysis of less and more experienced and competent translators has highlighted the fundamental of training and experience by showing how these contribute to the development of self-monitoring skills and affect self-perception, in that they foster awareness in trainees of their still lacking competence and ultimately promote more careful revision and rigorous self-assessment.

The above findings might be of great help in translator training to raise awareness in trainees about the possible consequences of overconfidence, particularly when it is not supported by actual competence. From a pragmatic point of view, trainees might ultimately come to realise that they are still largely inexperienced (and thus in need of appropriate training) and that their inexperience needs to be – at least tentatively – compensated by careful revising and re-reading, which does not only improve the overall quality of their work, but also involves self-training and may encourage self-reflection on one’s strengths and weaknesses.

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Chapter 15

Comparing novices and semi-professionals: False friends as a case in point

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This publication presents interim results of a larger empirical study which aims at determining and measuring the differences between novice and semi-professional levels of competence. The study attempts to model translation competence, in particular to predict the level of competence based on empirical process data about the distribution of visual attention, revisions and the use of reference materials. In the study, collocations, idioms, realia and the like are used as stimuli. This contribution focuses on the reading and comprehension of false friends in the language combination Italian-German. False friends serve as the basis for contrasting translation performance of novices and semi-professionals. The participants were native speakers of German (L1), acquiring both language and translation competence in their L2 almost simultaneously. A combination of research methods was applied to collect process data within a series of experiments conducted at the Faculty of Translation Studies, Linguistics and Cultural Studies of the University of Mainz: eye tracking, keystroke logging, retrospective interviews and screen recording. The collected data were evaluated quantitatively as well as qualitatively and then triangulated.

1 Theoretical framework

This contribution focuses on the processing of false friends and looks at the differences between the two levels of competence – novice and semi-professional. Both groups of students had no or very little knowledge of their L2 prior to their translator training, that is, the acquisition of the language competence along with translation competence played an essential role in developing their skills.



Foreign language acquisition based on the comparison of languages is still the dominant paradigm at the present time. Contrastive analysis has aimed at the optimization of language didactics since the first attempts to compare languages (Lado 1957; Alatis 1968; Fisiak 1981). The field departed from the belief that differences between languages cause difficulty in language learning (Hawkins 1986: 10), therefore contrastive analysis was necessary to systematize the language structures, thus contributing to the improvement of learning materials. According to Prüfer-Leske (1997), contrastive analysis is given a major amount of attention in a traditional foreign language class in spite of the availability of a variety of other alternative methods of language acquisition. A prominent example of a translation-oriented contrastive and stylistic language analysis is that by Vinay & Darbelnet (1977), with further studies in this direction being (Truffaut 1963; Henschelmann 1980; Gallagher 1982), all of which attempted to solve translation problems by comparing language structures. Motivated by the fact that everyday translation practice requires practical techniques for frequent translation problems, including language contrasts, Königs (2011) pay particular attention to systemic language contrasts which may be relevant for translation. Based on the findings of contrastive analysis, translators should be able to make conscious decisions and avoid solutions founded on pure intuition. Foreign language acquisition is also an important component of translator training according to the currently leading translation competence models (PACTE 1967; 2003; Göpferich 2008; 2009) in translation studies (a comprehensive overview of existing definitions and models of translation competence is given in Göpferich 2008; Herold 2010). Translation competence has interested researchers for decades: “While for the uninformed, translation competence often appears as the automatic by-product of second-language competence, translation scholars have known that there is more to translating than knowing two or more languages” (Göpferich & Jääskeläinen 2009: 174). The existing empirical translation competence models attempt to cover all possible multi-faceted fields of professional translators’ activity and thus are versatile and rather complex. According to PACTE, the most important sub-competences that represent the essence of expert TC are *strategic sub-competence, knowledge about translation sub-competence* and *instrumental sub-competence*. Undoubtedly, the field of a translator’s profession extends far beyond the knowledge of the foreign language; however, the *bilingual/linguistic competence* remains one of its important constituent parts. After all, the evaluation of linguistic and translation competence is an indispensable component of translation quality assessment (Mertin 2006: 199). According to PACTE, *bilingual sub-competence* is “pragmatic, socio-linguistic, textual and lexical-grammatical

knowledge in each language" (PACTE 2005: 610). They assume the underlying knowledge behind the *bilingual sub-competence* to be for the most part procedural. *Communicative competence in at least two languages* in Göpferich's translation competence model corresponds to PACTE's *bilingual sub-competence*. "Communicative competence in the source language is relevant primarily for source-text reception, whereas target-language competence determines the quality of the target text produced" (Göpferich 2009: 21). Another competence, which goes hand in hand with the *bilingual/communicative sub-competence* and is the focus of interest in the present study, is the *research competence*. PACTE calls it *instrumental-professional competence* and subdivides it in two separate sub-competences: *instrumental sub-competence* and *knowledge about translation sub-competence*. The *instrumental sub-competence* (mainly procedural knowledge) implies the usage of information, all kinds of documentation and communication technologies. The use of reference material is an indisputable part of a translator's work. The use of reference materials has been studied empirically by Krings (1986); Jääskeläinen (1989); Livbjerg & Mees (2002).

The translation competence models mentioned above provide the theoretical environment for practical considerations, but they are not detailed enough to characterize the development of single sub-competences. A continuously growing number of empirical studies, which specifically compare the levels of competence, provide the definitions of sub-competences: professionals vs. non-professionals (Breedveld 2002; Jääskeläinen 1999); semi-professionals, professionals, young professionals, student translators (Jarvela et al. 2002); professional vs. student translators (Carl & Buch-Kromann 2010), and others.

The way translators deal with language contrasts in the process of translation may shed light on the differences in translation expertise. Despite the large number of studies on language contrasts, little research has been carried out on how translators approach language contrasts directly in the process of translation. One of the pioneer studies carried out by Jakobsen et al. (2007) was conducted using keystroke logging as the method of data collection. The main purpose was to "find evidence to help [the researchers] understand how idioms are processed by translators and interpreters" (Jakobsen et al. 2007: 217–218). Vandepitte & Hartsuiker (2011) studied metonymic language in translation. Investigating to which extent metonymic language is a translation problem (= results in longer translation time) for translation students, they suspected the following: "[...] it is not clear to what extent cross-linguistic differences actually pose problems to most beginning translation students and therefore need a place in the training curriculum" (Vandepitte & Hartsuiker 2011: 68). Their study confirmed their hy-

pothesis, the results showing that “it took translation students more time not only to translate metonymic constructions than their non-metonymic counterparts, but also to produce a non-metonymic construction if the source text is metonymic than if it is non-metonymic” (Vandepitte et al. 2015: 127).

This research project pursues similar goals regarding the processing of *false friends*. *False friends* is a label usually applied to lexemes which are similar in both languages due to their phonological and orthographic form, but are different in meaning; at least one of the meanings in the target language does not exist in the source language (Pavlova & Svetozarova 2012: 295). Furthermore, “‘false friend’ [is] a word in one language which sounds like one in another and may be taken by mistake as having the same meaning.” (Matthews 2007: 126).

False friends are a kind of cognate. Researchers distinguish between true and false cognates, but the distinction between true and false cognates can be fuzzy (Taylor 1976; Browne 1982) in that cognate pairs will often share some, but not all aspects of their meaning or use (Perkins 1985); in certain contexts, they are true cognates, and in others false cognates (Shlesinger & Malkiel 2005: 174).

False friends are generally referred to as *false cognates* and are a source of interferences on the word level for translators. False friends are therefore problematic for translators, as they seem, from a formal point of view, to be interlingually parallel, but are in fact not, because they have quite different meanings. When they encounter a *false friend* in the process of translation, translators have two possibilities to deal with it: to prefer a target language cognate or to search for an alternative solution. Additionally, translators may avoid the usage of TL cognates on purpose and look for a creative solution. “Given the positive values associated with creativity, one may expect the translator to be predisposed to search for the ‘more creative’ solution, the ‘noncognate’” (Shlesinger & Malkiel 2005: 176). In their study “Comparing modalities: cognates as a case in point”, Shlesinger and Malkiel investigate “cognate status, performance on false cognates, and cognate processing” based on target texts from translation and interpreting (Shlesinger & Malkiel 2005: 176). In the first part of the experiment, seven professional translators/interpreters interpreted a source text containing cognates from English into their native language and four years later they translated the same text once again. When presenting the results of their experiment, Shlesinger and Malkiel focused on true cognates and false cognates separately. They found that most of the true cognates appeared in their cognate form both in interpreting and translation. Nevertheless, it is worth mentioning that there were more noncognate solutions in translation than in interpreting, possibly due to cognate avoidance (c.f. also studies on monitoring and priming processes by de Groot and Oster in

this volume). False cognates were translated correctly by means of noncognate alternatives in the vast majority of cases. In interpreting, however, false cognates were more problematic presumably due to the “minimax strategy” (Levý 1967), i.e. aiming at producing the most effect applying the least effort.

Vintar & Hansen-Schirra (2005) investigate shining-through and aversion in the use of cognates in German and Slovene translations of English. In their corpus study, they compare translated texts with originals in these languages to see whether there are differences between the use of cognates in translated and non-translated texts. Their analysis shows that the frequency of cognates in German and Slovene translations is similar. Further they found that Slovene translations contain less cognates than the Slovene originals, whereas German translations include significantly more cognates than German originals. Not only linguistic, but also cultural and political developments determine these results. While there is a strong influence of English on the German language, the strengthening of the Slovene national identity reinforces the purity of the language.

2 Hypotheses

False friends are generally viewed as potentially problematic for translation. This assumption enables hypotheses about the way in which they are processed, i.e. read and perceived, by semi-professionals and novices:

1. Novices process false friends faster than semi-professionals while reading and comprehending the source text, i.e. total fixation duration is shorter in the group of novices.
2. Novices use the dictionary less frequently than semi-professionals.

3 Multi-method process based approach

Contemporary research methods make it possible to combine/triangulate a number of research methods to study the translation process and translators' performance simultaneously as well as to analyse a relatively large number of user activity data. A combination of methods was applied to gather data: eye tracking, keystroke logging, retrospective interviews, screen recording and translation product evaluation. The instruments of data collection were the eye tracker Tobii TX300 and the keystroke logging software Translog 2006. The structured retrospective interview used in this study provided individual information on the

process of translation from the subjects' perspective. Eye tracking, keystroke logging and screen recording bring researchers closer to what actually happens in the process of translation.

4 Participants

Participants were for the most part students enrolled in a degree program of the Faculty of Translation Studies, Linguistics and Cultural Studies of the Mainz University in the summer semester of 2011. There were 28 participants in total. However, the data of 8 participants had to be excluded from data evaluation for different reasons (e.g. technical errors, loss of visual data). The definition of *novice* and *semi-professional* was carefully considered with regard to the participants' homogeneity (concerning the required level of skill and experience). Novices, here, are defined as students who possess the basic knowledge (after the completion of the *basic course*¹ of their curriculum) of Italian and whose native language is German. Furthermore, they meet the following requirements: 1) no or very little knowledge of Italian prior to the start of their degree programme; 2) no or only short private trips to Italian-speaking countries.

Semi-professionals were defined as students in their final or pre-final semester before graduation. The first requirement applies equally to all of them, whereas long- or short-term stays in Italian speaking countries were considered a positive but not obligatory factor for semi-professionals.

For translators, foreign language acquisition is typically the first phase in their education. This is particularly true for the so called *beginner-level-L2*², with no language knowledge required prior to beginning the study programme. The acquisition of *beginner-level-L2* takes place during the course of the study programme, typically as part of a so called *basic course*. Since novice and semi-professional translation competence levels are the main interest of this study, the important fact here is that participants did not have any knowledge of their foreign language (Italian) prior to their translation education. The acquisition of basic language knowledge took place in the framework of the *basic course* and through autonomous learning. Hönig describes the acquisition of the *beginner-level-L2* in the following way:

Erwerb der Grundkompetenz in einer Nicht-Schulsprache besteht vor allem in einer Anleitung zum Selbststudium. Das bedeutet: Die technischen Möglichkei-

¹Basismodul

²Anfängersprachen

ten von Sprachlabor und Videothek werden in einer Einführung dargestellt; das Lehrmaterial steht zum Selbststudium zur Verfügung. Der "Fremdsprachenunterricht" beschränkt sich auf eine Lenkung und Kontrolle dieses Selbststudiums. Es gibt keine Lehrveranstaltungen, in denen Syntax und Vokabeln gepaukt werden; die fremdsprachliche Grundkompetenz soll und muß der Studierende sich selbst aneignen. Die Aufgabe der Lehrperson besteht vor allem darin, den Lernfortschritt zu kontrollieren und nach Erreichung einer gewissen Grundkompetenz die Studierenden in die vorgesehenen Lehrveranstaltungen des Zentral-Moduls zu integrieren.

"The acquisition of the basic knowledge of a language which was not part of the school curriculum consists largely of instructions for autonomous learning. That is, there is an introduction into technical possibilities of a language lab and a video library; the teaching materials are available for autonomous learning. The "foreign language class" is limited to direction and control of this kind of autonomous learning. There are no courses in which syntax and vocabulary are studied intensively; students must master the core skills of the foreign language on their own. The primary task of the tutor is to control the learning progress and to integrate students who achieve a certain level of competence into the *courses of the central module*." (Hönig 1995: 167)

Certain characteristics of the *beginner-level-L2* make the investigation of the competence level rather difficult. Prüfer-Leske (1997) points out the lack of progress monitoring during language acquisition throughout the *basic course*. In other words, the definition of a certain basic competence, which a novice should possess in order to start translating, remains questionable. Furthermore, the individual process of learning is not transparent enough for a translation student. Therefore, he or she is unable to consciously locate him-/herself on a progression scale.

In the case of *beginner-level-L2*, the process of language acquisition takes place at the same time as the acquisition of translation competence. It is not the goal of the present study to investigate and compare all the possible facets of translation competence of novices and semi-professionals. Instead, the study focuses on aspects of translators' performance during reading and comprehension, such as visual attention, dictionary usage and individual feedback regarding the difficulty of comprehension.

5 Experimental design

5.1 Experimental settings

In the beginning of each individual appointment, participants were given some time to familiarize themselves with the eye lab environment. They were then informed about the conditions of the experiment and its structure, and were asked to fill out a questionnaire. The participants were informed about the skopos of the translation. There was no time pressure during the translation task. After receiving the instructions, participants could view the Translog 2006 interface which had already been opened for them prior to receiving instructions. The original text was located in the upper part of the screen, the participants typed their translations in the lower part of the screen. The participants had one monolingual online dictionary by *Corriere della Sera* at their disposal.³ For dictionary consultations, participants were asked to use the Internet Explorer window which had been opened for them prior to the start of recording. To ensure a smooth translation process without interruptions, interviews were conducted only at the end of each translation task (i.e. *delayed retrospection* in terms of Cohen & Hosenfeld 1981). However, in order to minimize loss of information and to overcome memory failure, participants could view the replay of their translation process in Translog 2006, with both texts at their disposal: the original text and their translation. High validity of retrospective data can be achieved by combining the replay of the translation process with the interview (Göpferich 2008: 35).

5.2 Experimental texts

The topics of the texts were fairly general due to the limited research opportunities and in order to keep the duration of translation process relatively short (approximately 200 words). Furthermore, the topic of both texts is quite neutral: the first text deals with an innovation in the shape of a robot which helps out in hospitals and the second text discusses the influence of reading habits on the gross domestic product of Italy. Both texts are derived from Internet resources (see below), however, for practical reasons they were significantly manipulated.

Due to practical considerations, the number of contrastive elements to be studied was limited to idioms, collocations, proper names, realia and false friends. Therefore, specific results could be filtered out from the vast amount of translation process data obtained through the chosen methods of research. The decision to enrich the experimental texts with the aforementioned contrastive elements

³http://dizionari.corriere.it/dizionario_italiano/

was reviewed critically by translation lecturers of the Faculty. However, these language contrasts have already been the focus of interest in past studies.

6 Instruments of data elicitation

Since the amount of data collected in the course of a multi-method approach is vast, there is a need to identify relevant metrics (Table 1) in order to conduct an analysis. Total fixation duration and total fixation count are metrics which characterize the amount of visual attention. The connection between fixations and cognitive activity is based on the eye-mind hypothesis of Just & Carpenter (1980). Its core assumption is that eye movements and pupil dilation correlate with perceptual and cognitive processes (Göpferich & Jääskeläinen 2009: 173). In this study, total fixation duration stands for the cognitive processing of one particular area of interest (AOI). In order to measure total fixation duration throughout the process of translation, every stimulus was marked with the AOI-tool of the eye-tracker software to ensure the calculation of the total time spent fixating each particular AOI (TFD) and additionally the total number of fixations (TFC) inside an AOI (Table 1).

Table 1: Metric units, abbreviations and measuring units

Metric	Category	Measuring unit
Total fixation duration (TFD)	Reception metric	s
Total fixation count (TFC)	Reception metric	times
Dictionary consultations (DIC)	Reception metric	times
Product evaluation (PRE)	Production metric	cognate/non-cognate/erroneous
Individual comprehension evaluation (ICA)	Reception metric	rating scale: -2 – +2

Dictionary consultations (DIC) is a metric representing the number of dictionary consultations related to a particular stimulus. The metric data was gathered manually by reviewing the screen recordings of the translation process.

Besides registering the length and number of fixations and the number and kind of dictionary consultations, participants in this study were asked to evaluate the comprehension difficulty of every language contrast. Individual comprehension evaluation (ICA) was based on a rating scale from 0 to 3 (0: very easy, 1: easy, 2: difficult, 3: very difficult) with no middle value. ICA values are expected to reflect the conscious individual assessment of comprehension complexity.

Product evaluation (PRE) is a metric unit evaluating the acceptability of the translation product.

7 Results

7.1 General data

Before focusing on false friends, it is worth taking a look at the general data of the translation sessions of both groups of students. Table 2 shows that the duration of translation (“initial orientation”, “drafting” and “revision”, Jakobsen 2002) is, on average, longer in the group of novices. This is not surprising as novice translators are generally known to be slower than professional translators. A closer, separate look at the source and the target text reveals some further information about the visual attention of both groups of participants. While novices fixate the source text longer than semi-professionals, the amount of visual attention on the target text is quite similar in both groups. When we compare the total fixation duration of the source and target texts in general, we come to the conclusion that semi-professionals are more busy producing the target text (15% and 24% more time spent on target text production than on source text comprehension) and novices comprehending the source text (slightly over 20% more time spent on source text than on the target text). The values of the total fixation count confirm this assumption, demonstrating that novices look quite more often at the source than at the target text.

Table 2: General data (T1-text 1; T2-text 2)

	Translation time (s)		TFD ST (s)		TFD TT (s)		TFC ST (times)		TFC TT (times)		DIC (times)	
	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2	T1	T2
Mean (nov)	2347	1477	444.9	685.0	343.0	533.7	1346.7	1904	907.8	1562	15	26.5
Mean (semi)	1475	1116	305.1	410.5	357.1	539.4	1084.0	1360	980.4	1454	7	1.0

Throughout the translation process, novices made use of the dictionary much more often than semi-professionals. This kind of discrepancy is not surprising, because novices' vocabulary in their *beginner-level-L2* is expected to be in the active stage of development.

7.2 Product evaluation

The meaning of the *false friends* selected for the present study depends largely on their context. In certain contexts *fenomeno* (*FEN*), *mito* (*MIT*), *idolo* (*IDO*) and *fiction* (*FIC*) can be translated as true cognates, i.e. as *Phänomen*, *Mythos*, *Idol* and *Fiktion*. However, in the context of the experimental texts they behave as false cognates. The results of the evaluation show that suitable solutions for *fenomeno* were *Neuheit*, *technische Errungenschaft* or verbal constructions, such as *Ärzte und Patienten sind begeistert*; good solutions for *mito* were *unglaublich*, *ein Wunder*; *idolo* was successfully translated as *Liebling* or *Vorbild*, whereas the most suitable solution for *fiction* was *Serie* or *TV-Serie*. As for the overall classification of translation solutions, they were subdivided into non-cognate (=acceptable), cognate (=not acceptable) and others (=omissions and other erroneous solutions). The final evaluation of the translation product shows, that the relation between cognate and non-cognate solutions in the group of novices is 21 to 16, whereas in the group of semi-professionals it is 8 to 26. These results complement the distribution of reception and production difficulties encountered by participants (Figure 4), making it transparent that novices largely consider false friends as a simple task, whereas the awareness of their tricky nature grows with the development of the translation competence.

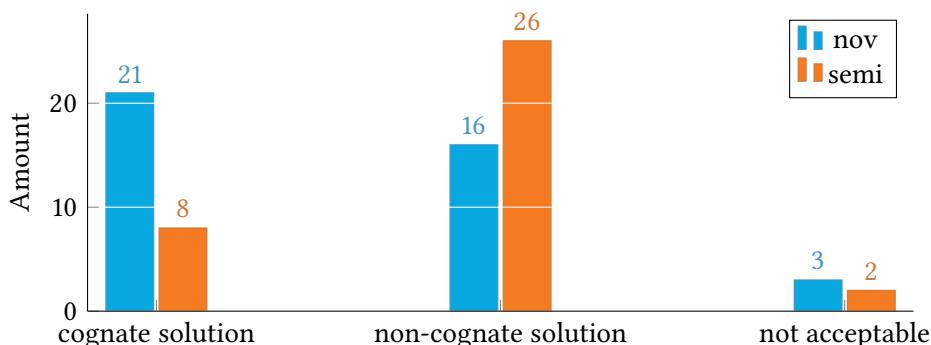


Figure 1: Product analysis

7.3 False friends: analysis of visual data

The mean values of the total fixation duration (Figure 2) show that both groups devote nearly the same amount of visual attention to false friends throughout the process of translation: the difference between the groups ranges merely from 0.1 ms to 1.9 ms. The hypothesized difference between novices, namely that they adopt false friends automatically, and semi professionals, who are presumed to consider alternatives which would suit the context, is not given. The mean value of the total fixation count (Figure 3) does not show any spikes either. However, the fixation count data show that novices fixate false friends slightly more frequently than semi-professionals which demonstrates that they reread parts of the source text several times.

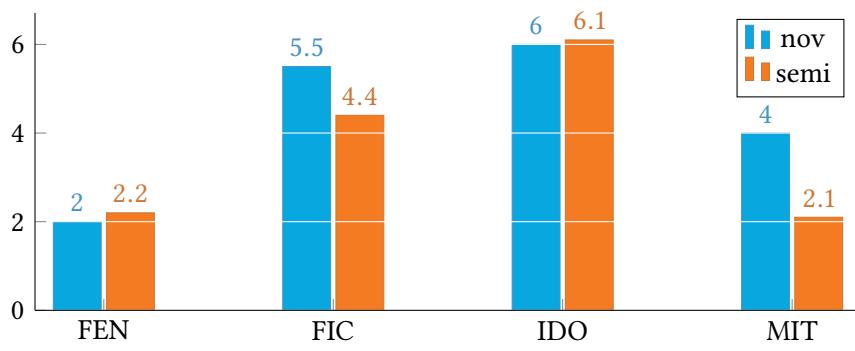


Figure 2: Total fixation duration (mean/ms)

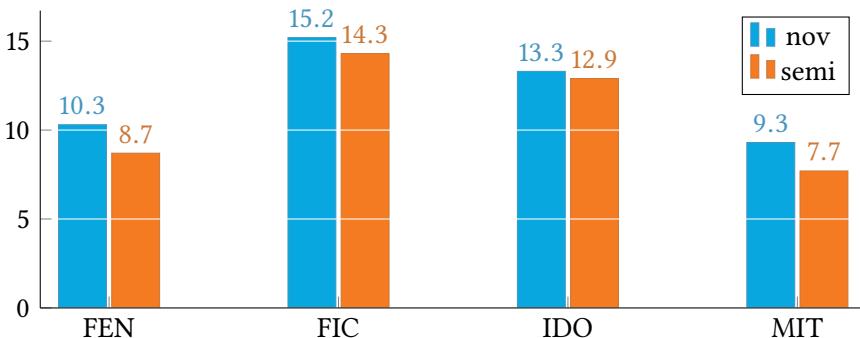


Figure 3: Total fixation count

We can assume that visual parameters show a very similar cognitive load in the processing of false friends by both groups of participants. Behind these values, the retrospective verbal data reveal that the distribution of difficulties encountered by both groups is not quite the same.

Figure 4 shows that in 25/40 cases, semi-professionals encounter production difficulties and in 6/40 cases, reception and production problems.

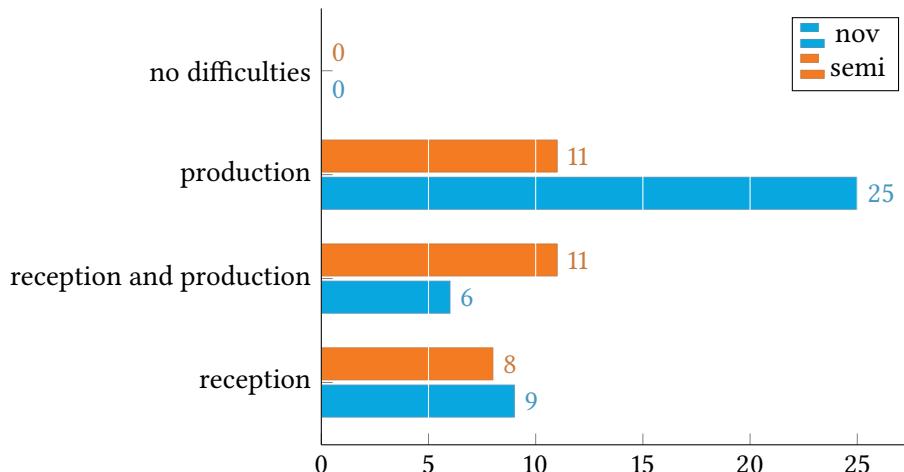


Figure 4: Difficulties in reception and production

In a large number of cases, novices, as expected, are not aware of the particularities of false friends within the given context and report twice as many (18/40) no-problem cases than the group of semi-professionals (9/40). The absence of difficulties in both groups has different reasons.

The majority of the novices demonstrate their unawareness of the specific false friends difficulties by reporting no problematic cases. Participant P20 believes that *Phänomen* is merely the German equivalent of the Italian *fenomeno*: <(wie haben sie das Wort *fenomeno* verstanden?) ähm als *phänomen* also (--) als halt was ganz besonderes so (hatten sie Schwierigkeiten bei der Übersetzung?) nee ich hab's einfach (.) das deutsche Äquivalent genommen> (P20/nov - *fenomeno* - PRE: *Phänomen*)

<(how did you understand the word *fenomeno*?) as phenomenon well (--) as something very special (did you encounter difficulties during translation?) no i simply (.) took the german equivalent> (P20/nov - *fenomeno* - PRE: *Phänomen*)

Participant P06 has more than one translation solution for *idolo*, however *Idol* remains his favorite. It seems to express the meaning in the best way: <(wie haben sie das wort idolo verstanden?) hm: ido:l (-) beziehungsweise einfach held wäre viel also (.) das idol (hatten sie schwierigkeiten?) nein> (P06/nov - idolo - PRE: Idol)

<(how did you understand the word idolo?) hm: ido:l (-) or simply hero would be too much well (.) the idol (was it difficult to translate?) no> (P06/nov - idolo - PRE: Idol).

Participant P21 relies upon the common but rather vague general definition of *fiction*, not attempting to adapt it to the target context: <(ist ihnen das wort fiction geläufig?) ja (hatten sie schwierigkeiten bei der übersetzung?) nein> (P21/nov - fiction - PRE: Fiction)

<(is the word fiction familiar to you?) yes (was it difficult to translate?) no> (P21/nov - fiction - PRE: Fiction).

Semi-professionals counteract the difficulties with their awareness of the specificities of false friends' specificity and are cautious translating them into German. The following examples also show that semi-professionals are more wordy in defending their solutions than novices: <(wie haben sie das wort mito verstanden?) ach so semplicemente un mito ich hab das alle schon gelesen (-) ein wunder habe ich gesagt (-) mythos habe ich auch nicht mehr nachgeguckt im wörterbuch (.) bin gleich auf wunder gegangen (-) weil es etwas außergewöhnliches ist (würden sie hier mythos reinschreiben?) [nein (wieso?) mythos ist für mich was (-) nicht so real und der ist ja DA und das ist ein wunder (-) dass es funktioniert (hatten sie schwierigkeiten bei der übersetzung?) nein> (P25/semi - mito - PRE: Wunder); <(wie haben sie das wort idolo verstanden?) ja (-) so wie der traum oder das (-) auf was die ärzte eben gewartet haben (hätten sie andere vorschläge für idolo) (...) [ne> (P28/semi - idolo - PRE: der Traum).

<(how did you understand the word mito?) o well semplicemente un mito i have already read it (-) i said a wonder (-) i haven't looked up myth in the dictionary any more (.) i picked wonder right away (-) because it is something very unusual (would you also accept myth as solution?) [no (why?) myth is something (-) not as real and THIS ONE it is kind of a wonder (-) that it functions (did you encounter difficulties during translation?) no> (P25/semi - mito - PRE: Wunder); <(how did you understand the word idolo?) yes (-) something like a dream or so (-) what the doctors were waiting for (any other solutions for idolo) (...) [no> (P28/semi - idolo - PRE: der Traum).

When they integrate false friends into the target context, semi-professionals often pick creative solutions like *der ... Vorbildcharacter hat* or *Vorbild* for *idolo*; *phänomenaler Erfolgzug* for *fenomeno*, which explains the time consuming procedure of producing a translation. A relatively small number of cases in the category false friends caused both reception and production difficulties within both

groups (11 nov/6 semi). As opposed to participants who merely report production difficulties because they are familiar with the meaning of false friends in the source text, some participants are uncomfortable with the ambiguity of false friends in the Italian source texts, which remains an obstacle on the way to a translation solution. Participant P01 declares that he is familiar with the word *fiction* in the English language, but becomes a challenge in the present context: <(ist Ihnen das Wort *fiction* geläufig?) aus dem englischen schon aber in dieser genauen wortbedeutung in bezug aufs fernsehen (–) nicht (...) ja (.) ich weiß auch nicht genau ob ich das richtig getroffen habe > (P01/semi - *fiction* - PRE: neue Fernsehreihe)

<(is the word *fiction* familiar to you?) sure from English but this particular meaning related to television (–) not (...) yes (.) I don't even know exactly if I got it right > (P01/semi - *fiction* - PRE: neue Fernsehreihe). Participant P26 reflects upon the semantics of *mito* in the source and the target languages and deducts the concrete meaning from the general idea: <(...) ich weiß es nicht (–) ob es jetzt diesen roboter wirklich gibt oder nicht weil mythos ist etwas (–) wovon man nicht sicher ist ob es wirklich gibt oder gegeben hat oder nicht und das kann ich einfach nicht einfach so schreiben (–) wenn ich gar nicht weiß (–) ob er wirklich entwickelt wurde und es den gibt kann ich ja nicht nicht sagen (–) er ist ein mythos> (P26/semi - *mito* - PRE: wie ein Märchen!)

<(...) I don't know if this robot really exists or not because myth is something (–) that you are not sure of whether it really exists or has ever existed before or not and I can not simply write it down in this way (–) if I don't know (–) whether it has ever been developed and it exists I can't say that (–) it is a myth> (P26/semi - *mito* - PRE: wie ein Märchen!)

In order to systematize sporadic comments, typifying them according to their central idea has proved useful. Some participants from both groups compensate for their reception difficulties with the influence of their previous knowledge about *fenomeno*, *fiction*, *mito* or *idolo* from other languages, for example English. It is firmly embedded into the procedural knowledge of participants and is the starting point for translation. The next reception problem is motivated by the unfamiliarity within the given context. Participants seem to know the concept behind the case, but cannot localize it in the given source text. In a situation where the translator is aware of the fact that hundred percent reception is not guaranteed, but the translation is expected to be provided, novices turn to the target text and look for a solution which is acceptable but not idiomatic.

The general evaluation of the quality of reported difficulties (Figure 5) demonstrates that, for the most part, they refer to translation competence of participants. Finally, it should be mentioned that participants mostly remained dissatisfied with their translation solutions.

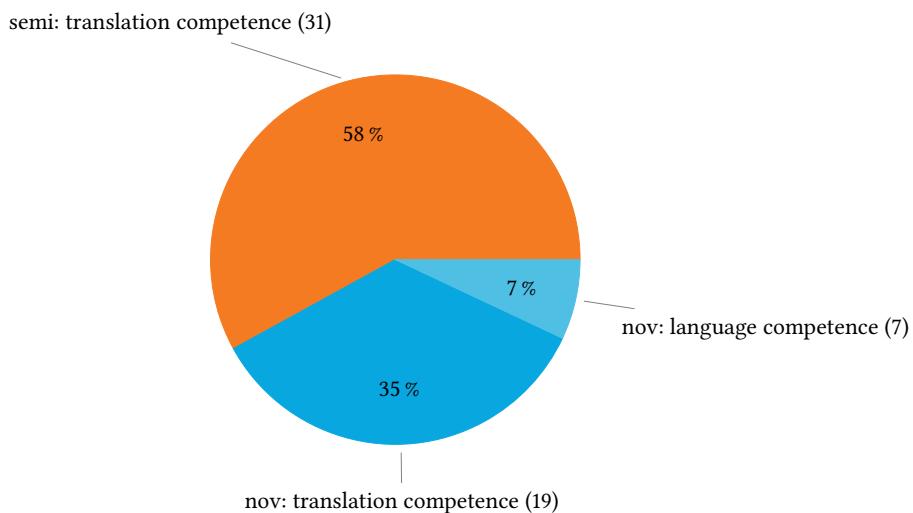


Figure 5: Quality of difficulties

7.4 False friends: dictionary consultations

The monolingual dictionary was used in both groups by some participants to look up the false friends, but in most cases the number of lookups did not exceed one (Figure 6). Only *fenomeno* was not looked up, presumably because it is used much more frequently in the spoken language than the other false friends in the experimental texts. Looking at the temporal distribution of dictionary consultations over the course of the translation process, the majority of participants made use of it during the drafting phase: after having read the sentence containing a false friend and – before translating it – they opened the dictionary window (Figure 7).

Some referred to the dictionary immediately, others reread the ST sentence several times (from two to five) before proceeding to the dictionary. Three novices and one semi-professional used the dictionary after having written down the translation. Two of the novice participants undertook changes in their solutions after the consultation: <Vorbild → Held> (mito) and <ein Idol → das Idol> (idolo). Only one semi-professional made use of the dictionary in advance: he read the whole passage, but did not start to translate it, instead he first read through the dictionary entries. After this dictionary session, he returned to the translation of the passage from the beginning.

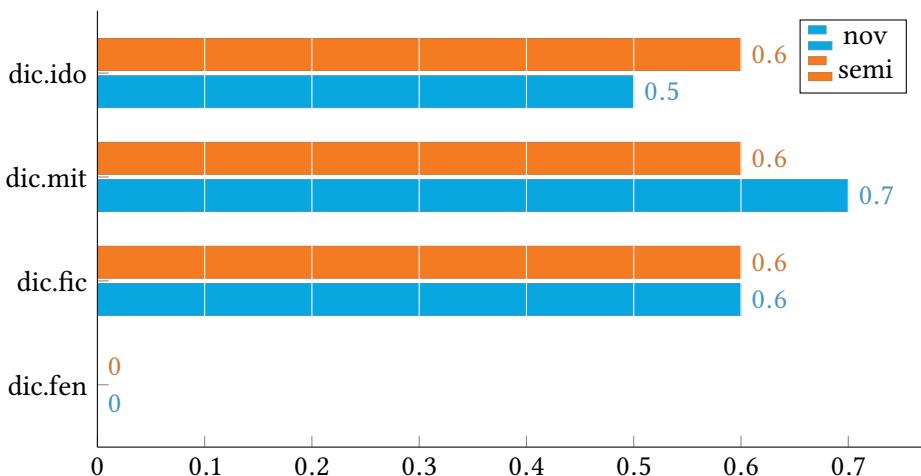


Figure 6: Dictionary consultations (mean/times)

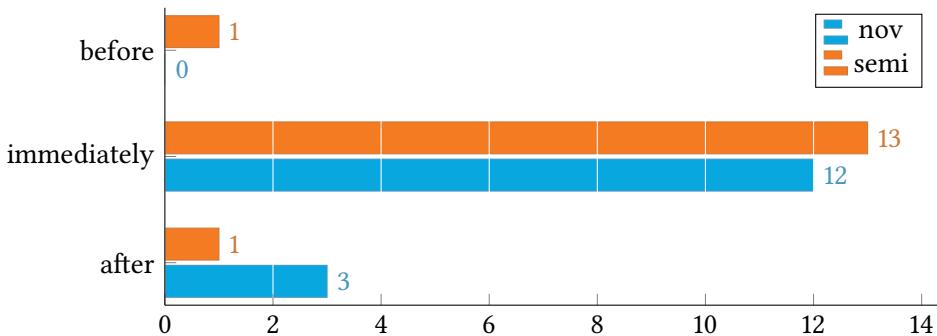


Figure 7: Temporal distribution of dictionary look-ups

The thoroughness of dictionary lookups was very individual. Figure 8 shows that 10 novices and 7 semi-professionals either did not read anything in the dictionary or stopped reading after the first line.

A number of participants (8 semi-professionals and 5 novices) were very thorough in reading the entries in the dictionary. In this context, it is possible to distinguish two types of behavior. The first type reads the dictionary entries word for word from the beginning to the end, fixating certain words longer than others, and returns to the translation after having finished reading. The second type reads the first dictionary entry carefully, then jumps back and forth between the entries, reading and rereading parts of them.

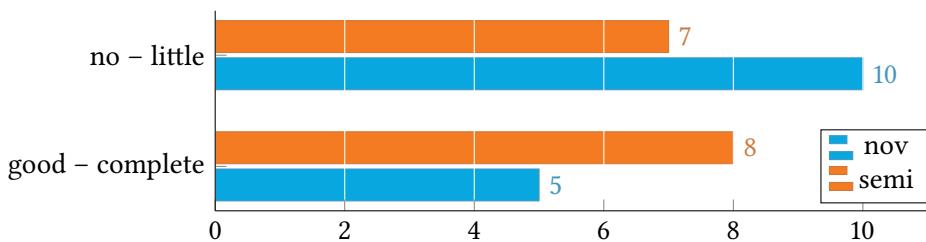


Figure 8: Reading quality of dictionary entries

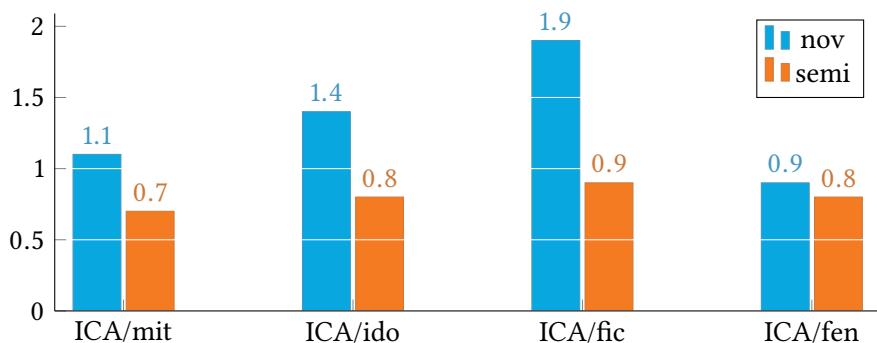


Figure 9: Individual comprehension evaluation

The monolingual dictionary itself may induce reception difficulties, because its entries contain words which may be unknown to participants. In two cases, semi-professionals went beyond the first entry and looked up words related to the entry itself. Participant P09, looking up the meaning of *idolo*: <(...) finds the words 'venerate' in the second contribution, types 'venerato', no solution, types 'venerare', reads the first two lines and goes back to translation> and participant P11, looking up the meaning of *mito*: <(...) clicks on 'mitico', scans the contribution, stops at 'miticamente, in modo m.' then at 'che costituisce, è... leggenda', returns to translation>. It was expected that both groups would not consult the dictionary for the purpose of comprehension, but rather for other reasons. Although participants were not prompted to comment on the usage of the dictionary, some of them did it voluntarily. According to most verbal reports, the main reason for using the dictionary was either to confirm or to reject the idea in translator's mind. Several participants compared the German "definition" of *Idol* with the contribution of *idolo* in the monolingual dictionary to see how far they coincide. Participant P09, for example, interpreted the explanation of the word *idolo* in favor of the German version *Idol* and decided to use it.

7.5 False friends: individual comprehension evaluation

Assuming that visual parameters are unconscious indicators of reception, individual comprehension evaluation is the conscious assessment of reception difficulty. The results show (Figure 9) that novices evaluate the reception difficulty slightly higher than semi-professionals, they do, however, not reach the mark *difficult*. These results are not surprising and are quite in line with the visual parameters.

8 Conclusion

Summarizing the findings and going back to the hypotheses, we cannot confirm that novices process false friends in terms of reading and comprehension faster than semi-professionals. A large proportion of novices seem to be aware of the treacherous nature of false friends, as the results of the retrospective interview and the product evaluation show. Still, a large number of novices, as opposed to semi-professionals (18 to 9), considered false friends a simple task and picked the cognate solution, without further reflection. These results confirm that the behavior of non-professionals seems automatic, because they are often completely unaware of potential problems and therefore process relatively little (Jääskeläinen 1999). The very similar amount of visual attention spent on false friends by both groups can also be explained by the fact that semi-professionals spend more time producing the target text and novices, instead, are involved in a more time-consuming source text analysis. The fixation count data show that novices fixate false friends slightly more frequently than semi-professionals, which demonstrates that they merely reread parts of the source text several times. Semi-professionals, as expected, are for the most part aware of the difficulties associated with the false friends and carefully consider their translation solutions, which results among other things in a choice of creative solutions. These results are in line with the conclusion by Jonasson (1998) that professionals are more aware of potential problems in translation. Furthermore, extensive processing, as the results of the retrospective interviews show, “is likely to yield better results, for experts and novices alike” (Breedveld 2002: 233), which explains the outcome of the product analysis.

As for the frequency of dictionary consultations, it became apparent that false friends are not a typical source of reception problems, which would severely impede the understanding of the text. The frequency of lookups is low and nearly identical in both groups. The main purposes of consultations were to confirm or

reject the pre-existing idea in a translator's mind, i.e. to compare one's own understanding with the explanation of the dictionary entry.

In terms of translation competence development and in particular its bilingual/linguistic proportion, we observe a notable progression from the novice to the semi-professional level. Furthermore, we see that apparently similar behaviour, e.g. similar total fixation duration, is motivated differently, as the complementing data show.

Detailed production data, which is missing in the small framework of the present evaluation, would add further clarity to the processing of the target text. Further categories of language contrasts (collocations, realia, proper names etc.) will be analysed in the framework of the present study by applying the same methodology and thereby laying the foundations for the comparison of different categories of language contrasts. Translator performance, e.g. related to the use of reference materials, will presumably differ between categories.

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Part VI

Mental models of translation

Chapter 16

Metaminds: Using metarepresentation to model minds in translation

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Addressing the other is fundamental to translation studies. Language is the unique human capacity for interaction by transferring meaning, emotions and attitudes to another mind. The translator has to understand the author's intentions behind the communication in order to correctly interpret and adapt her message for the target audience. One of the most interesting features of translation is this double metarepresentation of author and audience.

The aim of this paper is (1) to conceptualise translation as higher-order metarepresentation and (2) to show empirically that the permanent taking and giving of other's perspectives shapes the translator's mind.

I shall begin with outlining why translation is an intensive mental interaction, and how previous literature has dealt with the translator's mental interaction with the two others. After introducing the concept of attributive metacognition, or Theory of Mind (ToM), I shall review the literature on how translation trains attributive metacognition. If translation really is such a highly demanding task in terms of attributive metacognition, translators should have a better ToM than non-translators. I set up an fMRI experiment to study this question.

The results show an important activation in the precuneus for both groups. Labelled as "the mind's eye" (Fletcher et al. 1995), the precuneus is the region that subserves the representation of the self in relationship with the outside world (Cavanna & Trimble 2006) as well as perspectives contrary to our own (Bruneau & Saxe 2010).

1 Introduction

From the outside, translation seems to be a rather lonely activity: The translator interacts with text and hardly ever with other individuals. Bizarrely, however,



translators experience their work as highly interactional. They call their activity “an act of supreme empathy” (Simic, in Kelly & Zetzsche 2012: 107), “an act of love” (Steiner, in Kelly & Zetzsche 2012: 213) and “a valuable way of coming closer” (Bassnett 2002: 119). These individual experiences hint at the hidden character of translation as social activity on the mental meta-level.

The following sections present different models of translation to show that translation has always been considered a phenomenon on the meta-level, be it textual or communicative. The main point of this paper is to extend this view to include metacognition and in particular, to consider competences in attributive metacognition as one of the core components of translation competence.

Translation involves many competences at the meta-level (Plassard 2007). In the late 1970ies, translation scholars started to think of translation as a metatext (Popovic 1976). As a textual reaction to prior text, translation was similar to reader’s letters to the editor (Popovic 1976: 232). The translator is thus a reader who reacts to prototext. But in contrast to other readers, the translator’s reaction is a reproduction of the original. The communicative impact of the newly created metatext, however, depends entirely on the reader’s frame of reference (Popovic 1976: 230). As a reader who recreates the text s/he has just perceived for other readers, the translator’s capacity to anticipate their frames of reference is crucial for the communication.

Indeed, translation was soon to be considered as an act of communication instead of a textual genre. In 1978, John Bigelow conceptualised translation as a form of indirect speech. Ever since, this is one of the most frequently used approaches to model the translation process. The language switch becomes a secondary and not necessarily defining feature of translation. For the philosopher Donald Davidson, sameness of meaning exists independent of language on the level of the language user (Davidson 2010: 125). Since every language provides means for indirect speech, every language user must have the cognitive possibilities for interpreting indirect communication. Communication across languages is hence possible because everybody who can understand and produce monolingual indirect communication has the necessary cognitive means for understanding and producing multilingual indirect communication.

Translation is possible because it does not require any special mental equipment that would not be used in inferential communication in general (Gutt 2000: 200). But then what makes translation different from monolingual standard communication, if not the language switch? According to Relevance Theory, standard inferential communication is characterised by the so-called mutual cognitive environment, i.e. shared information between the interlocutors. Experts in a

specific field, like engineering, share a mutual cognitive environment: engineering. Similarly, a conference interpreter shares a mutual cognitive environment with his/ her audience, in form of the conference they are attending. Within this mutual cognitive environment, “a piece of information will be taken as part of the intended context if it is the most accessible information that yields an adequately relevant interpretation” (Gutt 2004: 2).

By definition translation brings people with different mutual environments together (Gutt 2004: 5). As a secondary communication situation it lacks a mutual cognitive environment. Translator, source text author and reader do not share the same frame of reference because they are separated in space and time. In the translation process, the author’s intentions have to be interpreted although they may not be explicitly stated in the text. These intentions have to be considered while rendering the text for the target public, a process for which it is also important to anticipate the target public’s prior knowledge of the subject and the extent to which the author’s aims and intentions consequently have to be adapted in order to be correctly communicated in the other language.

As second-order metacommunicative representations, translations should entail second-order metacognitive representations. A second-order metarepresentation is a metarepresentation standing for another metarepresentation. The first meta-representation, the source text, is already a higher-order representation since it stands for the author’s ideas. The translator’s primary concern is thus not the representation of a state of affairs, “but the metarepresentation of bodies of thought” (Gutt 2004: 13).

A metarepresentation is not a copy or duplication of a thought. Rather, translation is a transformation of metarepresentations. The source text is the only material basis for the generation of the translator’s mental representation of the target text. The creation of the target text happens in the reverse order. It starts with the translator’s purely mental representation of the author’s mental representation as represented in the source text. During the translation process, this mental metarepresentation is materialised in form of the target text. Translation briefs and technical guidelines offer indications both about author intentions and the background of the target audience. Such documentation is, however, not a default setting of translation. First, consider cases where this type of information is lacking, like in the case of dead authors. How does one translate “a dead person, or a living person whom you never meet, or who never corresponds with you or your editor or your publisher in the attempt to control your work?” (Robinson 2001: 24). Second, the presence of extensive documentation does not exclude that they may be conflicting with the translator’s views about author and

audience. Finally, such documentation does not necessarily reduce the metarepresentational effort. To the contrary, it may even increase it since the translator has to add these “external” considerations about author and audience to the own assumptions of their respective cognitive environments. Instead of comparing the reference frameworks of two interlocutors and finding possible overlaps, the translator may end up juggling with the additional reference framework of the authors responsible for the technical documentation and translation brief. Given these possible complications, I shall treat the translation process in what follows as a simple chain of text production and re-production between author, translator and audience. Metacognition is a central feature of this process.

Representing the minds of others is central to translation (Wilss 1992). Traditionally, this feature of the translator’s work has been studied in terms of imitation, empathy, metempsychosis and simulation. For Reiss and Vermeer, translation “simulates a primary information offer” (1991: 88). For them, translation is an “imitative action including the entire person” (1991: 91). Other translation scholars have pointed out that translation is “inevitably mimetic” (Mossop 1998: 249), i.e. that it is always geared toward imitation (Mossop 1983; 1998; Folkart 1991; Gutt 2000; Hermans 2007). Another key concept in this context is metempsychosis (Dussart 1994: 108). This rather spiritual idea that one soul animates different bodies has been taken to explain the “magnetism” between translator and author (Wuilmart 1990: 241). The term “empathy” has been used to describe the intuitive understanding between author and translator, a process that precedes rational understanding or goes beyond it (Dussart 1994: 109). Folkart refers to recreation by translation as the ultimate form of mimetism (1991:418), and Stolze qualifies a full mimesis as the unreachable ideal of translation (2010: 144). These concepts are seriously limited. Firstly, many of them cannot be used as parameters for empirical translation studies since they arise from traditional theoretical approaches to translation such as aesthetics. Furthermore, most of these concepts express rather general ideas. There is no translation-specific definition of “imitation” or “empathy”. Different authors may use them to refer to different concepts. It is thus not very clear whether, in the context of Translation Studies, “imitation” and “mimesis” are to be thought of as distinct concepts. Similarly, it is unclear whether “empathy” and “intuition” cover the same phenomena and mechanisms.

Modelling the translation process in terms of metarepresentations has at least three advantages. Metarepresentation provides a simple, yet powerful model of translation as a special form of inferential communication. It links up with previous research on metatexts and metacommunication, and accommodates them

together with metacognition in a coherent framework. In this framework, translation is defined as a metacommunicative process generating metatexts. These texts are secondary communication situations about previous text. Generating them requires higher-order metarepresentation. These second-order metarepresentations should at least partially account for the cognitive effort in translation. Furthermore, translators who are constantly operating on this higher metacognitive level should develop a higher cognitive proficiency than non-translators. I study these questions with the help of recent evidence from social psychology about attributive metacognition, or Theory of Mind (ToM).

2 Theory of Mind

Theory of Mind (ToM) describes the ability to represent and attribute mental states (such as beliefs, desires and intentions) to oneself and others (Saxe et al. 2004). It refers to “our ability to reflect on ourselves and become self-conscious, and our ability to reflect on others and become conscious of the way others may see us. It involves thinking about how information is represented to us in terms of beliefs, desires and goals. Theory of mind is necessary for understanding the social world and our part in it” (Larkin 2010: 31). It allows us to make sense of others’ behaviour and predict their future actions. Investigations into how the mind works have a long tradition in Western philosophy. For a long time, Theories about the Mind dealt with questions about how the mind could access itself – as the only means to study one’s thinking was to think about it. While there is a substantive body of research on how the mind deals with numbers, symbols and language, the research about the mental framework that deals with other minds is comparatively young. It is only in recent years that scientists with such diverse backgrounds like social psychology, neurosciences, anthropology and linguistics became interested in metacognition. Papers on neuroimaging research on Theory of Mind have increased from four in 2000 to more than 400 in 2013 (Koster-Hale & Saxe 2013).

The interest in mental state attribution began in 1978, when Premack and Woodruff used the term “theory of mind” outside of philosophy to answer the question whether chimpanzees have a system of mental state attribution. They define the concept of theory of mind as the attribution of mental states to oneself and others. For their paper in particular, this idea applies beyond the boundaries of biological species. Their research consisted in presenting chimpanzees with a series of videotaped scenes showing human actors struggling with a variety of problems. After each video, the chimpanzee was presented with a picture fea-

turing a possible solution to the problem. For example, one picture proposed a stick to reach for a banana which was too far away for the protagonist. The chimpanzees were consistently chose the photographs with the correct solution to the problem, which led the authors to infer that the animals were able to attribute a mental state to the actor (e.g. the desire to have the banana) and understand that they would regulate their behaviour according to their mental states. Although the study has received fundamental criticism (Call & Tomasello 2008), it did not only spark the interest in the subject, but led the philosopher Daniel Dennett to think about other possible research designs for ToM testing (1978). Acknowledging that a fully-fledged Theory of mind was rather difficult to test, he asserts that the required conditions are easily met by communicative acts, such as warning, requesting or asking (*ibid*). While modern research is convinced that preverbal infants, apes and monkeys share any of the fundamental capacities of human social cognition, a fully-fledged Theory of Mind remains, like the sophisticated use of language, part of the uniquely human social cognition.

The mature ToM network seems to be universal. Without any pre-existing neuroscience of ToM and unusually few preconceptions about its possible neural counterparts, every group that sought to identify brain regions implicated in ToM got essentially the same answer (Saxe 2010). Activation in the same brain regions is found in participants ranging from 5 to 65 years of age from diverse regions of the world (Britain, USA, Japan, Germany, China, Netherlands and Italy) and in congenitally blind and deaf adults (Koster-Hale & Saxe 2013). To be so widely shared, neural substrates of ToM have to be similar in all these populations, and hence independent of the particular circumstances of their lives.

The regions reliably activated by ToM tasks are the right temporo-parietal junction (RTPJ) and the medial-prefrontal cortex (MPFC), the precuneus (PC) and the superior temporal sulcus (STS; Koster-Hale & Saxe 2013; Dodell-Feder et al. 2011; Saxe 2010; Young et al. 2010; Atique 2010; Saxe 2009). All these brain regions have been identified through fMRI, transcranial magnetic stimulation (TMS) and lesion studies (Saxe 2009).

But ToM is no default setting of the mind one is born with. It develops throughout childhood and undergoes significant changes until adolescence (Gunther Moor et al. 2012; Cummings 2009).

Experience with diverse mental contents in language switch situations could help bilingual children to develop ToM competencies earlier than monolinguals (Kovacs 2009). This argument is twofold: bilingual children do not only have experience with two languages, but also with mixing them both and switching from one language to another. A situation involving a language switch implies

knowing that one of the communication partners does not understand one of the languages. Frequent exposure to such situations would lead to enhanced ToM capacities. Alternatively, the bilingual's experience with controlling multiple languages and adapt their use according to their environment could enhance the development of their executive control – which in turn would enable them to perform better on ToM tasks that require such abilities (Kovacs 2009). There is evidence that bilingual children know that and when interlocutors may not understand one of the child's languages (cf. Bassnett 2002). Children learn to address their communication partners in the appropriate language before the age of three (*ibid*). Growing up with two languages confronts bilingual children more often with conflicting mental representations. A bilingual child has to learn that a monolingual friend does not understand what is being said in the child's second language. In a larger bilingual context, bilingual children have even been found mediating actively between two monolinguals by helping them by translating for them (Kovacs 2009). Bilingual children grow up with multiple referents for objects. Whereas monolingual children only assign two labels to an object at around the age of 4, bilinguals do so much earlier (Kovacs 2009). Yet, there is no evidence suggesting that bilingual children may have advanced language abilities. Kovacs (2009) did not find any relation between the vocabulary scores and the ToM performance of bilingual children. Similarly, bilingual children perform better than their monolingual peers in false belief tasks and ToM tasks involving a language switch, without showing an advantage for either task. Kovacs (2009) concludes that bilingualism enhances cross-domain performances.

The influence of several languages may go beyond purely linguistic domains as bilingual individuals are at the same time bicultural. In an fMRI study by Kobayashi Frank et al. (2008), Japanese (L1) and English (L2) bilingual children and adults were presented with false belief task in both languages. Whereas children's brain activation showed an overlap of activity for the L1 and L2 conditions, the brain activation patterns of adults varied depending on the task language. The results indicate that individuals recruit different neural resources depending on the language context, and that this difference may become greater with age. An alternative interpretation is that the different activation patterns are induced by the influence of participants' cultural background on their social cognition. Cultural influences can be found in terms of childrearing, mother-child interaction patterns and the way behaviour is explained to children (Kobayashi Frank & Temple 2009).

Up to now, no systematic difference has been found in the development of ToM abilities depending on the child's mother tongue (Zufferey 2010: 46). Sim-

ilarly, bilingual and monolingual children achieve linguistic milestones at the same time. It is thus unlikely that a possible linguistic advantage alone could explain the superior performance of bilinguals in ToM tasks.

Van Overwalle (2009) proposes a comprehensive list of ToM tasks used in 200 fMRI studies, mainly published between January 2000 and April 2007. Among the tasks he identifies are: viewing tasks, tasks requiring imitation, a causal prediction or causality judgement.

Non-verbal stimuli involve pictures of human faces, enacted human actions, comics and picture stories. Methodologies involving non-verbal stimuli include gaze tracking and non-verbal answers, e.g. by pushing buttons. In the so-called "Mind in the Eyes" test participants are presented with a series of 25 photographs of the eye-region of the face of different actresses and actors (Baron-Cohen et al. 2001). The picture is accompanied by four descriptive terms and participants have to select the one that offers the best description of the person's mental state.

The most frequently used verbal stimuli are short stories and sentences. One of the earliest and often used test stimuli is the Strange Stories test by Happé (1994). The stories were originally designed as naturalistic tool for the diagnosis of specific ToM impairments in patients with autism. The original Strange Stories test consisted of 24 vignettes comprising 12 different types of stories with two stories for each type. The 12 different story types depict common elements of communication or communication situations, such as: lie, white lie, joke, pretend, misunderstanding, persuade, discrepancies between appearance and reality, figures of speech, sarcasm, forget, double bluff and contrary emotions. Adapted versions of the task contain stories on human mental and physical states as well as physical states of animals (White et al. 2009). fMRI item analyses reveal that activation of the ToM network does not depend on the linguistic features of the stimuli (Dodell-Feder et al. 2011). These findings suggest that the examined verbal ToM stimuli work independent of language – and languages.

Applying the ToM concept to translator's metarepresentation of other minds has several benefits. Unlike the previously mentioned concepts, ToM has been investigated thoroughly in numerous contexts, across several cultural and linguistic groups, covering all ages from early childhood to adulthood. ToM is associated with a robust activation pattern in fMRI studies, which is rare for comparatively complex cognitive phenomena. This activation pattern is independent of language. Furthermore, mother tongues do not seem to have an influence on ToM development.

While both mono- and bilingual children reach the different stages of their ToM development at the same time, bilingual children have shown to score bet-

ter in ToM tasks than their monolingual peers. This difference is not necessarily explained by the fact that they speak different languages, but by how they use their languages. Children growing up in a bilingual environment frequently encounter situations in which they have to decide which type of verbal behaviour is most appropriate for their given audience: switching from one language to another because the audience does not share the same language; or mixing language because all parts of the audience share the same languages as the interlocutor, or translating what is said for the part of the audience that does not understand one of the languages used. Regular inferences on the content of other minds taking part in any given communication situation, and adapting one's behaviour to those inferences could help bilinguals to acquire ToM more efficiently than their monolingual peers.

These observations make ToM a relevant concept for translation. Unlike the previously presented traditional concepts, ToM provides a model for empirical research. Linking existing research about the understanding of others in human communication in general with findings from Translation Studies will deepen our understanding of translation as a specialised form of human communication. Given that ToM is associated with a robust brain activation pattern, research about the role of ToM in translation could constitute one of the first steps into researching the neurological mechanisms of translation which are still one of the chief known unknowns of translation studies (Tymoczko 2012: 83). The following section presents evidence for the role of attributive metacognition in translation, and reasons why translation is likely to train this particular competence.

3 Theory of Mind in translation

The translator's task does not tolerate any approximate use of language. Text creation based on prior text requires highly conscious choice of words, information structure and stylistic devices. The two main tasks of translation are reading and writing. Both activities have been shown to increase attributive metacognition. Finally, translation training in classroom settings also leads to greater metacognitive competences.

Translating for other people is a formidable way to get experience with the way other speakers use their words and phrases. Translation involves a more conscious language use than direct monolingual standard communication when one speaks on behalf of oneself. "I never realised what an imprecise word 'clear' was until I tried to translate it", says linguist Arika Okrent (2010: 67) about her experience with translation. In spontaneous speech, we can use language with-

out knowing what we want to say from the beginning; we can figure it out as we go along. Translators, in contrast, always have to know precisely what it is they are saying when they translate.

Using several languages also entails a certain familiarity with different social conventions. Work by Shatz et al. (2006) shows that translators manipulate the expression of mental states in translation. For their study, Shatz and colleagues (2006) developed a technique they call “double translation”: two bilinguals translate two versions of a book, the source text and a published translation. By comparing their work with the official translations, “non-native researchers (...) could note when the professional translators had translated something in a way that seemed unusual to them” (2006: 96). Results of the study show that many modifications in the translations are motivated by culture-specific practices and beliefs. This shows that translators are sensitive to the culture-specific cues of mental states. In dealing with a particular mental state, translators reflect common beliefs or practices in a given culture. That is, they infer the mental state in question and adapt it to the social conventions of the target text culture. The increased demand in social reasoning imposed by the task is one of many factors influencing metacognitive abilities in translation.

Indirect communication trains perspective-taking capacities (Djikic et al. 2013). Among the best examples for the power of indirect communication are literature and narration. As soon as the reader starts engaging with the story, his/ her mind is almost automatically pulled out of his/ her actual present situation into the life of others. Reading means accessing this abstract, yet high concentration of social life. Reading means mind-reading.

Reading literary fiction has been found to improve ToM (Djikic & Oatley 2014). The more people read, the better they score on ToM tests (Djikic & Oatley 2014). Literature is the indirect experience of the other. Literature can be persuasive and lead the reader into an indirect communication with the characters. More generally, however, one of the main traits of literature is its subject matter. Literary writings deal with selves and their interactions in the social world (Djikic & Oatley 2014). The reader is taken to adopt the perspective of another and live, at least partially, through their experiences.

Translation and narration are based on the same principle: the willing suspension of disbelief (Pym 1998). Although the translator is not the CEO of a bank, s/he will have to write the address to the reader in the annual report as if s/he was. In translation, both language comprehension and production require the willing suspension of disbelief which makes writing for translation yet another exercise in indirect communication. Individuals who have been writing fiction for several years scored higher on ToM tests (Djikic et al. 2013: 17).

Translation involves a great share of reading, writing and hence confrontation with different types of higher language use, such as irony. Like narration, translation helps to understand language and the human mind as representational devices of cognition. Reading and writing are proven to train attributive metacognition. Reading also increases evaluative metacognitive skills such as self-monitoring and control skills (Larkin 2010: 74).

Translation comes intuitively to mind as one of the best ways to engage people in perspective-taking. The psychologists Emile Bruneau and Rebecca Saxe 2012 tested members of two conflict groups in a perspective-giving and perspective-taking paradigm. Two roles were assigned to participants of each group, Sender and Responder. In the perspective-giving task, participants with a Sender-role had to write a brief description about difficulties and challenges of their respective situation. Responders were told that the brief was a translation they had to verify. They had to summarize the Sender's statement in their own words, but without expressing their own beliefs, feelings and experiences. According to the authors, "describing the difficulties and challenges experienced by the outgroup in one's own words is a novel and robust implementation of perspective-taking", since it requires the Responder "to at least partially get 'inside' the Sender's description" (Bruneau et al. 2012: 856).

Classroom experience with translation also trains perspective-taking capacities. Salles Rocha (2010) analysed whether translation activities help second language learners to become aware of the L2 perspective and consequently adjust to it to improve their ability to effectively communicate in the foreign language. The ability to communicate effectively in a second language is highly dependent on the ability to conform to the perspective of the second language (2010: 1), as reflected in deictic elements. Likewise, L2 learners have to be aware of possible influences certain grammatical structures have on the mental representation of text (e.g. passive voice as compared to active voice). Salles Rocha points out that "professional translators do not only have to be aware of the different perspectives embodied in the language that they are dealing with, but also know how to take those perspectives when passing from one language into another" (2010: 8). In her study, she compares the organisation of information in descriptive essay by native and non-native speakers, i.e. American undergraduate students and mostly Chinese English-language learners, before and after translation exercises. After the translation exercises the learners got closer to the way native speakers conveyed information, improving a significant number of thematic and processual structures (Salles Rocha 2010: 44), in particular their use of material and mental state processes (2010: 45). The findings indicate the learners gained

greater awareness of how native speakers compact and organise information (2010: 45).

In 1989, Miriam Shlesinger launched the two year Translation Skills Program (TSP) for some secondary schools in Israel. It proposes classes in which students translate from English (L2) into Hebrew (L1). In a longitudinal study, Shlesinger & Almog (2011) investigated the effects of the TSP on students' metalinguistic awareness. As a result of the study the authors consider translation competence as the interplay between metalinguistic awareness and general language skills: "Translational proficiency might be thought of as an interplay between bilingual proficiency and meta-linguistic maturity, involving the recognition of commonalities and differences in the nature and functions of languages, analysis of linguistic knowledge and control over processing" (Shlesinger & Almog 2011: 164).

Translation scholars predict and observe similar changes in the academic translation classroom. Dam-Jensen & Heine point out the importance of the text producer's mental state and its interaction with the "situation in which it evolves" (2013: 91). Author and audience influence this situation. Shreve (2009) emphasised the role of the translator's position regarding these two, suggesting a shift during the development of translation expertise. According to him, translation experts focus on the target audience, whereas novices' attention would solely lie on the source text. Research by Ehrensberger-Dow & Massey provides evidence for these predictions. Translation novices in their study use comments on the readership to solely refer to the ST readers. In line with Shreve (2009), a more equilibrated view regarding the implication of others in translation reflects the emerging awareness of the translator's position and the multiple roles s/he has to handle. Again, data by Ehrensberger-Dow & Massey (2013) confirms this prediction. MA students were found to spread their attention "over three categories, with half of them indicating an awareness of the importance of conveying the message of the ST and tending to talk about target text readerships" (2013: 111).

In summary, this section provided evidence to support the hypothesis that translation requires ToM. The translator represents both source and target other at the same time. Forming these concurrent metarepresentations should hence activate the ToM network in the brain. Furthermore, frequent exposure to translation should train ToM.

To test this hypotheses, I compare participants with two different levels of translation competence: BA and MA students from the Translation Faculty at the University of Geneva. In the present framework, BA students considered non-proficient, or novice translators. MA students assumed to have a greater translation competence due to more training. If it is true that translation in-

volves ToM, a translation task should engage the neural ToM network. However, brain activation patterns should be different for BA and MA students if it is true that translation trains ToM. That is, I assume different levels of translation competence to be associated with different activation patterns of the ToM network. Details of the study are presented below.

4 Study

Subjects were presented with 40 German sentences, 20 of which were in a ToM condition and 20 in a noToM condition. The task consisted in reformulated each sentence in the same language. This was to avoid noise in the neuroimaging data due to participants' different language levels. Two sentences of each condition were matched in terms of sentence construction as to exclude effects due to linguistic particularities or simple lexical processing. A ToM condition sentence requires participants to take the narrator's perspective in order to infer the meaning of the message (e.g. "When I stood on the stage for the very first time, my palms became wet"). For the noToM condition sentences, the simple understanding of the sentence's logic was required (e.g. "When touching that used towel, my palms became wet"). The resemblance of the sentences should guarantee that there was no effect linked to any text-statistics factor that would influence the results (Dodell-Feder et al. 2011).

24 subjects (13 BA, 11 MA) were tested. Functional data were collected on 3T-MRI scanner (Siemens), analyzed with SPM8 using fixed-effect analysis with a general linear model applied to each voxel and an auto-regressive function to account for temporal correlations between them across the whole brain. Afterwards, simple main effects of each condition were subjected to a random-effect analysis. All conditions were modeled in a full 2x2 factorial model (ANOVA) with modalities (verbal/ nonverbal) as factor 1 and the condition (ToM/ noToM) as factor 2.

Participants were asked provide an intralingual translation of the sentence, focusing on the sentence's message. The intralingual translation setting was chosen because it allows for a better control of the design, particularly with respect to possible influences different degrees of language proficiency could have on the brain activation patterns (Kim et al. 1997; Korning Zethsen 2009). The baseline task of the verbal condition consisted in reading aloud. As non verbal control condition, the Mind in the Eyes task was chosen. This test was originally developed as a diagnostics tool for autism by Baron-Cohen et al. (1997). It consists of a set of pictures showing only the eyes of a person. In the ToM condition, par-

ticipants have to choose one adjective out of four to describe the expression of the eyes. The original task was complemented by a no ToM condition consisting in attributing an age to the depicted person, and a baseline task in which participants have to indicate the location of a red dot placed in the picture.

5 Results and discussion

The ToM-noToM contrast for the verbal task reveals an important activation in the left middle temporal gyrus, the left precuneus, the left cerebellum, the left middle inferior temporal gyrus, the left middle temporal gyrus, the left caudate body, the left subgyral part of the left temporal lobe, the left parahippocampal gyrus and the right superior temporal gyrus. The interaction analysis for the ToM-noToM contrast reveals activation in four regions across the non-verbal and verbal modality: the bilateral precuneus, the right superior frontal gyrus the inferior temporal gyrus and the left cerebellum.

The hypothesis that translation activates the ToM network can thus be only partially confirmed since the only ToM area activated by the task is the precuneus (PC). Despite being an important part of the ToM network, the literature dedicated to the role of the precuneus is scarce, but it is a major association area and is implied in numerous behavioural functions, such as visuo-spatial imagery, episodic memory retrieval, self-processing and consciousness (Cavanna & Trimble 2006). Its implication in self-processing seems to be relevant to my study, because first-person reference ('I', 'my', 'me') was used in all verbal stimuli. Could the activation of the PC be due to the participants' processing of this self-reference rather than to the translation condition? Experiments revealing the implication of the precuneus in self-processing have addressed with the representation and awareness of the self (Cavanna & Trimble 2006), more precisely with the representation of self versus non-self representation as in self-referential judgement and first- versus third-person-perspective-taking. These studies involved tasks in which participants were asked to compare self-relevant traits with self-irrelevant traits of information (Cavanna & Trimble 2006) by asking them to make decisions about psychological personality trait adjectives, or attributing personality trait adjectives to themselves (Cavanna & Trimble 2006). Other studies found activation in the PC when participants were asked to describe themselves as compared to a neutral reference person (Cavanna & Trimble 2006). Further evidence for the activation of the PC was found in studies asking the participants to evaluate psychological traits they associated with three people with different degrees of self-relevance, namely the person herself, her best friend and a neutral person (Cavanna & Trimble 2006).

The studies listed above provide evidence for the fact that activation in the PC is linked to various forms and degrees of self-reference. However, self-reference cannot fully account for the PC activation in my study because the nonverbal task does also require the first-person-vantage point. Although the latter might be rather implicit in the nonverbal condition, the task consists of the evaluation of others' facial expression as seen by me. The choice of answers could thus be rephrased as 'To me, he looks aggressive', or 'I think she looks flirting'. First-person agency does thus not depend of the test condition. However, this factor might be more explicit in the verbal condition, because the personal and demonstrative pronouns 'I', 'my' and 'me' might trigger a more explicit form of self-reference than the non verbal condition. The factor of self-reference might therefore be stronger in the verbal condition as compared to the nonverbal condition.

This view finds further support by an fMRI item-wise analysis of theory of mind tasks which revealed that the number of people in a story was the best predictor for activity in the PC. Activation was greater if more people were involved (Dodell-Feder et al. 2011). According to this meta-analysis, the nonverbal task in my study should have elicited a greater PC activation because it involves several different people as compared to the translation condition, which features only one protagonist, the 'I'. Self-reference cannot explain the activation patterns found in the present study.

However, PC activation in studies about intergroup conflict seems to be more elusive with regards to the translation task in my study. Bruneau & Saxe (2010) found that the activity in the precuneus was strongly correlated with explicit and implicit behavioural measures of negative attitudes towards the outgroup. They presented Arab and Israeli participants with statements of partisan views and measured the BOLD response with fMRI imaging. Only the PC was reliably recruited during emotion- laden reasoning in most individual subjects. Furthermore, only the PC differentiated between pro- ingroup and pro-outgroup statements across groups. Bruneau & Saxe (2010) provide one of the rare neuroimaging studies where implicit associations towards the outgroup have been studied. Their study is in line with other work about the PC's implication in emotional reasoning. PC activation has been reported when participants with a very strong political orientation were confronted with apparent contradictory statements made by their own political candidate Bruneau & Saxe (2010).

Similarly, the verbal stimuli used in my study most likely did not reflect the participants' own view. The PC activation revealed in the verbal task might thus reflect the inner conflict of using terms of self- reference such as 'I', 'my' and 'me' without, however, actually referring to oneself (Robinson 2001; Hermans 2007;

Pym 2005). While using these words, the translator, very clearly, distinguishes herself from the person whose place she takes while producing these utterances. The PC activation might thus reflect this inner disparity between intended reference, i.e., the author, and the actual performing reference, i.e., the translator.

The hypothesis that different levels of translation competence would be related to different levels of activation of the ToM network could not be confirmed. There are three possible explanations to account for this result:

1. There is no difference between both groups.
2. There are differences between the participants, but the actual group distinction is not a sensitive criterion for them.
3. There are differences between both groups, but the verbal test is not sensitive enough to detect them.

The first point can only be reliably addressed by further testing in terms of neuroimaging studies and in terms of other experimental research into the metacognitive proficiency of translators. The second possible explanation could be that the verbal task is not sensitive enough to reveal group differences for the studied conditions. The verbal task did not yield any group differences in terms of brain activation. Similarly, the nonverbal task did not reveal any group difference in terms of reaction time. Both tasks, the nonverbal and the verbal, yielded a robust contrast for both conditions (ToM and noToM). The third point could be due to a ceiling effect in the brain activation. Because all subjects were healthy young students of a similar age range, the distinction of academic curricula might not be sensitive with regards to differences in the activation of neural networks.

However, BA students showed a greater activation in the inferior parietal lobe throughout the verbal task. This activation was, however, independent of condition. The intralingual translation task parallels the results of the validated nonverbal test design, and therefore seems to be adequate for the testing of conditions. The most plausible explanation may thus be that the group distinction is not a sensitive criterion to answer the question. It has been observed before that professional translators do not necessarily produce high quality translations (Sun & Shreve 2014).

Since the BA/MA distinction may not be sensitive enough a criterion to detect actual differences in translation competence, a third analysis was conducted for which participants were regrouped according to the quality ratings of their translations. This analysis revealed a positive correlation between translation quality ratings and activity in the precuneus. In other words: greater precuneus activity

lead to translations which received higher ratings for their quality. This finding emphasizes the previously discussed role of the precuneus.

6 Conclusion

This paper argues that translation requires the metarepresentation of at least two other mindsets. If this assumption is right, translation should be highly demanding in terms of attributive metacognition; and the latter should account at least for some of the cognitive load involved in the translator's task. A second assumption is that frequent exposure to this task trains metacognitive abilities, among them attributive metacognition, or ToM.

I set up an fMRI study to answer the question whether translation activates the ToM network. This was the case. However, translation did not activate the entire ToM network, but only one part of it, the precuneus (PC). This area is most frequently associated with self-reference, self-processing and awareness of self. In addition, PC activation has been positively correlated to the number of people in a story. In the present context, it may indicate the translator's awareness for the multiple metarepresentations. ToM stimuli required the representation of several minds whereas noToM stimuli descriptively reported facts or states of the world.

Furthermore, the results of the present study indicate a positive correlation between PC activation and translation quality ratings. Higher PC activation was linked to higher translation quality. This finding could indicate that successful attributive metacognition contributes to translation quality.

However, this partial activation of the ToM network does not mean that subjects are consciously aware of textual requirements in terms of attributive metacognition. Existing literature suggests that students' pragmatic awareness builds up slowly and is only acquired over time. Since attributive metacognition is only one part of this pragmatic ability, its development may be even less visible. The training of metacognitive abilities could also evolve through other translation-related tasks, like reading or writing fiction. The training of other subcompetences, such as executive function, could also lead to better metacognitive abilities.

On the methodological level, this study attempts to push disciplinary boundaries by studying a traditional translation concept like "otherness" with the help of neuroimaging. The present work shows that neuroimaging research need not be limited to localising translation in the brain. Transdisciplinary research in translation does not only further our understanding about translation, but also our understanding of what it means to be multilingual.

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Chapter 17

Cognitive economy and mental worlds: Accounting for translation mistakes and other communication errors

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The present paper applies the two notions of cognitive economy and mental world to the analysis of two rather different cases of miscommunication in translation. The paper argues for two tenets. First, the paper argues that cognitive economy is occasionally manifested as an unwarranted and only partly conscious decision to switch over, in the construction of translations, to what Berger (2007) calls the experiential mode of information processing. This is a way of processing information which is not analytical in nature but rather based on intuition generated by past experience and thus susceptible to overlooking some crucial source text information. This is information which is essential to the construction of adequate translations and which can be detected by the brain in its more methodically oriented rational mode only. Secondly, the paper also argues that the notion of mental world can be invoked to account for certain aspects of cultural infelicities in translations.

A minor part of the material discussed in this paper was presented in a preliminary form at the 6th DGKL conference *Constructions & Cognition* (Erlangen, Germany, Sept 30–Oct 2, 2014) but the gist of the argumentation, especially the part related to the conclusions reached, is based on my later contribution to the *Translation in Transition II* conference (Germersheim, Germany, Jan 29–30, 2015).

1 Introduction: Errare humanum est

We know from experience that we occasionally make the wrong choice when there are more courses of action than one available in the situation we happen to be in. This is a phenomenon which makes itself known in linguistic as well as in non-linguistic contexts.



Trying to find the shortest way back to your hotel in a city you are not very well acquainted with is a familiar example of the non-linguistic variety. A few minutes after you have started walking in what you believe is the right direction you realise you did not take the shortest route after all but rather took the wrong turn at some point and ended up taking, inadvertently, a more or less distinctly longer detour.

Given the existence of such experiences, it is quite interesting to note that a recent paper by Hölscher et al. (2011), which explicitly discusses the “communicative and cognitive factors influencing planning strategies in the everyday task of choosing a route to a familiar location...” (228), is a study which concludes that “different planning and navigation conditions lead to different wayfinding strategies” (245). Given this result, it is hardly surprising that there may be different wayfinding strategies employed also in planning routes to *unfamiliar* locations, and that some of those strategies lead to (navigation) results which do not fully meet the planner’s expectations but rather lead one astray.

Misunderstanding a text in turn exemplifies the linguistic type of an incorrect choice: mistranslations occasionally occur because a translator interprets the source text in a way which is in some respect(s) different from the intentions of the author of the original text and thus ends up producing a translation which is considered to contain one or more mistakes due to such a misunderstanding of the original author’s intention(s). Arguments similarly sometimes surface because one person interprets another person’s words in an unexpected manner, resulting in the all too familiar “that’s not what I meant” conversation.

The present paper takes a detailed look at two attested cases where the wrong choice is made when a text is received, interpreted, and ultimately understood (in a manner not intended by the sender), and seeks to offer a cognition-based explanation as to why a linguistic construction is sometimes misunderstood when there are two equally sensible readings available, i.e. why language users occasionally make the wrong choice when selecting a given semantic (and pragmatic and functional) interpretation as the basis of their understanding of the text.

Translation is an activity which is crucially based on constructions. We do not translate texts word by word, not in professional settings anyway, but rather by larger chunks, by constructions and combinations of constructions. Therefore, if something goes wrong with a particular translation assignment, we would probably do wisely to start looking for the cause(s) of the failure by checking first if the analysis of the source text made by the translator is one where the constructions constituting the entire text is of the kind that makes it plausible to argue that the sum total of the constructions in the translation indeed accounts for the contents and structure of the entire original text. Further, we wish to make

sure that, between the source text and the target text, i.e. the translation, there is adequate correspondence (or equivalence or matching in the sense of Holmes 1988), i.e. correspondence which makes the source text and the translation similar to each other in an appropriate manner and to an appropriate extent so that we can justifiably call the latter a translation of the former rather than a version of the former. Yet, it sometimes happens that these requirements are not fully met and that the desired goal is consequently not reached after all.

As human beings, we are different from machines in a number of respects, but for our present concerns there is one particular difference which is of considerable significance: while even the most sophisticated machines (or computer programs, which may be viewed as a special type of machine, cf. e.g. Rammert (2008)zylberg2011) can only be made to make observations on the world, human beings can go further, viz. we can make sense of the world, that is, we can interpret and thereby understand the world and give meanings to its various phenomena. This in turn is crucially based on the fact that we continuously make assessments of and judgments on what we observe around us, the results of these assessment or judgment operations then making us do yet other things: most notably, we make decisions based on our assessments in order to reach the goals we find desirable.

In support of this view of human behaviour we can note, for instance, that there is a paper by Lupyán (2013: 615) which argues convincingly that “educated adults routinely make errors in placing stimuli into familiar, well-defined categories...”, and that “the distributed and graded nature of mental representations means that human algorithms, unlike conventional computer algorithms, only approximate rule-based classification and never fully abstract from the specifics of the input”. That is, since we are not all that good at context-free computation, we occasionally interpret a situation inadequately and make the wrong choice: “If human algorithms cannot be trusted to produce unfuzzy representations of odd numbers, triangles, and grandmothers, the idea that they can be trusted to do the heavy lifting of moment-to-moment cognition that is inherent in the metaphor of mind as digital computer still common in cognitive science needs to be seriously reconsidered” (*ibid.*).

Here, translation is no different from other forms of human action which require decision making based on analyses where assessments, judgments or evaluations of data play a major role. Language, however, does present some complexities of its own. If we agree with Langacker (2008: 457–458) that “a discourse comprises a series of usage events...” and that “conceptually, a usage event includes the expression’s full contextual understanding – not only what is said [or

written] explicitly, but also what is inferred, as well as everything evoked as the basis for its apprehension,” it becomes understandable that we occasionally miss something in such a complex project and end up generating, in translation, another series of usage events in another language which is not quite adequate for the purpose at hand and that misunderstandings accordingly sometimes occur. After all, it is pieces of language in discourse that we translate: cf. e.g. Halversen’s (2013: 34) remark to the effect that “the creation of translation..., in whatever medium, is recognized by translation scholars as an instance of discourse; that is, as a communicative event situated in historical, cultural, and personal circumstances and impacted by the particulars of those very real circumstances”.

This view seems to be compatible, in all essential respects, with what Croft & Cruse (2004: 98) say about meanings, in particular when they argue that “words do not really have meanings, nor do sentences have meanings: meanings are something that we construe, using the properties of linguistic elements as partial clues, alongside non-linguistic knowledge, information available from context, knowledge and conjectures regarding the state of mind of hearers and so on”. On such a conception of language in general and of meanings in particular, it is understandable that language users should make mistakes of especially the misunderstanding variety: if meanings are not fixed products of reification or of other similar processes but are rather the inferred end results of dynamic cognitive processes, it is more than likely that language users sometimes pay less attention than is desirable or required to what they hear or read and for that reason fail to arrive at the interpretation their interlocutor had in mind when sending the message. Therefore, as long as a person’s state of mind has an effect on how fully or appropriately the person’s brain can process the incoming message, it is understandable that mistakes are occasionally made: if a person is distracted from processing the events of incoming discourse, there may not be enough processing or monitoring capacity available to pick out all of the salient clues from the spoken or written text the person is receiving, in which case the inferential processes applied to the language data received and processed may generate a misunderstanding.¹

¹That judgment and decision making are, essentially, complex cognitive tasks affected by a variety of conditions is made exceptionally clear by Weber & Johnson (2009: 54), who strongly argue for the tenet that, although earlier studies of judgment and decision making were “dominated by mathematical functional relationship models, ... the field has started to realize, however, that the brain that decides how to invest pension money and what car to buy is the same brain that also learns to recognize and categorize sounds and faces, resolves perceptual conflicts, acquires motor skills such as those used in playing tennis, and remembers (or fails to remember) episodic and semantic information”.

Also, given that context plays such a major role in all language processing (cf. e.g. Baker 2006, Halverson 2013: 34, 45), it is not inconceivable that a language user should occasionally fail to register something in the message's textual, cultural or other type of environment, which is occasionally of a very complex nature, and instead concentrate on the contents of the message itself, which may then result in pragmatic infelicities. For example, understanding a question such as *Could you open the window (please)?* as a request rather than as a question requires that a person decoding this piece of language, as used in context, pay sufficient attention to the non-linguistic aspects of the utterance as well.

2 Decision-making: Selecting between the alternatives available

Assuming that language is crucially dynamic in character in the sense of the preceding section, it follows that language users continuously need to decide which particular interpretation they should attach to a language or discourse event that comes their way. Therefore, and also because decision making is an essentially cognitive process, it makes sense to examine this process in some detail since incorrect inferences leading to unintended and thus misconstrued interpretations are also products of bad calls or poor or erroneous decision making.

The metaphor of the human brain as a digital computer is seriously challenged by Lupyan (2013: 616), who argues – in consonance with Rosch's (1973) prototype view on categories – that “the reason people err in classifying items into categories with clear boundaries and known membership criteria is that human categorization algorithms are inherently sensitive to the particulars of the input”, and that “even in a context that calls for categorical responses, typicality continues to play a role” (Lupyan 2013: 631). Given this, we must assume that classification is no simple, invariably clear-cut matter which never leaves any residue but that it is rather a process where there are cut-off points but where these points are not fully predetermined – whence it follows that making sense of the world by means of the process of categorization is a procedure which is not implemented in the same manner by all individuals or even by any one particular individual on all occasions.

There are two particular issues which I would like to offer as major causes of erroneous decisions and which bear on the consequence of such decisions known as mistranslation. One of them has to do with the possibility of using either a highly conscious, analytical mode of processing information or else an intuitive mechanism crucially based on past experience as suggested by Berger

(2007). The other is the observation that “in choices between uncertain options, information search can increase the chances of distinguishing good from bad options...,” and the associated further observation that “competition drastically reduces information search prior to choice” (Phillips et al. 2014: 104). Let us first consider each of the two phenomena in some detail and then see how they help explain the emergence of misunderstandings and possibly also some other poor choices in translation.²

Berger (2007: 215) argues that the two modes of rational and experiential information processing “operate in parallel and synchronically but sometimes one may dominate the other,” and that “when information about threatening phenomena [is] presented in statistical or graphical form and require cognitive judgments, the rational system exerts primary influence in determining the nature of the judgment”. Thus, if a person feels that there is a threat which needs to be dealt with, the typical approach is the rational one: we try to analyse the situation rationally and in that way find a way of either removing the threat completely or at least diminishing its effects to what we consider to be a satisfying extent.³

In Hietaranta (2014), I suggest that translation tasks can also be viewed as a type of threat in that such tasks are obligations which the translators have to do something about in certain partially predetermined ways to ensure customer satisfaction. Translators need to provide adequate translations, and are thus facing something that will have unfavourable consequences for them if they do not react to the translation situations appropriately. In this sense, then, translators are dealing with a specific type of threat.

What is of the greatest significance in the present context is the observation by Berger (2007: 228) that “those who are skilled experientially [...] may [...] be able to compensate for the potential shortcomings of the rational system when the task at hand is not amenable to rational analysis [...].” Given this, one can argue that at least on some occasions it is possible and perhaps even likely that translators may resort, in an unwarranted degree or too hastily, to the experiential mode of processing the information afforded by the source text and that they may therefore fail to detect in the source text something that a more detailed rational analysis would have revealed, whence it in turn may follow that an in-

²Cf. also Weber & Johnson’s (2009: 60–62) discussion of the relevance of external search to the task of making choices.

³Berger’s (2007) distinction between the rational and experiential modes of thinking is one which is in a number of respects quite similar to the well-known distinction Daniel Kahneman makes between his System 1 and System 2 modes of thinking (for a recent exposition, see Kahneman 2011).

correct choice is made regarding e.g. word choice so that a misunderstanding ultimately occurs.⁴

I did not, however, previously consider the possible reason(s) for or cause(s) of such translator behaviour. Here, I would like to suggest the following line of reasoning, based on the discussion of the role of competition in information search by Phillips et al. (2014), as an explanation for such behaviour.

In essence, Phillips et al. (2014: 104) argue that people tend to apply minimal search strategies as the basis of their choices in cases where it is obvious or even likely that there are competitors around who “may seize the better option while one is still engaged in search”, and that people may not behave in this manner when there is lack of competition. Thus, “on a slow shopping day, the leisurely shopper … can take his time deciding whether or not to buy the television …” while “on a frantic shopping day like Black Friday, the same shopper is likely to behave very differently”. I agree with this analysis, and would in fact like to propose that it is possible to extend the analysis also to other types of situations where the notion of competition figures just as prominently even if it manifests itself in a somewhat different way.

Specifically, it seems that competition is a special case of the more general notion of psychological pressure (cf. Kilduff et al. (2010)), and that translation situations are characteristically cases where the translator has to work under some pressure at least in the sense of translators having to compete against time to meet the deadlines set for the translation commissions and also in the sense of each individual translator having to compete against herself or himself to meet or even surpass the customer’s demands and expectations.

As an example, consider the case of a translator having to meet the deadline set for a translation project. If the translator realises that the deadline is approaching and that there is still some checking or research to be done before a finished product can be supplied to the customer, it is understandable that shortcuts may be taken wherever possible, otherwise the translator’s attempt to guard her or his reputation as a punctual service provider will suffer. It is here, then, that the possibility of deciding to resort to the intuition-based experiential mode of information processing comes in handy: if you sincerely believe that you have a reasonable amount of experience regarding the type of project you are currently

⁴I am not suggesting here that the rational way of processing information is in any way necessarily superior to the experiential mode or that the rational mode is always more likely to yield more reliable or more warranted results than those obtained by the experiential mode; see e.g. Zey (1992) for a selection of approaches to cases where well-justified alternatives to rational choices are discussed in detail in a number of different contexts.

engaged in, your brain may revert, this decision never being subjected to careful, rational analysis, to the experiential mode, and start acting the way it did previously in what you believe was a comparable situation. Specifically, you will then start making decisions of the kind you made previously also, and decide e.g. to use, as a translator, the equivalent you used on the earlier occasion(s). What your brain may not be alerted to, however, is the possibility that the current situation is not fully similar in all essential respects to the earlier situation(s) after all, and that problems may therefore crop up.

Further, if we agree with Weber & Johnson (2009: 59) when they argue that “emotions experienced by the decision maker, in addition to the many cognitive factors mentioned..., focus attention on features of the environment that matter for emotion-appropriate action tendencies,” it makes sense to assume that a translator willing to retain a reputation as a high-quality professional capable of meeting set deadlines may be tempted to resort to shortcuts aiding the relevant cognitive processes even when such shortcuts might be deemed somewhat risky.⁵

To substantiate the above argumentation, let us examine two genuine cases of incorrect choice in the realm of translation and see how they might be explained by reference to what has been said above.

3 Mr Murphy at work: Selecting the wrong reading

The first case is a mistranslation which I discuss briefly in Hietaranta, where I suggest what I now believe is only a partial explanation. In short, the case concerns a mistake which was made in 2010 in the Finnish translation of a cookbook and which was of such a serious nature that the Finnish Safety and Chemicals Agency *Tukes* (<http://www.tukes.fi/en/>) decided to issue a warning on its web site to inform the general public about this potentially hazardous translation mistake. Here are the essential details of the case. The book contained a recipe where a reference was made to a mushroom whose English name is *morel* but which was incorrectly translated into Finnish by means of the Finnish word *korvasieni*. This expression, however, is not the Finnish word for *morel* but rather for another En-

⁵What I argue here seems to be fully in line with and in fact supported by Kahneman’s (2011) remarks at the very beginning of the chapter entitled *Cognitive Ease*: “Whenever you are conscious, and perhaps even when you are not, multiple computations are going on in your brain, which maintain and update current answers to some key questions: Is anything new going on? Is there a threat? Are things going well? Should my attention be redirected? Is more effort needed for this task?”

glish expression which also refers to a mushroom but to a mushroom which is extremely poisonous unless it is carefully prepared according to specific instructions, viz. *false morel*. The interesting question here is then why the translator made the wrong choice in the first place.

In Hietaranta (forthcoming) I argue that the translator behaved as follows. As soon as the translator recognises the English word *morel* in the context in question, it becomes necessary to find a Finnish equivalent to the word. Because of the type of the context (a mushroom in a recipe), a number of potential equivalents – names of edible mushrooms – are activated in the translator's mind. Next, the number of these candidates needs to be cut down so that a suitable equivalent can be found and used in the translation. At this stage, a mistake is made: the translator realises that the item *morel* has to be linked with a Finnish item which equally refers to an edible mushroom, but what the translator does not realise is that the typicality effect and cognitive economy (cf. Evans & Green 2007: 169, 260), without any authorisation from the rational mode, insidiously take over and more or less automatically activate in the somewhat unwary translator's mind an equivalent which is deceptively similar to the source text item and which the translator therefore accepts. That something like this may happen is due first and foremost to the fact that the English *morel* is known to be an expression which is reasonably common in mushroom terminology and which further refers to an edible mushroom. On the Finnish side, it is the similarity to these qualities which makes the translator accept the equivalent that first comes to mind: a relatively common item, refers to an edible mushroom, and is connected to the word *morel*. What the translator does not realise is that the Finnish item *korvasieni* is not linked with the English *morel* but rather with the spuriously similar *false morel*.

I now believe that while the argumentation above is valid in all essential respects, it fails to capture the true nature of certain aspects of the decision making involved and thus does not provide an entirely accurate picture of the case. Specifically, my previous argumentation does not seem to capture very well the fact, referred to, in a totally different context, by Sjöberg (2003: 18), that "it has been found that extensive training for expertise in a substantial area gives rise to a semi-automatic mode of functioning, which could be equated with intuition...". Thus it is quite likely that, in the case of translators as well, routines established via considerable amounts of previous experience tend to conspire to the effect that tried solutions are every now and then resorted to without a sufficient amount of explicit analysis. And once this happens, it may turn out that the new situation or problem requiring a solution is not after all quite so similar to the ones previously considered and solved, whence it follows that translators

occasionally make mistakes as a result of applying inadequate amounts of conscious analysis to the case at hand.

This also seems to accord quite well with Kiel's (2003: 671) observation to the effect that "overconfidence is also found in studies of text comprehension, in which people often do not detect their own failures to understand a passage of text...".

Furthermore, if we agree with Baars & Gage (2010: 359) when they argue that the human brain typically operates not on discrete picture level representations of the world around us but rather on "visual images that are prototypical reminders of categories in the world", it can be argued that our brain occasionally simply fails to single out the correct representative of a class, be it a mushroom or something else, and instead picks out something which is referentially and semantically close enough even if the entity picked out is ultimately not quite what we want.

In sum, while cognitive economy is a principle which enables us to ensure to some extent that there is in all likelihood always a certain amount of processing capacity available to handle emergencies, it is also the case that economising, especially in stressful situations, on that capacity by resorting to intuition to an unwarranted extent in what must be regarded in hindsight as the wrong place may lead to problems.

The second case that I wish to consider here briefly is one that I have also considered before in another connection but which I now believe did not receive a fully adequate analysis in my previous treatment of the issue (see Hietaranta 2014). In essence, the case is as follows. In December 2011, the news site of the Finnish Broadcasting Company YLE published a news item which informed the readers that according to "Interior Minister Päivi Räsänen, the cargo manifest of the M/S Thor Liberty on which 69 Patriot ground-to-air missiles were found listed the weapons as 'fireworks'. On Friday, officials announced the missiles were listed on the manifest as 'rockets', which Kotka port officials had misinterpreted as meaning 'fireworks'" (http://yle.fi/uutiset/missiles_listed_as_fireworks_on_ship_manifest/5472045). Again, the question is why the incorrect choice was made: out of two equally sensible readings, why was the wrong one chosen?

My earlier explanation was that "it is possible and probably even likely that someone whose mother tongue is Swedish read the list and by mistake connected *rockets* with the rather similar Swedish expression *raket*, which has the two meanings of 'missile' and 'firework', and that the person simply made the wrong choice". My tentative explanation was "that our brain – despite our best efforts – occasionally interprets the circumstances we are working under as threatening

to the extent that the brain, without asking for a permission from our conscious self, initiates a procedure which will not be halted until a solution has been found. This in turn is so energy-consuming that the brain will not be able to sustain such a state very long, and so a solution is as it were forced upon us..." (ibid.).

I am no longer sure that this is all that there is to the issue; rather, it seems that the brain is tempted to prefer certain types of readings over other readings in certain types of contexts. Specifically, assuming that contexts work on a principle of exclusion (readings of textual items which are not compatible with those of other items and the text in its entirety are discarded so that the intended reading ultimately surfaces), it may be that the brain for some reason fails to exclude a reading because it does appear to be compatible with the rest of the text even though it is not the only reading with that property. That is, if there are several seemingly appropriate readings available, our processing machinery accepts the reading that first suggests itself even if the reading is not the one intended by the sender of the message. This in turn may have quite a lot to do with (what I believe is) the fact that the brain tends to process contextual clues in specific ways and that the brain sometimes misjudges the relative significance of a particular clue and draws a hasty conclusion, either overestimating or underestimating some aspect of the context (cf. e.g. Dascal 2003: 169–193). In translation, some of the consequences of such unwarranted conclusions may then manifest themselves as translation errors of one kind or another.

As regards the above case of *fireworks* vs. *missiles*, the incorrect initial interpretation probably surfaced because the fireworks reading was so much more likely than the missile reading that the person reading the text just could not stretch his or her imagination to extend the processing cycle to cover missiles too. This in turn was most likely so because in most non-military circumstances missiles seem to be encountered far less frequently than fireworks.

4 Explaining translation mistakes further: Judgment and decision making in a wider perspective

It thus seems that incorrect choices or bad calls are occasionally made by the human brain because some aspect(s) of a text's cultural, textual or cognitive environment are overlooked so that the reading the brain settles on is not fully backed up by what is available, on closer scrutiny, in the situation. Why such oversights occur is a question which is most likely to have several answers of different orientations. However, it seems that quite a few of these answers or explanations, which are mutually distinguishable from each other, also share some common features.

One unifying property here seems to be cognition. Since all information entering the brain needs to be processed if the information plays a part in a person's conscious decision making and the ensuing conclusions, it follows that any piece of information which, for whatever reason(s), does not receive the attention it should, may prompt inconsequential inferences, which in turn may instigate associated actions we, on a more detailed analysis, would not be willing to subscribe to.

Against this background, consider following three points about decision making made by Weber & Johnson (2009) and their relevance to translation mistakes.

First, the above hypothesis about the tendency to use the experiential mode of information processing as a shortcut to reach a state where the brain is again reasonably relaxed and in particular has enough reserve processing capacity in case an emergency of some kind should appear seems to receive some support from Weber & Johnson (2009: 66), who refer to the good mood maintenance hypothesis, which "assumes that people in a good mood would like to maintain this pleasant state and thus try to avoid hard, analytic work and use cognitive shortcuts instead" (for an earlier formulation of the idea, see Isen et al. (1987: 1122, 1128-1130)). What is most remarkable about this hypothesis and about the evidence accumulated in support of it is the fact that in the experiments conducted it was established that "good mood resulted in inferior performance and overconfidence" while "bad mood resulted in more accurate decisions..." (*ibid.*). It is therefore quite likely that a translator who is, perhaps even unconsciously, tempted to use previous experience as recalled by memory as a shortcut solution to the problem of finding a translation equivalent may indeed end up making a translation mistake since the potential translation equivalents may not be analysed and evaluated in sufficient detail.

This is also in consonance with Weber and Johnson's (2009: 67) observation that "both cognitive ... and affective processes ... have been shown to influence people's evaluative judgments". It seems fair to assume that a translator working for commercial goals is constantly under more or less pressure and that the translator's decision making is therefore influenced by this affect.

Secondly, let us consider the translational relevance of Weber and Johnson's (2009: 70) argument to the effect that "social norms dictate the use of different decision principles in different domains (e.g., moral vs. business decisions...)". Assuming that this is so in general, it seems that we are provided with yet another explanation for the emergence of mistakes in translations for the following reason. If a translator is seeking to comply with the moral code or the principles of the work ethics of the profession to secure the quality of the finished product,

he or she will need to expend some effort to make sure that there will be no mistakes in the translation, which obviously requires that a certain amount of time will have to be spent on checking the quality of the final product.

However, on the other hand it is equally clear that business will not flourish if too much time is spent on any individual stage of a translation project; spending too much time on a project means that the project will not be an economically profitable one, which is of course unacceptable as long as the translator is translating for a living.

Thus, it is vital that the translator strike a balance between the need to use enough time on any individual project, on the one hand, and the need to economise judiciously on time, on the other. This, in turn, is tantamount to being in a situation where a decision must be made so that the moral norm of translation quality is not violated while the business norm of profitability is also observed to a sufficient extent at the same time. In such a situation the translator is then facing a dilemma whose solution necessarily calls for a reconciliation between potentially conflicting types of norms, which is yet another example of a situation where the notion of (psychological) pressure apparently has a part to play in the sense that if the pressure becomes overwhelming, the translator's brain may again inadvertently resort to a shortcut and simply force a solution on the situation so that the level of uncertainty and indeterminacy can be diminished sufficiently and a minimally acceptable level of processing capacity secured (for some relevant discussion of some of the details pertaining to uncertainty and indeterminacy management, see e.g. Gudykunst 1988; Angelone 2010). If this happens, it should come as no great surprise that a mistake may be made, one or another aspect of the translation process having been subjected to insufficient analysis and some subsequent ill-founded decision making.

Thirdly, the type of analysis advocated in the present paper also seems to receive some support from the fact that Weber & Johnson (2009: 72), too, independently argue for a view on decision making which, on nonlinguistic grounds, appears to be fully compatible with what has been argued above. Specifically, Weber and Johnson note that "individual and cultural differences in decision making seem to be mediated by two classes of variables: (a) chronic differences in values and goals, ... and (b) differences in reliance on different automatic versus controlled processes, related to cognitive capacity, education, or experience". Thus, in a vein similar to Berger (2007), Weber and Johnson here invoke the notion of automatic or less analytic behaviour as an explanatory factor in their account of differences in decision making between individuals and cultures, and on this basis also one can then argue that translation mistakes are sometimes committed

because not all translators are always capable of retaining an analytic approach to their tasks even if such a method is required; rather, it seems that some translators may at least temporarily discard the analytic mode of information processing and instead attempt to construct at least part of the translation by means of techniques which are essentially experiential in nature.

That this is a plausible explanation is a claim which is supported by Weber and Johnson's (2009: 73) observation, based on the cognitive reflection test, that "normative choice models may turn out to be descriptive for at least a subset of the general population, those who have a greater ability or inclination to use rational/analytic processing in their decisions". That is, among translators too there are people who are more prone to analytical thinking and information processing than others, which is one reason why not all translators make the same (kinds of) mistakes when translating the same texts. Those with less patience and more willingness to take risks may well make mistakes which the more analytically minded and cautious colleague may be able to avoid.

5 A methodological note: Emotions and cognition

The explanations propounded for the two cases of misunderstanding discussed above in §3 undeniably presuppose that cognition is not an independent human faculty but rather that there are inherent connections between emotions and cognition, in particular. Otherwise it will not be possible to argue that the brain may be likely to prefer certain types of readings or interpretations in certain types of contexts. This is so because in many cases the type of context is determined to a crucial extent by factors connected with emotions; for instance, arguing that the desire to save face for professional reasons is a valid explanatory factor when explaining misunderstandings in translation only makes sense if we assume that emotions affect cognition, the desire to save face being by definition an emotional concept. Thus emotional concepts frequently though not invariably constitute a necessary part of the explanatory apparatus we need to invoke when we try to make sense of what happens in cases of misunderstanding such as the ones discussed above.

While there are a variety of accounts of emotions as regards the ways they affect language use and cognition (cf. e.g. Power 2006), there are a number of empirical findings which suggest that it is the complex interplay of different emotions which accounts for much of how our cognition relates to and deals with emotions when we use language. Further, and most importantly for our present concerns, it appears that it is group-level phenomena which particularly shape

individuals', including translators', ways of dealing with emotions as they connect with human cognition (cf. van Kleef & Fischer 2016).

Thus, given that a translator working for a commercial employer is frequently working under at least somewhat demanding conditions e.g. when the deadline is approaching, it is more than likely that some of the decisions the translator makes are also affected by factors which are inherently coupled with group-level phenomena. This is so because translators are nowadays typically connected with other translators and experts via different types of networks connecting groups of people (cf. e.g. Tyulenev 2014), and are therefore also affected in their decision making by other translators and experts. Among these group-level phenomena influencing translators' decision making procedures and the ensuing (mis)interpretations of the source texts they are working on, at least two specific types are of methodological significance.

First, as argued by Power (2006: 710), "basic emotions can become 'coupled' with each other" so that emotions may and occasionally in fact do influence each other, which makes it very difficult to analyse emotions in completely unequivocal terms. The specific case of the two emotions of anger and disgust examined by Power is a relevant example in the present context also in that in Power's study the emotion term *disgust* was found to correlate "more highly with the 'Anger' basic emotion scale than it did with its own predicted 'Disgust' scale".

Therefore, if a translator becomes disgusted even by some minor problem(s) with a translation project, it may happen that the translator is also angered through frustration, for instance when an adequate translation equivalent does not present itself to the brain quickly enough. In such circumstances, the translator may then very well accept the first sensible alternative which becomes available after some deliberation. But as we have already seen, there may be several sensible alternatives available, and on second thought it may turn out that it is not the first candidate that the translator should choose. The problem is that the second thought may never materialise itself.

Secondly, in the case of our latter example of the English rocket, group-level phenomena may equally have come into play. Assuming that the brain utilises contextual information in language processing to exclude readings of textual fragments which are incompatible with the remainder and the whole of the text, it may still happen that the brain fails to exclude a sensible reading of part of the text because the reading in question is preferable for emotional reasons with regard to cognitive economy. Note the time of the misunderstanding in the fireworks/missile case: according to the news item, the misunderstanding took place on 21 December 2011, that is, just a few days before Christmas and just ten days

before the new year. In such emotionally loaded circumstances, it is quite likely that a person who is not a professional translator but who is still in need of a domestic equivalent to a foreign expression will readily settle for the first sensible option that comes his or her way. Now, what would be the most likely candidate for such a first sensible equivalent? Since both Christmas and New Year's Eve are times when fireworks are regularly used and seen virtually everywhere in Finland as well as in many other countries, it is quite understandable that it should be the firework interpretation which first came to the mind of the unfortunate layperson translator.

Methodologically, it is of special significance in the present context that the accounts provided above clearly rely on the assumption that the human cognitive systems – particularly as they are related to decision making – are not independent of our emotional states but rather both affect them and are affected by them. For this assumption, there seems to exist a body of data which is reasonably convincing both in terms of its quantity and its breadth. Let us consider here just one piece of evidence which relates directly to single word processing since the examples considered above involve single lexical items.

If Vinson et al. (2014) are correct to argue that “even single words in isolation can evoke strong emotional reactions” (737) and that “both negatively and positively valenced items are relevant to survival and well-being” (744), it is more than likely that lexical items such as *morel* and *fireworks* were both submitted in their respective contexts to processing cycles where emotions were crucially involved for reasons related to existing time limitations and the eventually ensuing risk of face loss if not for anything else.

In sum, then, it seems fair to say that human cognition is affected by emotions in a variety of ways, and that the argumentation of the present paper is thus based on solid grounds as regards the use of emotions as an explanatory factor in the analysis of the cases discussed above.

6 A final note: Cognition in communication

That translation mistakes are committed in the first place is an observation which is worth subjecting to closer scrutiny because communication in general is relatively smooth and unproblematic even if it does break down occasionally in one way or another (cf. e.g. Bosco et al. 2006). Because of the additional linguistic load on communication through translation one might hypothesise that there is something additional about the combination of languages involved in translation which makes it exceptionally hard for human cognition to handle and that

the process of communication therefore sometimes breaks down in the form of translation mistakes, in particular (cf. e.g. Angelone 2010: 17).

Above, I have offered, with special reference to the process of decision making, what I believe are some cognitively motivated explanations for such mistakes. Now, to conclude the discussion, I propose to tie up the analysis of translation mistakes in the decision making frame with the larger picture of communication in general.

Assuming that Piller (2010), among others, is correct to argue that cultural factors have a notable effect especially on the pragmatics of human interaction, it makes sense to assume that at least some of the difficulties and problems surrounding translation are dependent on if not caused by cultural differences. Yet, there are clearly other types of problems involved too, and some of these non-cultural difficulties are arguably related to communication in general even if the specific framework assumed is that of translation. Thus Angelone (2010), who specifically discusses the effects of uncertainty and uncertainty management on translation-related problem solving tasks, argues that “the translation task is essentially a chain of decision-making activities relying on multiple, interconnected sequences of problem solving behavior for successful task completion” (17), and that difficulties in translation typically lead to uncertainty: “Should the translator’s declarative or procedural knowledge begin to falter at the point of difficulty, *uncertainty* will likely emerge shortly thereafter”, uncertainty being defined as “a cognitive state of indecision that may be marked by a distinct class of behaviors occurring during the translation process” (18) (italics in the original – PH).

What is of special significance for our present concerns is Angelone’s observation that, for any successful completion of a translation task involving problems, “in addition to solution evaluation, two other fundamental uncertainty management problem solving strategies must be considered, *problem recognition* and *solution proposal*” (20, italics in the original – PH). For it is clear that a problem can be either solved or even avoided completely only if it is recognised in the first place; a problem cannot be solved if it is not known to exist.⁶

Thus a translation mistake may be avoided if the translator is aware that a particular type of text in a given type of context is only seemingly easy to translate

⁶The problem may still exist even if it is not known to exist, only it may not surface until it starts having visible consequences as in the case of mistakes in translation causing undesirable recipient behaviour, e.g. people cooking meals which cause food poisoning because of a mistake in the translation of a recipe; for an example in a Finnish context see <http://www.tukes.fi/fi/Ajankohtaista/Tiedotteet/Kuluttajaturvallisuus/Ruokaohjeiden-kaannosvirheet-voivat-aiheuttaa-myrkytysvaaran/>.

and is in fact deceptively transparent as far as its translation is concerned. That is, an existing problem can be solved as soon as it is recognised as one. In this sense, translation problems are similar to a number of other types of communication difficulties: a remedy can be administered only if the disease is first diagnosed properly.

As regards people's success in coping with uncertainty management related to translation tasks, it is quite revealing to note Angelone's findings about what really counted in the experiments he conducted on uncertainty management involving translation: "When this study was first conceptualized, assumptions were made that expertise in uncertainty management would be revealed by more frequent expression of metacognitive indicators (such as direct articulation) on the part of the professional. While that assumption, as far as it went, was supported, the fact is the mere quantity of metacognition or articulation was not the indicator of expertise and improved performance. Clearly, the manner in which uncertainty management unfolded was a much more reliable indicator of potential success in translation than the simple frequency of uncertainty management behaviors" (37). Assuming that this is a valid and reliable result, we can then argue that some mistakes in translation are explainable at least to some extent by reference to the different techniques different translators employ while practicing their profession: those that are capable of solving decision making problems in ways which include adequate amounts and appropriate types of problem articulation (the problem is formulated in sufficiently explicit terms) and solution evaluation (the solution entertained is checked by reliable and appropriate means) make fewer mistakes than those whose metacognitive competence is of the kind which is less suitable for translation work.

This conclusion, it seems, is fully in line with the conception of translations as attempts to solve problems: a source text (or to use Halverson (2013: 37) more chronologically oriented term *anterior text*) which needs to be translated can be construed as a kind of a problem, and just as (especially larger) problems are typically solved step by step, a translation task is also accomplished in stages. In this view, translation is not unlike monolingual communication, where the goal of getting oneself understood by means of a linguistic message or that of understanding someone else can also be viewed as problems awaiting solutions. And just as the implementation of any plan drawn for the purpose of reaching a specific (type of) goal needs to be executed in steps, so is a translation task essentially, because of the decision making operations required, a problem solving task which enables the translator to reach the desired goal at an acceptable cost only if the sum total of the efforts expended on the project includes some

minimal number of relevant cognitive operations, which is not always clearly specified or perhaps even specifiable.

Yet, as noted by Halverson (2013: 39), it is clear that in intercultural communication in general, whether the communication is monolingual or multilingual, there is less common ground than in monocultural communication: “It is obvious ... that in intercultural communication, whether monolingual, bilingual, or multilingual, the assumption of shared lived environments does not hold: the knowledge bases [of the participants] that may be activated and evoked, as well as the conventional paths of inference, may differ widely”. Since translation is inherently an intercultural operation, it is thus only to be expected that there will be problems in translation, the translator always being natively familiar, through his or her mother tongue competence and its associated culture, with the inner workings of one culture only, whence it follows, in particular, that it is the “conventional paths of inference” of that culture only which are readily available to the translator for decision making purposes and other high-level cognitive tasks. In this light, a translation mistake is therefore sometimes caused by the fact that the translator is unable to come up with a translation which would enable the recipients to process the translation by using their own domestic inference machine because of the way the translation is constructed.

This obviously accounts for the fact that recipients sometimes find parts of translation difficult to understand but it also accounts for the possibility of translation mistakes in the following sense. If the translation is constructed in a manner which reflects the translator’s inadvertent or unconscious decision to reflect the inference types available in his or her native language and source texts e.g. by means of lexicalisation where no corresponding technique is available in the target language text, the end result in the form of the finished translation may ultimately contain forms and expressions which are not entirely natural in or native to the target language communication but rather betray their foreign origin via the inference mechanisms required for their successful processing (cf. Weigand 1999: 773). The translation sounds “odd”.

That this unnaturalness is a general phenomenon detectable in communication in general and not limited to less felicitously translated texts (translationese) is suggested in a number of studies. Thus it is argued e.g. by Mustajoki (2012: 223) that “communicative ability includes not only a repertoire of words and structures of the language concerned, but also the skills that are needed to use them in various contexts...”. Therefore, it does not really matter as far as success or failure in communication is concerned whether a person is lacking in communicative competence in a monolingual or in a multilingual context: in either type of context, such a lack is liable to create problems.

But it is not only a lack of competence which may lead to difficulties in communication. What is most important in the present connection is Mustajoki's further argumentation (229), on the basis of the experiments conducted by Keyzar & Henly (2002), to the effect that "people are systematically biased to think that they are understood when they are not...". That is, when we perceive no distinct differences between ourselves and others, we tend to use ourselves as the relevant yardstick and reference point. Consider what this means as regards translation. If a translator is gauging the cultural and/or linguistic distance between his or her own culture (language) and that of the future readership and cannot detect, on a particular dimension or even more generally, any clear difference between the source text environment and the target text environment, he or she is likely to rely, even unconsciously, on the cultural and linguistic practices of his or her own culture, and may thereby force some of the associated inference mechanisms on the readers, thereby either making it difficult for the readers to decipher the translation in its entirety or producing a translation which is not adequate or which may even contain one or more translation mistakes.

Also, as regards translators themselves as human agents, it is likely that they may genuinely believe that they have understood the text they are translating when in fact they have not. This is so because "one basic desire of people is the wish to be regarded as smart and intelligent" (Mustajoki 2012: 230). If this is so, it is more than likely that there are translators out there who sometimes do not dare to admit to themselves that they have not understood a text they are supposed to translate; if they did, they might lose their face in front of their customer(s). Such intellectual dishonesty towards oneself is of course virtually bound to lead to translation mistakes sooner or later – most likely, sooner.

Given, then, that translation mistakes are a special case of the more general phenomenon of communication failure, we can say that there are both personal factors and social conditions which contribute to the occurrence of translation mistakes. On the one hand, overconfidence in one's abilities combined with the desire to make a favourable impression on other language users is a likely explanatory factor in some cases of miscommunication involving translation errors of one kind or another. On the other, there are also culturally instilled conditions which are conducive to making translators susceptible to translation mistakes; since familiarity breeds contempt, similarity on one conceptual dimension or other is occasionally taken for sameness or equivalence, and a translation mistake is consequently committed.

In sum, what is argued here seems to agree with most of what is suggested by Mustajoki's (2012) general account of communication problems, where the

notions of cognitive economy (the tendency to avoid processing efforts which are not deemed vital) and mental world (which includes a person's cultural background, internalized cognitive patterns, emotional states, and various situational factors) play major explanatory roles. With these notions, it appears to be possible to account for a relatively large number of different types of translation mistakes and problems in the manner illustrated above.

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Chapter 18

Aspects of a primacy of frame model of translation

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Frame Semantics and Construction Grammar are two highly interdependent cognitive linguistic theories which have been used in various ways to date to analyse and model translation. However, a unified model on how frames and constructions (are) operate(d on) and interact in translation, i.e. a translational perspective on and of frames and constructions, has not yet been fully developed. The model proposed in this paper is intended to narrow this gap. In drafting this model, I establish the principle of maximum frame comparability. I furthermore analyse factors which may lead to an override of this principle. From these analyses, I deduce research questions the investigation of which can benefit both translation studies as well as the theoretical frameworks Frame Semantics and Construction Grammar.

1 Introduction

Though we can contend that “transferring” “meaning” is the main objective of a translation, the wish to “transfer” this “meaning” in a precise and adequate fashion often collides with constraints e.g. on the forms we can use, or in other words the grammar of a language. This can be observed in the following example from the CroCo-corpus (Hansen-Schirra et al. 2012):

- (1) Einzelheiten können Sie diesem Bericht entnehmen.
Details can you from-this report take.out
Additional details are contained in this report.

In the German original, we have a construction, a sentence initial direct object followed by the finite verb, which cannot usually be reproduced as such



in English. There are various ways how to deal with this in translation (Hansen-Schirra 2008; Čulo 2016), focussing on various aspects of the original. In this case, the translator decided to leave the *details* in sentence-initial position, giving it a certain attention focus, similar to the German original. As the sentence initial element in English usually is the subject, *details* is shifted from the direct object to the subject grammatical function. With a new subject in the translated sentence, the main verb is accommodated accordingly, resulting in a different perspective and thus a slight shift in “meaning”: While the German original speaks of an action, somebody taking out something from a “container” (i.e. the *report*), the English translation describes a state, i.e. something as being inside a “container”. This shift leaves us with at least two questions: If meaning is central to translation, which factors can lead to shifts in “meaning”? And how can we describe shifts in “meaning” in a systematic manner, making use not of prose but e.g. of abstract schemata?

“Meaning” can involve various aspects. Without diving too deeply into any philosophical discussion on what “meaning” exactly entails, we can distinguish at least two aspects on a coarse level of abstraction: First, the information that is contained in an expression or its *semantics*. This is comparable to the idea of the propositional act (Searle 1969), which entails references to entities and predications on them. It is information expressible in abstract, schematic ways, but not the meaning as it is construed by an individual and enhanced with personal emotional, associative, aesthetic or other aspects. Second, the effects that we connect with the way we present the information, or in other words the *function* of an expression. This is different from the intentions of a speaker/writer, which are not available to us unless shared with us (even though they can often be at least partially inferred), whereas the function of an expression, e.g. guiding attention focus towards a certain element within a larger construction, is collective knowledge. In the above example, two aspects of “meaning” collide: The attention focus that is put on the sentence initial element by the German sentence construction, the perspective on the information and the actions around it resp. its state, and last but not least the formal grammatical make-up of the sentence such as what the subject of the sentence is. The problem in example 1 is that not all three aspects, form, function and semantics can be fully rendered the same way at the same time in one message in the target language.

The translation aspects in focus in this paper are thus the operations on form and semantics during a translation, with a certain function in mind, and the interaction of these aspects.

In this paper, I present the draft of a model of translation which focuses on these aspects of translation and aims at an integrated view of the three dimensions form, function and semantics. It aims at describing how these dimensions may manifest in similarities and differences between original and translation product, with occasional reference to which role processual factors may play.

In order to model the linguistic aspects of translation along these three dimensions, I make use of Construction Grammar (henceforth CxG, cf. e.g. Fillmore 1985b; Goldberg 1995)¹ for more form-oriented aspects and Frame Semantics (henceforth FS, Fillmore 1982; Fillmore 1985a) for semantics-oriented aspects. Function manifests as the choice of certain formal or semantic aspects over others. I have chosen CxG and FS because these theories do not solely rely on studying a system of signs or constructs, but they also assume that background knowledge, including personal and cultural backgrounds and beliefs as well as world knowledge, is directly involved in producing or understanding linguistic expressions. According to these theories, links between forms and meanings are conventionalised, and these conventions can be learned, extended and changed. In their basic assumptions, CxG and FS are thus highly compatible both with the aim of this paper and a functional-cognitive view on translation serving as the backdrop of the model proposed in this paper.

In this model, I assume that the semantics of an expression is what by default makes up for the key considerations in translation. As the semantics is represented by means of frame descriptions, it is called the *primacy of frame* model. By saying “primacy of frame”, I do not mean to imply that semantic information is processed first or necessarily processed at all on a neurocognitive level; but in a cloud of features representing functional, formal and semantic aspects, by default semantic aspects should receive most consideration. In developing this model in the following sections, I will also present cases in which, I believe, formal or functional considerations override certain semantic ones, rounding off a model in which, though we can assume the various dimensions to be somewhat structured internally, no dimension is immutable and none is absolute.

The model drafted here does not only address translation settings involving one lonely translator in their quiet chamber. The methods of analysis applied here rest on principles laid out by CxG and FS which I assume collectives (can) share. The model should thus just as well cover translations that were made by a crowd or revised at a later stage.

¹The references cited here refer to different incarnations of Construction Grammar, but the principles of CxG referred to herein are shared by these varieties.

While I will mainly be using CxG and FS for the analyses in this paper, this model does not intend to be an island theory. It is quite clear to me that CxG and FS analyses will not suffice to explain each and every translation phenomenon. The two cognitive linguistic theories used here are, however, compatible with a number of other theories such as the metaphor theory by Lakoff & Johnson (1980); Lakoff (1999) or mental spaces theory by Fauconnier & Turner (2002) which can serve as further explanatory devices.

I am also aware that some of what will be said here may be reminiscent of and hopefully much of it compatible with what has been said in other places in cognitive (translation) studies, e.g. on the cognitive basis of translation phenomena (Halverson 2003), linguistic theory and how it can be modelled by means of networks, e.g. Word Grammar (Hudson 2007) and an extensive body of process-based and neurocognitive investigations into translation (cf. Göpferich 2008; Aitchison 2012 for an overview). The model drafted here simply represents a FS and CxG perspective. In later stages, it should be aligned with findings from the fields cited above. In this paper, I will focus on the aspects of a frame-and-constructions analysis and explanation as I envision it and on highlighting which benefits I expect from adding FS and CxG to the mix (§3). I will also lay out further principles beyond those stated above for a primacy of frame model, deducing from them further research questions (§4).

In drafting this model, I will refer to empirical findings of a number of researchers (including myself) and will attempt to come up with a coherent model. These findings do not only involve findings from corpus studies, but to a lesser extent also from translation process and neurocognitive studies. It needs to be pointed out, though, that this model is rather a *mental* model of translation, as opposed to a *neurocognitive* model; i.e. it deals with a higher level of abstraction of operations, both conscious and subconscious. Some statements made here may run counter to findings from neurocognitive studies. I will, however, leave the resolution of potential contradictions to future research.

2 Frames, constructions and translation

In recent years, the cognitive paradigm has been on the rise in translation studies, as witnessed by a growing number of events and publications on the topic. As the informed reader will know, this not a completely new topic, though. It was already in the 1980s that, for instance, Krings (1986) used Think-Aloud-Protocols to look into what is going on “inside the translators’ minds”. Recent advances in technology have opened new windows into the translators’ minds: By means of key logs, eye tracking protocols, brain imaging techniques etc. we can look

not only into conscious verbalisations, but also into unconscious operations and strategies during the translation process.

The idea of using FS to model a product-oriented perspective on what “goes on” inside the translators’ minds is not a new one, as we will see in the following. More recently, CxG has also been playing a role in Translation Studies. In the following subsections, I will first give a brief introduction into FS and CxG and will then present some approaches which involve at least one of the two theories and are relevant for this line of work.

2.1 Frame semantics and Construction grammar

Frame semantics and construction grammar both originate from Charles Fillmore’s work. His valence theory-based Case Grammar (Fillmore 1968) soon evolved into a theory of a semantics of understanding (Fillmore 1985a). While frame semantics focuses on the semantic side of language, Construction Grammar (Fillmore 1985b) deals with the grammatical side. CxG has seen adoption by many, resulting in various incarnations of CxG. In this paper, I will not position myself in favour of any of those incarnations, but will stick to the basic tenets shared by most if not all theories belonging to the CxG family.

FRAME SEMANTICS is a semantic theory of understanding: In his frame semantic theory, Fillmore highlights the importance of background knowledge for the interpretation of linguistic expressions and thus distances it from purely truth-semantic theories. A frame is defined as a:

... system of concepts related in such a way that to understand any one concept it is necessary to understand the entire system; introducing any one concept results in all of them becoming available. — Petrucc (1996)

The theory of frame semantics is closely entrenched in a linguistic paradigm. While FS in many ways is a theory of the system of concepts prevalent in a culture (or, more generally, a collective of speakers), it also captures the relation between linguistic material and mental concepts. A frame is *evoked* by means of linguistic expressions, and by this evocation our background knowledge is activated and helps us interpret an expression. One of the most popular examples to describe this is by means of the COMMERCIAL_TRANSACTION frame. In this frame, a BUYER and a SELLER are involved in a transfer of Goods in exchange for MONEY. This frame can be perspectivised in various ways: In the COMMERCE-BUY scenario, the focus is on the BUYER, in the COMMERCE_SELL scenario on the

SELLER. But the fact that the frame is linked to the evoking elements such as *buy*, *purchase*, *sell*, *price*, etc. and that the frame as a whole is activated in the process of interpretation allows us to fully understand partial instantiations of a frame. So when we read/hear a sentence like

- (2) Jane sold her house.

we understand that it was sold to someone and for a certain amount of money, even though this is not explicitly mentioned.

This example highlights an aspect of the theory which is central to it – and interesting with respect to translation: the various different realisation of a COMMERCIAL_TRANSACTION are instances of different perspectives on events. This notion of perspective is an important one in translation: it is not rare to find shifts in perspectives in translations, as demonstrated by the following well known example from Vinay & Darbelnet (1995: 104):

- (3) Blériot traversa la Manche par avion.
Blériot traversed the channel by plane
Blériot flew across the channel.

While in the French version it is the direction of motion that is encoded in the verb, the English version realises the manner of motion in this place. The two different frames instantiated here can easily be related to each other, coming from the same domain. Also, this difference in how motion events are usually encoded in Romance and Germanic languages is well documented (cf. e.g. Talmy 2000; Slobin 2004). One question of course is to which extent such shifts in perspective can be described and explained by means of frame semantic analysis. This question will be addressed in §2.2.

FrameNet (Fillmore et al. 2003) contains a list of frames together with the linguistic expressions they are connected to based on corpus data. Each frame entry gives a definition as well as a list of core and peripheral frame elements. For lexicalised frames, a list of lexical units which evoke the frame is given, and for many lexical units, corpus examples and the annotation scheme can be viewed. Frames do not stand just for themselves, but are also connected to each other via frame-to-frame relations. The frames FILLING and FULLNESS, for instance, are connected via the *inchoative of-relation*, where FILLING is inchoative of FULLNESS. Other relations currently defined include such relations as *inheritance*, *precedence* or *causation*. FrameNets exist in various other languages, with differences in coverage, e.g. for German (named SALSA, Burchardt et al. 2006), for Japanese (Ohara et al. 2004) or Spanish (Subirats Rüggeberg & Petruck 2003).

CONSTRUCTION GRAMMAR has a variety of incarnations (e.g. Fillmore 1985b; Fillmore et al. 2012; Goldberg 1995; 2006), but all of them based on a set of compatible definitions and assumptions (cf. Stefanowitsch & Fischer 2007 for an overview). Most notably, CxG does not assume a strict division between lexicon and grammar, but rather a continuum. A construction is defined as a pairing of form and meaning; the concept of form comprises the whole range from morphemes to lexemes to phrasemes to grammatical patterns and even textual patterns. For instance, the *Caused Motion* construction (Goldberg 1995: 3, 9f.) is realised by the pattern *Subject-Verb-Object1-Oblique*, as in the following example:

- (4) Pat sneezed the napkin off the table.

Though *sneeze* is not usually thought of as a transitive verb, we understand the caused motion aspect when it is used in within the grammatical pattern associated with the construction. The form-meaning pairing is conventionalised and the frequency of occurrence is crucial both for acquiring as well as entrenching a construction as such.

The Berkeley Constructicon (Fillmore et al. 2012), an extension of FrameNet, contains a list of constructions with the definition of their grammatical pattern, the list of the construction elements and an informal description of their semantic and pragmatic properties. This Constructicon, which lists English constructions, is used as blueprint and as source for contrastive studies for Constructicons in other languages such as Swedish (Sköldberg et al. 2013) or German (Boas 2013).

2.2 Applying frames and construction to translation or the analysis of translation

There have been a number of studies and approaches to studying translation by means of FS and/or CxG; the list of those presented in the following is certainly more than incomplete. What they lack, however, is a unified, consistent model not of how FS and CxG may serve as linguistic theories for the study of translation, but of how they may serve as *translational* theories (though, of course, with a linguistic perspective). An underlying, common model should connect these studies, which sometimes give a very broad idea of how to apply FS and CxG in a translational perspective, and sometimes focus on very specific phenomena, not taking the great big whole into account. Based on the following coarse overview of relevant studies and approaches, I will identify some of the benefits I expect from taking a translation perspective on frames and constructions in §3, where I will also identify the research questions which are connected to a unifying model, the primacy of frame model, presented in §4.

Vannerem & Snell-Hornby's (1986) approach already contains some of the ingredients of a primacy of frame-model. According to them, there can be three ways of translating: By means of a *scene-to-scene*, *scene-to-frame* or a *frame-to-frame* transfer. Their theory is based on earlier versions of frame semantics, then still named *scenes-and-frames* semantics, where the scene roughly corresponds to a frame and the frame roughly to a (phrasal or sentential) construction. Vannerem and Snell Hornby's model is based, in current terminology, on the following key observation: If the frame in source and target language are equivalent for the given context, the transfer is simply a matter of finding the right construction(s) in the target language, resulting in a construction-to-construction transfer. Sometimes, however, adaptions need to be made in terms of the semantics (the frame, in our current terminology), but the authors give a few examples of adaptions that can be made.

Kußmaul (2000) discusses a number of kinds of adaptions on the semantic level that may occur in translation. He cites various cognitive theories such as script theory, lateral thinking and frame semantics, and integrates them into a four-phase approach to translating. He demonstrates how, by means of using our knowledge of frames, we can find translation solutions that go beyond an exact reproduction of the original. He discusses the translation of a line from the Musical *Cats* (ibid.: 158f.), where, given the constraints of metrics, an exact translation is not always possible:

- (5) Als man täglich von ihm in der Zeitung gelesen
When one daily of him in the newspapers read.
Though his name was very famous, he says, in his time

Being famous activates frames in which it is defined that fame comes with regularly being on TV or in the newspapers. This is thus a case of activating parts of a larger frame within a domain. Kußmaul's approach offers a number of insights into how different frames may be connected and how their connections can be exploited.

The foci of the two models by Vannerem/Snell-Hornby and Kußmaul are somewhat different: Vannerem and Snell-Hornby present a more general approach on how frames and constructions serve as points of orientation in translation, with various types of replacement operations (e.g., in their terminology, frames for scenes, frames for frames). Kußmaul shows how the background knowledge connected to a frame can be exploited to choose different perspectives in translation. Neither of the two approaches is spelled out in such a way, though, that types of permissible links are investigated and they are somewhat underspecified as to which factors (generally) lead to which sort of shift.

Padó & Erk (2005) report on a finding with regard to systematic differences between English and German in framing causation for events like changing a position on a scale. They survey a small English-German sample from Europarl (Koehn 2005) with the translation pair *increase* – *höher* ‘higher’. When a Cause or Agent is present with *increase*, the lexeme is associated with the CAUSE_CHANGE_OF_POSITION_ON_SCALE frame (CCPOS), else with the CHANGE_OF_POSITION_ON_SCALE frame (CPOS). The German adjective *höher* can only instantiate the CPOS frame (in this particular meaning); the causation aspect is then expressed by a second frame in the sentence, such as in the following sentence pair (cf. Padó & Erk 2005 frame evoking elements in caps, frame elements in brackets):

- (6) wenngleich [der Welthandel]_{CAUSE} [einen HÖHEREN_{CPOS}
 [Wohlstand]_{ITEM}]_{EFFECT} ZUR FOLGE HAT_{CAUSATION}
 though [world trade]_{CAUSE} can of course INCREASE_{CCPOS} [prosperity]_{ITEM}
 ‘[...] even if world trade has higher prosperity as result’

The lexical units *increase*, *höher* ‘higher’ and *zur Folge hat* ‘have as a result’ evoke the CCPOS, the CPOS and the CAUSATION frame respectively (marked by underlining in the example). In the German version, the inchoative CPOS frame is embedded in the CAUSATION frame, and together they convey the meaning which is conflated in the Ccpos frame in the English version.² The authors note that in their data, the adjective *höher* is only used in the inchoative meaning, which results in the consistently observed pattern of two-to-one frame matches between German and English versions.

Serbina (2013) studies constructional shifts when translating the basic *Subject-Verb-Object* construction in English into German. She finds that there is a tendency for shifts (though not a strictly significant one) when the subject is filled with an inanimate entity, something that has been described in the contrastive linguistic literature before (cf. e.g. Hawkins 1986; König & Gast 2005), as illustrated by examples such as the following König & Gast 2005: 108):

- (7) Mit dieser Werbung werden wir viel Hundefutter verkaufen.
 With this advert will we much dog-food sell
 ‘This advert will sell us a lot of dog food.’

²I speak of “versions” here because it is not clear from Padó & Erk (2005), whether the examples were checked for the status “original” or “translation”; nevertheless, the relation described here seems to hold irrespective of the original vs. translation status in their sample.

Serbina finds a tendency for shifts in cases in which the English original has an unagentive subject. According to her evaluation scheme – in which she does not only distinguish between agentive and unagentive, but between human, animate and inanimate – the effect is only weakly significant, though.

The studies by Padó and Erk and by Serbina investigate specific factors for frame or construction shifts in translation. Their studies can serve as blueprints for further studies, and their findings can be well integrated into a model studying factors for such shifts.

Rojo & Valenzuela (2013) look at constructions from a process-based perspective. They focus on a case of *constructional mismatch*: The English resultative construction has no counterpart in Spanish, unlike the English predicative construction. In their experiment, they asked their subjects to translate sentences of which some were given in the predicative variant such as *She hammered the metal until it was flat* and the resultative variant *She hammered the metal flat*. The authors find that translating the resultative variant into Spanish took longer and resulted in more fixations than for the predicative variant, underlining the relevance of the concept of a construction in the translation process and building a bridge from product-oriented linguistic theory to process-oriented cognitive studies.

In Čulo (2013), I combine construction analysis and frame analysis to study shifts in form and meaning of a translation which I hypothesise to be induced by a constructional mismatch, such as the sentence initial direct object followed by a verb in German. An example of this is the following sentence pair:

- (8) Handlungsbedarf wird ES auch weiterhin GEBEN_{EXISTENCE} .
Need-for-action will it also furthermore give
More changes will TAKE PLACE_{EVENT} in the future .

As I report in Čulo (2016), there are various strategies to deal with this. The simplest would be to just switch the order of subject and object, losing the focus on the direct object. In (8), the translator decided, it seems, to mimic the information structure of the original sentence, but by shifting the element which was a direct object in German into the subject in English, the main verb of the sentence needs to be accommodated. This results in a frame shift between the sentences: While the German original speaks of the EXISTENCE of a need for change, the English version describes the EVENT of a change happening in the future. Despite this shift in semantics³, we can still relate the two sentences to each other in terms

³ And leaving out the question of whether the context licenses this shift.

of “semantic similarity” and model this relation by means of exploiting frame-to-frame relations as proposed by Ellsworth et al. (2006) and demonstrated in Figure 1.

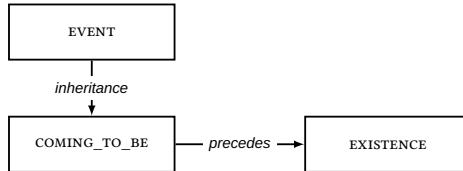


Figure 1: Frame-to-frame relations connecting the frames EXISTENCE and EVENT

The EXISTENCE frame is preceded by the COMING_TO_BE frame which, in turn, inherits from the EVENT frame. The frames EXISTENCE and EVENT are thus closely related and we can state that the two sentences in (8) are semantically similar, something that we would expect of an original and a translation.

The cross-lingual application of such frame-to-frame relations opens up more questions than it answers. The English frame hierarchy can be well exploited where regions of the frame hierarchy are structured in the same way. It is not clear yet, though, how to proceed in cases where regions of the frame hierarchies for two languages are divergent, such as for the legal domain between Brazilian Portuguese and American English (Bertoldi & Chishman 2012). Also, it is not yet clear how many steps through the frame hierarchy we can take and still plausibly claim “semantic similarity”. Nevertheless, this study exemplifies how to take an integrated perspective on both form and semantics, with function playing a key role in the choice of formal and semantic aspects.

3 Frames and Constructions within a cognitive translation paradigm

In the following I list the expected positive outcomes of using FS and CxG as basis for the primacy of frame-model, and I will also address cases in which FS and CxG benefit from testing and application within the primacy of frame model.

3.1 FrameNet and the Constructicon as resources

One thing that both FS and CxG have to offer is that, through projects such as Frame Net and the Berkeley Constructicon, there is already an existing inventory

of categories for frame semantic and constructional units. Moreover, the English versions of these inventories have served as blueprints for similar projects in several other languages, among them SALSA as German version of FrameNet (Burchardt et al. 2006), Spanish FrameNet (Subirats Rüggeberg & Petrucci 2003), or the Berkeley Constructicon (Fillmore et al. 2012). These kinds of “dictionaries” are a treasure, certainly not only, but also for the study of various areas in Translation Studies such as semantic similarity, interaction of conceptual systems or grammatical conventions. Their inventories would need extension in coverage especially their non-English versions, to make them useful for a broad range of research questions, but this is, of course, a matter in which FS and CxG could go hand in hand with Translation Studies.

As shown in the above-cited studies for translational purposes as well as for other, e.g. contrastive purposes (cf. Boas 2010), FS and CxG annotation and analysis can serve well as a starting point for comparisons. At the same time, translational and contrastive studies may help uncover semantic and functional aspects that remain somewhat obscure in purely monolingual study settings. Consider, for instance, the following sentence pair and its frame-semantic annotation (CroCo-Corpus, Hansen-Schirra et al. 2012, text pair G2E_POPSCI_007):

- (9) [Besondere Probleme]_{EFFECT} HAT_{CAUSATION} man [MIT sadistischen und
Special problems has one with sadistic and
masochistischen Patienten]
masochistic patients
[Sadism and masochism]_{CAUSE} RAISE_{CAUSATION} [special problems]_{EFFECT}.

There are (at least) two notable observations to be made in this sentence pair. The first is on the grammatical level: The direct object *Besondere Probleme* remains a direct object in the English version, whereas *Sadism and masochism* shifts from a prepositional object to a subject in the English version (let us disregard the deletion of *Patienten* for the time being). This may be due to a constructional mismatch: While German easily allows the direct object in sentence initial position, it is rather unusual for English (cf. e.g. Hawkins 1986; König & Gast 2005). The other interesting observation to be made is the decision the translator made by translating the German *haben* ‘have’ into the causative *raise*. But does the German *haben* indeed have the standard reading of possession here? I would argue against it. A second look reveals that the translator might actually have had the construction *X haben mit Y* in mind. In German, there are a few expressions like *Probleme haben mit Y*, *Ärger haben mit Y* etc. in which Y is an entity causing *Probleme* or *Ärger* ‘trouble’. However, this causative reading at the same time de-

pends very much on the filler of X: In a phrase like *Erfahrung haben mit Y* ‘have experience with Y’, it seems somewhat debatable whether one would think of Y “causing” the experience. The construction certainly begs a deeper investigation, but this shall suffice for the purpose of illustration: the causative reading of the German sentence in (9) is only strengthened by the opposition of original and translation and by what one might call an expert decision. If we think of translators as expert communicators in context (both in a specifically linguistic and in general in a cultural context), then translation decisions like the one in (9) are an excellent source for extending FrameNet and the Constructicon. This example proves that developing the primacy of frame model may benefit practical as well as theoretical aspects of FS and CxG.

3.2 Frames and Constructions as multi-level description devices

FS and CxG work on multiple levels of language. In fact, CxG does not assume the strict division between lexicon and grammar, defining a continuum of constructions through all levels of grammatical analyses, including morphemes, words and phrasal patterns (cf. e.g. Goldberg 2006: 5). Also, grammatical patterns can carry “meaning” just as lexical units do; this “meaning” may be of the functional or the semantic type. The two theories are thus interconnected beyond matters of representation (Petrucci 1996: 7). It is this interconnectedness which facilitates an integrated analysis of the interplay of form, function and semantics in translation.

This interconnectedness and the principles established by the primacy of frame model may also help push the boundaries of theory in other translation-related research, such as neuro-cognitive and process-based research. As Oster (2017 [this volume]) notes, many of the models for word processing in psycholinguistics are defined on the basis of word level. Assuming that words are constructions on equal footing with lower- and higher-level constructions, her network model of the lexicon can be easily extended to model e.g. how phrase patterns are connected and accessed in translation.

3.3 Frames and Constructions as collective organisational schemata

As Busse (2012) notes, the question of whether frames relate to conceptual structures of an individual or a group, has been mostly left undiscussed. I argue that frames as they are defined in FrameNet are generalised abstract schemata of concepts shared by a collective. The definitions in FrameNet describe frames in a way in which they can be understood by most, if not all, members of the respec-

tive (sub)culture. This, however, does not exclude the fact that each frame will receive a very individual “instantiation” in a speaker’s mind.

Let us imagine a BEING_AT_WAR-frame and a situation in which two parties are at war: The roles and relations described in a FrameNet lexicon will be recognizable by both parties, that there is a WAR_CAUSE, that there are WARRIORs and FIGHT_EVENTS, as well as CIVILIANS involved/affected. Also, there will probably be a causer of the war, potentially called the ATTACKER. However, members from the different sides of the party will not necessarily agree on whom or what to map onto which role, especially with respect to the ATTACKER role.

Thus, the frame definitions serve as landmark in cognition. But while everyone (or again, most) will be able to see and recognise the landmark, like a hill, depending on the perspective this “hill” may look somewhat or very different to different observers.

Similarly, for constructions, different (sub)collectives may have different perspectives on these. For instance, a polite form may be seen as respectful in one collective, but distant in another and may lead to the rejection of the polite form (e.g. certain political groupings not using the polite form *Sie* for addressing someone in German as it might create too much of a distance between speakers).

With the help of FS and CxG annotations we can thus study phenomena that are describable on a collective level. By fact of this, we can also study shifts that appear not only in a singular-translator setting, but also translations that were created by collectives.

4 The choice of a Frame or a Construction in translation

In Čculo (2013), I formulate the *primacy of frame* hypothesis having as the basic assumption that

[...] preserving the conceptual information connected with a frame in the source language by picking an adequate frame in the target language is a core procedure in translation. (Čculo 2013: 144)

In the simplest case, this would mean that for an expression in language A there will be an expression in language B evoking the *maximally comparable frame*, i.e. following Čculo (2013: 145):

- the two frames refer to equivalent scenarios,
- share core properties

and – in addition to what is said in Čulo (2013) –

- there is no other frame which would suit better in the given context in language B.⁴

The expression *maximally comparable* takes into account that frames, though we might even give them the same names or call them by the closest matching translation equivalent in the given context, may have slightly differing conceptualisations in various cultures. Take, for instance, the MARRIAGE frame which in many cultures designates a life-long partnership between a man and a woman explicitly, whereas in some cultures this notion has shifted recently to also include partnerships between people of the same sex.

The assumption described here follows the general assumption in Translation Studies that meaning is the guiding factor in translation. The primacy of frame model is, however, by no means intended to be a prescriptive approach to translation, but takes this assumption as point of departure for investigating in which cases this direct frame-to-frame mapping is overridden. Technically, this is dependent on the principle that for each structure the ideal match in the target language would be something maximally comparable on as many levels as possible, but when this is not given e.g. due to a constructional mismatch, then the primacy of frame principle may be overridden. As “meaning” is the central component in translation, I define the maximum frame comparability of the source and target product as primary goal, hence the name primacy of frame-model. Several reasons have been established in literature as to why an override of the primacy of frame principle may occur. The ones listed here are motivated by typological, contrastive or cultural differences.

A TYPOLOGICAL EXPLANATION for frame shifts in the motion domain is offered by Talmy (2000) and Slobin (1996; 2004). They show that languages differ in the PERSPECTIVE of a motion event they realise in the verb. For instance, so-called satellite-framed languages like English and German tend to put the manner of motion into the verb and the direction of motion into an adverbial expression, whereas verb-framed languages like Spanish and French tend to do it the other way round (cf. example 3). Slobin (1996) also notes that due to these differences, the manner of motion aspect is frequently dropped in translations from English to Spanish.

⁴While this may be implicitly clear, a list of criteria would be incomplete without making this explicit. Of course, the question of whether there is one single most suitable frame is debatable in many cases, but this criterion shall remain as “default ideal case” in which *the* most suitable frame can be identified in language B.

For the case of causation, Padó and Erk's (2005) notes on different framing of causation and the change of position on a scale apply (cf. example 6). The difference in LEXICALIZATION STRATEGIES, where Causation and changes of position on a scale are combined in one lexeme in English and are expressed by two lexemes in German, holds for a number of examples they observe and is thus a candidate as a type of CONTRASTIVE DIFFERENCE.

The case of CULTURAL DIFFERENCES is exemplified by a contrastive study of Brazilian Portuguese and American English legal language (Bertoldi & Chishman 2012). The authors reveal that not only the frames will differ between languages, but that due to the differences in the legal systems, the sections of the respective frame hierarchies may have a very different structure. Another case is that of translation asymmetry, as in the aforementioned example of the Marriage frame: When two cultures have a somewhat comparable frame, we can translate (almost) all instances of Marriage from the culture with a narrower definition to the other culture as Marriage, where in a number of cases (i.e. same-sex marriage) this may not be possible vice versa. In these cases, a frame like Marriage would be the maximally comparable frame in most cases, according not to formal or functional, but by culturally motivated semantic criteria; in some of the cases some other type of partnership frame might apply.

Probably to be classified as another specific type of CONTRASTIVE DIFFERENCES is the case of CONSTRUCTIONAL MISMATCHES as investigated e.g. in Čulo (2013), Rojo & Valenzuela (2013), Serbina (2013) (cf. §2.2). Due to the unavailability of a certain construction in a target language, various effects may occur, from constructional shifts to frame shifts and prolonged cognitive processing.

The constructional factor is also studied by Oster (2017 [this volume]), in terms of FORM PRIMING. She investigates translations of cognates, i.e. cases in which there is a formally and semantically close correspondent in the target language which in some cases may, but in others may not be the best equivalent. As an example, the English *system* may well be translated by the German *System* e.g. in the computer science domain, but would probably better be rendered as *Anlage* when it comes to certain domains of engineering. In translation experiments with less and more experienced students, Oster finds that students with less experience will over-produce cognate translations. Taking into account that according to CxG words are constructions as much as are morphemes or phrase structure patterns, we can say that in the case of Oster's findings, it is not only that this form imitation *overrides* the primacy of frame principle, but in some sense *violates* it: By producing a cognate, students were using the wrong form in the given context, stipulating a form-meaning pairing (e.g. the word *System*

and the frame MECHANICAL ENGINEERING) which does not (fully) conform with the conventions in the target language. In cases where the rendered cognate is an acceptable, but marginal rendering, the primacy of frame principle is adhered to, but the form factor of the construction apparently had a major impact and produced a non-typical rendering.

The cases of overrides of the primacy of frame principle presented here may convey a view on translation solely as a close reproduction of the original guided by linguistic principles. This is, however, not intended and is only indicative of the early development stage of the model. Incorporating methods and findings from works by Rojo López (2002) for comparing cultural elements (e.g. social frames) between English and Spanish, or by Bertoldi & Chishman (2012) for comparing divergencies in the systematicity of legal frames between American English and Brazilian Portuguese, will allow the model to extend beyond the analysis of semantically very “close” originals and translations. In other cases, we may witness that form(-aesthetic) factors clearly dominate functional or semantic factors: I am thinking of types of poetry where metrics and sound quality are the actual matters at hand, not the meanings of the words (or non-words!) used. This is, however, not a contradiction to the primacy of frame-principle.

A primacy of frame model as drafted here has theoretical implications for FS and CxG, currently the most prevalent ones being questions of co-activation, as described in the following two sub-sections.

4.1 Frame co-activation hypothesis

Frame semantics is based on a *co-activation hypothesis*: When a “system of concepts” is evoked, this results in all concepts becoming available (cf. Petrucci 1996). This is certainly not all the co-activation that happens: Fillmore himself points out that “scenes” and “frames” (as in the early version of the frame semantics terminology) co-activate each other (Fillmore 1975: 124). When a frame is evoked, it will activate other frames. So when asked to reproduce something we just read, we have a range of frames to choose from for conceptualisation due to the co-activation of frames.

When speaking about linking, there are two ends of a scale of consciousness which we need to distinguish:

- First, there are the unconscious links, e.g. certain metaphors which are so entrenched that we may not even notice them as metaphorical ways of speaking anymore, such as the *Grasping is Understanding* metaphor in “I

don't get what you're saying" (see Lakoff 1999: 124ff. for a discussion of (seemingly) 'dead' metaphors).

- Second, there is the heavily conscious linking, such as that proposed by Kußmaul (2000), a procedure in which techniques like lateral thinking and associative chains are exploited. Kußmaul's method begs the question whether such conscious linking may result in "search paths" for a solution which are hard to describe in terms of frame-to-frame relations as they may be – and this is exactly the goal of the method proposed by Kußmaul – creative.

Irrespective of the type of co-activation, the question is how far the co-activation spreads through our conceptual system and by what this co-activation is bound. There are at least two candidates for delimiting the potential range of co-activation:

- Certainly, domain plays a crucial role in identifying potential candidate frames for a translation. Domain can be said to be delimited within Frame-Net by higher order frames, potentially non-lexical frames, such as the Motion frame with its many different child frames. These domains can be quite complex structures, as demonstrated e.g. by Kußmaul's example 5 of how to translate within the domain of stardom: Being a star, and thus being famous, involves regularly appearing in newspapers, which is a specific perspective on stardom.
- Also, metaphorical links (or mappings from frame to frame between domains) are a candidate for frame co-activation. This would explain how metaphors can be de-metaphorised in translation or new metaphors introduced where there is no source metaphor (cf. e.g. Toury 1995; Samaniego Fernández 2013).

In the frame co-activation hypothesis I formulate here, the decision path leading to the replacement of one frame by another (or by a frame group) can be located somewhere on the two-dimensional scale between conscious/unconscious and conventional/unconventional. It remains to be assessed in how far this can be modelled by means of the existing inventory of frame-to-frame relations, such as those exploited in the analysis of example (8) and other links such as metaphorical links.

4.2 Construction co-activation hypothesis

Just as with frames, a network of constructions is also posited (Goldberg 1995: 67ff.). The paths through the network may, however, look very different according to what feature we are looking at. In Čulo (2016), I analyse the *sentence initial direct object followed by the finite verb* construction in German and its translation into English. The analysis of a sample of 51 sentence pairs from the parallel German-English subcorpus of the CroCo corpus (Hansen-Schirra et al. 2012) reveals a number of strategies in dealing with this German construction which cannot be easily reproduced as such in English. The sentence initial direct object is typically associated with a (degree of) attention focus on the sentence initial element (Helbig & Buscha 2001: 578). In the analysed sample, there is a small number of sentences in which the direct object is indeed also fronted in English or stressed by means of clefting. In about half of the cases, the subject-verb-object order of English is restored, either by simply switching the elements around, as in the following example:

- (10) Gewerkschaften gibt es in vielen Ländern .
 Trade-unions are there in many countries
 There are trade unions in many countries .

In this case, the function of the inversion, attention focus on the element in sentence-initial position, is lost for the most part. In some other cases, the function is kept by retaining the word order and adapting the main verb of the sentence, in order to accommodate for the changed mapping of lexical units to grammatical functions (cf. example 1).

In the latter case, there still is a certain focus in the English translation as the element has been retained in sentence initial position, though clearly not as much stress as in the German version. The translators thus chose to go with a version in which the function of the construction, i.e. guiding the reader's attention, was either enhanced, weakened or in some cases even dropped.

One might envision, then, that there is a co-activation path amongst constructions which

- either are capable of expressing similar functions, e.g. the attention focus put on an element when realised as sentence initial direct object in German and when embedded in an it-cleft in English;
- or share the basic formal factors such as word order, but do not necessarily share the function in question, e.g. in cases like (1), where word order

as a factor seems to be prioritised, potentially to mimic the information structure of the original, or maybe through some sort of formal priming.

These (and potentially other) competing search paths are then being weighted according to co- and contextual factors. Conscious (e.g. learned) decision steps can interfere at any given moment in the process.

5 Discussion

The model proposed here exploits the FrameNet and Constructicon resources (cf. sentence pair analyses in 8 and 9) and integrates the underlying theoretical frameworks, Frame Semantics and Construction Grammar, to arrive at an integrated analysis of translation shifts in which grammatical, functional and semantic factors interplay and can be weighted differently.

Based on product-based analysis, the basic co-activation hypothesis of FS is extended to a co-activation hypothesis for both frames and constructions. Currently, the model falls short of integrating a wealth of process-based and neurocognitive findings, and while I am aware of some of the work done in the field, alignment with these theories remains a desideratum at this point.

Besides this shortcoming, there are a number of questions which are raised by applying FS and CxG as sketched out above, among them the following:

- Are the various frame-to-frame relations and metaphorical links weighted differently?
- How are connections strengthened/weakened through (half-)conscious learning?
- What are the neurocognitive “correspondences” to that?
- How can frame-to-frame relations be exploited cross-lingually?

The model thus raises some more questions, not only in relation to translation, but also with respect to FS and CxG. For instance, a shift in perspectives is not uncommon for translation. This might even remain the fact within a frame: While we all may recognise the basic roles and relations of a family frame, the power and nurture relations may be viewed quite differently between and even within cultures. As noted above, these individual *perspectives* on frames have not been a central question in the frame semantic literature, but may well become central in the context of translation. As this and other research questions listed

here show, work on this model can result in new perspectives not only for Translation Studies, but also for the resources and theoretical frameworks used for the purpose of a frames-and-constructions analysis of translation.

As for the last question listed above, the frame-to-frame relations between English and German could be exploited for the purposes of this paper on the level of very general frames, as it is assumed that relations will be the same in these cases for English and German. A different solution would be to “translate” the starting frame from English to German first, i.e. choosing the maximally comparable frame in the target language and checking whether the frame arrived at in the translation product can be connected to the “translated” starting frame. In any case, further investigation into the methodology of cross-lingual application of frames-and-construction analysis is necessary.

6 Conclusions and future research

The model drafted here is aimed at providing a unified basis for studies in translation using FS and CxG, by providing a translational perspective on frames and constructions. It is also intended to be compatible with other (cognitive) theories of translation and shall be further aligned with neurocognitive and/or process-based findings. The model is based on one basic assumption, namely maximum frame-to-frame comparability between original and translation, with various factors which can override this principle. This in return does not mean that individual levels, e.g. solely formal aspects of constructions in translation, cannot be of interest by themselves, but the model provides a framework for an integrated view of form, function and semantics in translation.

There are some limitations of the preliminary model and the analyses presented here.

First, the examples referred to in this paper come from exploiting resources of limited size. Part of the problem of creating larger databases of parallel frames-and-constructions analysis is, to my knowledge, the current unavailability of a tool which can combine both kinds of annotation *and* the alignment.

Second, the different Frame databases do not describe equally sized proportions of the cultural concepts, and also not always in equal depth. For instance, in the SALSA workflow, whole texts were annotated and missing frames were defined ad hoc, whereas FrameNet aims at annotating a certain amount of instances of a frame before a new frame is addressed. A project annotating larger proportions of parallel texts will need to ensure that many or at least most of the central frames found in the text are defined in both languages; filling potential gaps would be part of a project. The situation is even worse with respect to Constructions.

Third, the methodology for full-text annotation of frames and constructions needs to be well worked out. Recall Padó and Erk's analysis of frame groups: These can only be captured if all meaning-bearing elements of a sentence are annotated.

As has been pointed out in the paper, though, there is much to be gained by further developing the model. It presents an opportunity to contrast conceptualisations both on the grammatical and the semantic level for two languages (and the cultures they are embedded in). This will certainly result in further research questions to be dealt with within the context of FS and CxG (and potentially other cognitive linguistic theories). Alignment with process-based and neurocognitive findings are facilitated by the fact that both FS and CxG are cognitively oriented theories, and at the same time FS and CxG can provide a framework to order and contextualise process-based and neurocognitive findings.

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Empirical modelling of translation and interpreting

Empirical research is carried out in a cyclic way: approaching a research area bottom-up, data lead to interpretations and ideally to the abstraction of laws, on the basis of which a theory can be derived. Deductive research is based on a theory, on the basis of which hypotheses can be formulated and tested against the background of empirical data. Looking at the state-of-the-art in translation studies, either theories as well as models are designed or empirical data are collected and interpreted. However, the final step is still lacking: so far, empirical data has not lead to the formulation of theories or models, whereas existing theories and models have not yet been comprehensively tested with empirical methods.

This publication addresses these issues from several perspectives: multi-method product- as well as process-based research may gain insights into translation as well as interpreting phenomena. These phenomena may include cognitive and organizational processes, procedures and strategies, competence and performance, translation properties and universals, etc. Empirical findings about the deeper structures of translation and interpreting will reduce the gap between translation and interpreting practice and model and theory building. Furthermore, the availability of more large-scale empirical testing triggers the development of models and theories concerning translation and interpreting phenomena and behavior based on quantifiable, replicable and transparent data.

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