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# WHAT DO RENDERING OPTIONS TELL US ABOUT THE TRANSLATING MIND? TESTING THE CHOICE NETWORK ANALYSIS HYPOTHESIS

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CICLO XXXV

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## *Testing the choice network analysis hypothesis*

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MMXXIII

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# ABSTRACT

*Frame.* Assessing the difficulty of source texts and parts thereof is important in CTIS, whether for research comparability, for didactic purposes or setting price differences in the market. In order to empirically measure it, Campbell & Hale (1999) and Campbell (2000) developed the *Choice Network Analysis* (CNA) framework. Basically, the CNA's main hypothesis is that the more translation options (a group of) translators have to render a given source text stretch, the higher the difficulty of that text stretch will be. We will call this the *CNA hypothesis.* In a nutshell, this research project puts the CNA hypothesis to the test and studies whether it does actually measure difficulty.

*Data collection.* Two groups of participants (n=29) of different profiles and from two universities in different countries had three translation tasks keylogged with Inputlog, and filled pre- and post-translation questionnaires. Participants translated from English (L2) into their L1s (Spanish or Italian), and worked—first in class and then at home—using their own computers, on texts ca. 800–1000 words long. Each text was translated in approximately equal halves in two 1-hour sessions, in three consecutive weeks. Only the parts translated at home were considered in the study.

*Data analysis.* Based on the CNA's inspired assumption that the more translation options, the lower the fluency might be and vice versa—due to uncertainty and a more blundersome decision-making process—the log files were analyzed using the *Task Segment Framework* (TSF, Muñoz & Apfelthaler 2022). The TSF is designed to analyze keylogged translation processes in terms of fluency, attention, and strategical management of cognitive resources, yielding behavioral units often containing text stretches. Translation difficulty was accordingly operationalized in terms of *behavioral* fluency, the indicators being *respites* (unintentional mid-length pauses), *disfluencies* (typos, deletions, and corrections) and *typing speed* in task segments with text production.

*Results.* A very different picture emerged from data than that which the CNA hypothesis might predict: there was no prevalence of disfluent task segments when there were many translation options, nor was a prevalence of fluent task segments associated to fewer translation options. Indeed, there was no correlation between the number of translation options (many and few) and behavioral fluency. Additionally, there was no correlation between pauses and both behavioral fluency and typing speed. The discussed theoretical flaws and the empirical evidence lead to the conclusion that the CNA framework does not and cannot measure text and translation difficulty.

# ABSTRACT

*Stato dell'arte*. La valutazione della difficoltà dei testi di partenza e di parti di essi ricopre un ruolo centrale nel campo degli studi cognitivi sulla traduzione e l'interpretazione (CTIS), che si tratti di comparabilità della ricerca, di scopi didattici o di gestione delle differenze di prezzo sul mercato. Per misurarla a livello empirico, Campbell & Hale (1999) e Campbell (2000) hanno sviluppato la *Choice Network Analysis* (analisi della rete di scelte, CNA). L'ipotesi principale della CNA è che quante più opzioni di traduzione un gruppo di traduttori ha per tradurre una porzione di testo, più alta sarà la sua difficoltà. Questo progetto di ricerca mette alla prova l'ipotesi della CNA per verificarne la validità come strumento per misurare la difficoltà.

*Raccolta dei dati*. Due gruppi di partecipanti (n=29) di profili diversi e provenienti da due università di paesi diversi hanno svolto tre prove di traduzione usando Inputlog, ognuna preceduta e seguita da un questionario. I partecipanti hanno tradotto dall'inglese (L2) alla loro L1 (spagnolo o italiano) e hanno lavorato prima in classe e poi a casa con i propri computer su testi di circa 800-1000 parole. Ogni testo è stato suddiviso in metà pressoché uguali e tradotto in due sessioni da un'ora l'una, in tre settimane consecutive. Lo studio si concentra solo sulle parti tradotte a casa.

*Analisi dei dati*. Partendo dal presupposto della CNA che un maggior numero di opzioni di traduzione è correlato con una minore fluidità e viceversa (a causa dell'incertezza e di un processo decisionale più macchinoso), i file ottenuti tramite keylogging sono stati analizzati utilizzando il *Task Segment Framework* (TSF, Muñoz & Apfelthaler 2022). Il TSF è stato progettato per analizzare i processi di traduzione acquisiti tramite keylogging in termini di fluidità, attenzione e gestione strategica delle risorse cognitive, ottenendo unità comportamentali spesso contenenti porzioni di testo. La difficoltà di traduzione è stata quindi operazionalizzata in termini di fluidità comportamentale, con indicatori come *respites* (pause involontarie di media lunghezza), mancanza di fluidità (errori di battitura, cancellazioni e correzioni) e velocità di battitura in segmenti di attività rivolte alla produzione di testo.

*Risultati*. Dai dati è emerso un quadro molto diverso da quello suggerito dall'ipotesi della CNA: non è stata riscontrata alcuna prevalenza di segmenti con minore fluidità relativi a un maggior numero di opzioni di traduzione, né una prevalenza di segmenti con maggiore fluidità associati a un minor numero di opzioni di traduzione. Al contrario, in entrambi i casi la fluidità dei segmenti è rimasta tendenzialmente nella media. Infine, non è stata riscontrata alcuna correlazione tra le pause e fluidità comportamentale o la velocità di batttitura. Le inesattezze teoriche precedentemente discusse e le prove empiriche portano alla conclusione che la CNA non misura e non può misurare la difficoltà del testo e della traduzione.

# INTRODUCTION

The 1990s witnessed many changes in translation processes and in their research, thanks to the mass adoption of computers. New tools began to be used for keylogging, video recording, eyetracking, and other data sources. The turn of the millennium coincided with a renewed call for more interdisciplinary collaboration, theoretical rigor, methodological innovation and the integration of the rudimentary models and concepts of the *translation process research* of that time with new models of bilingualism, L2 acquisition, memory and cognition emerging in psycholinguistics and cognitive sciences (Danks et al. 1997), paving the way for today's *cognitive translation & interpreting studies* (CTIS). However, legacy concepts and dated theoretical constructs are still in use that hinder disciplinary progress. Some of these concepts and constructs have been adopted, and often taken for granted, without assessing them critically (for one of a few exceptions, see Marín 2019).

This dissertation deals with one of these constructs: the *Choice Network Analysis* (CNA), originally formulated by Campbell & Hale (1999). The main idea behind the CNA hypothesis is that the more translation options a group of translators have in order to render a given source text stretch, the higher the difficulty of that text stretch is, and vice versa. That is to say, they assessed translation difficulty by counting the number of different versions of specific source-text items rendered to another language by several translators, solely focusing on the text. The items with more options would be more difficult, and the items with only one option would be easier under two assumptions: first, all options in the sample—and no more—were implicitly assumed to be equally available to everyone in the sample; second, more options always entail more difficult decisions. The main goal of this dissertation is to test empirically this idea, hereinafter referred as the CNA hypothesis, since several works published later assumed that it can measure difficulty. To that end, this dissertation used quantitative and qualitative data collected via keylogging. Difficulty was operationalized in terms of behavioral fluency, and the keylogged data will be analyzed using the Task Segment Framework (Muñoz & Apfelthaler 2022) an analytical framework designed to analyze keylogged translation processes in terms of fluency, attention, and strategical management of cognitive resources, yielding behavioral units often containing text stretches.

Chapter 1 opens with an in-depth discussion of the CNA. We discuss the origins of the CNA, and explain how the CNA was developed in a series of papers published from 1999 to 2002. Empirical studies that have used CNA and research with the same assumptions as the CNA hypothesis are also reviewed, as well as problems and limitations of the CNA. We then explain a central concept for this dissertation: difficulty. We contextualize it in CTIS and also explain how difficulty has been measured in writing research by using fluency. This is then followed by a cognitive-translatological approach to translation difficulty, in which we present the conceptual scaffolding framing the cognitive approach to the study of translation adopted in this dissertation. Then, segmentation and the operationalization of pauses in CTIS are discussed. The chapter ends introducing the Task Segment Framework (Muñoz & Apfelthaler 2022) an analytical framework developed to study keylogged translation processes.

Chapter 2 summarizes the research methods used in this dissertation, providing information about the research questions, hypotheses, informants, materials, tasks, data collection procedures, data cleaning and data processing.

Chapter 3 offers the results. Data analysis is divided into three sections, one for the product-based hypotheses (H1 and H2), one for process-based hypotheses (H3 and H4) hypotheses, and one for the questionnaire data.

Chapter 4 discusses the findings for each of the hypotheses. It also includes a general discussion of the results in light of the whole project. Findings that are not related to the research question are also included. Further research avenues are also explored, and the caveats of the study are also presented. The closing remarks are followed by the list of references and appendices.

# CONCEPTUAL FRAMEWORK AND STATE OF THE ART

## 1. The Choice Network Analysis

### 1.1. Precedents

In 1928, the mathematician John Von Neumann laid the foundations of Game Theory and the *minimax theorem*. Cronin (2011, 91) explains that, in this theory, players and social actors arrive at an optimal strategy "by way of a pay-off matrix, a formal device that lists the alternative and strategies available to players and allow them to evaluate outcomes so that they choose the optimal strategy". The minimax theorem states that in a finite, two-player, zero-sum game, where every player knows the strategy of the other player and its consequences, there is a strategy that allows both players to minimize the maximum loss scenario. Levý (1967, 1179) applied this theorem to decision-making in translation and argued that

> […] translation theory tends to be normative, to instruct translators on the optimal solution; actual translator work, however, is pragmatic: the translator resolves for one of the possible solutions which promises a maximum effect with a minimum effort. That is to say, he intuitively resolves for the minimax strategy.

In Levý's view, every move of the translator "is influenced by the knowledge of previous decisions and by the situation which resulted from them" (1967, 1172). Thus, Levý was arguing that translators intuitively choose the most efficient ways for translating a text, the ones that entail a lower mental effort, and also that experience pays a crucial role in this process. Several scholars influenced by Levý's work, such as Krings (1986) and Lörscher (1991), started to research empirically the translation process. Krings (1986, 507) proposed that translators can process on three levels of depth:

1. the interlingual level of primary equivalent associations and spontaneous translations
2. the combined intra-/interlingual level of L1 reverbalizations together with primary equivalent associations and spontaneous translations, and
3. the deep semantic level of direct conceptualizations

Translators would only go deeper if the cognitively less demanding option did not succeed (a minimax strategy). That way, the translator would keep the cognitive effort as low as possible (Krings 1986, 508; also Lörscher 1991, 276). The main difference between Levý, on the one hand, and Krings and Lörscher, on the other, is that the latter two see the translation process from a strategic/procedural perspective, i.e., they only focused on the strategic processes of translation (where strategic amounts to problem solving), leaving aside other processes. This in turn led them to claim that "the subjects do not proceed to sense-oriented translating before sign-oriented procedures have turned out to be unsuccessful or unsatisfactory" (Lörscher 1991,

276; cf. cognitive processing routes §1.2 Developing the Choice Network Analysis). From the CNA hypothesis perspective, the minimax strategy could be viewed and summarized in the following way: If all translators opt for the minimax strategy, they all should select the same translation.

Levý's work also inspired a practice that was incorporated into the CNA. Rachlin et al. (1986) argued that formalist models do not apply to translator performance, but several scholars suggested decision trees to explain decision-making process in translation (e.g., Krings 1986, Lörscher 1991, Tirkonnen-Condit 1993, Leppihalme 1997). An example of these trees can be found in Leppihalme (1997, 84), where she listed nine techniques for translators to use when rendering a key-phrase allusion. She proposed a strategy (or method) for choosing among these techniques. This process was represented in a decision tree (see Figure 2) that is remarkably similar to conditional statements in computer science. Leppihalme's main criterion for choosing a technique over another is the amount of effort required for the translator (1997, 108).

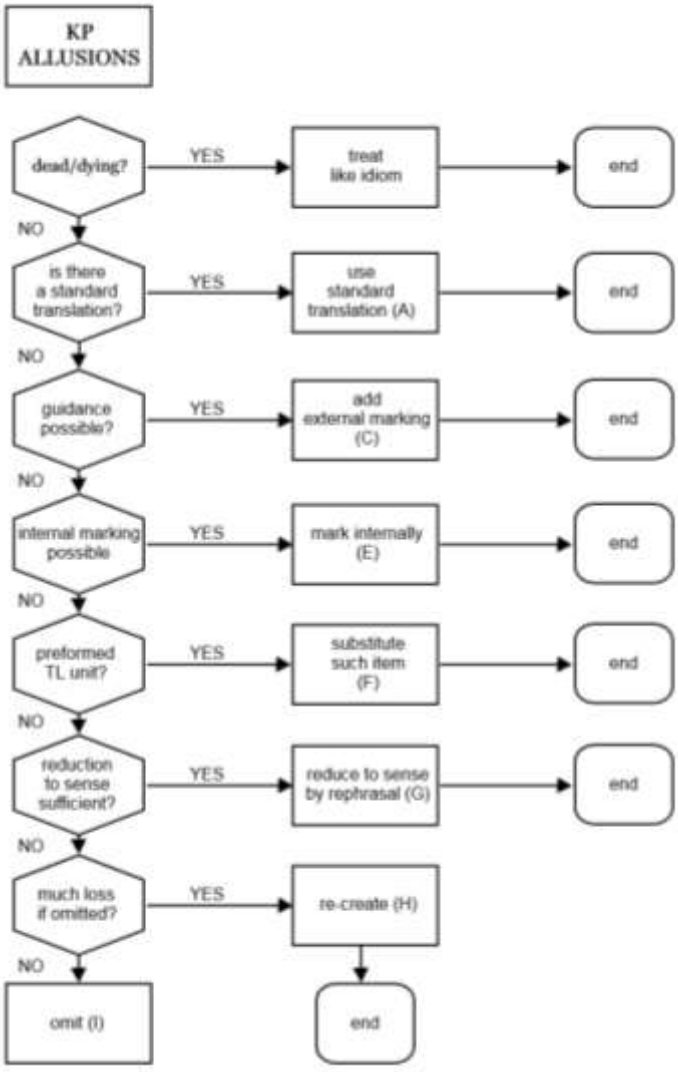



**Figure 1.** Decision tree for translating allusions (adapted from Leppihalme 1997).

Chesterman (2013, 159) calls these models *models for virtual processes,* since they would show "the potential path from one sense of 'translation problem' to a potential solution", showing the translation strategies required to translate a particular item. These models would "outline possible courses of action leading to possible solutions. It is a simplified, idealized model of possible decision processes leading to acceptable solutions" (Chesterman 2013, 11). Nevertheless, the models presented here have been reverse-engineered from empirical data and they are conceived "to help to find solutions in decision-making" (Muñoz 2016b, 149). Campbell and Hale were inspired by these decision trees when they proposed their choice networks, but they gave them a twist. The main difference with their predecessors was that they did not use them prescriptively nor to help to find solutions, but to determine the difficulty of the source text based on empirical data collected from their students.

## 1.2. Developing the Choice Network Analysis

Campbell (1998) studied L1→L2 translation based on empirical data collected from his translation classes. He developed (chapter 6) a way to analyze textual competence related to students' use of lexis. The way to carry out the analysis is basically a choice network of lexical items where "identical texts translated by multiple subjects are compared, and a number of strategies are identified; these strategies deal with, among other things, the treatment of metaphors and the extent to which subjects use information beyond the level of the word to inform their choices" (Campbell 2000a, 33). Campbell then classified his students as risk-taking or prudent, and persistent or capitulating, depending on their choices. Campbell suggested that the strategies, organized in a choice network, represent a primitive model of the mental processing underlying the translation of nouns.

Campbell & Hale (1999) was a study on translation difficulty whose goal was to identify both universal and language-specific difficulties in translation using the CNA hypothesis. Accordingly, the authors identified five difficult areas for translators: words low in propositional content, complex noun phrases, abstract words, official terms, and passive verbs. In their aim to develop a psycholinguistic model of the translation process, Campbell & Hale (1999) suggested that the best way to measure difficulty is weighting items in a translation text and then adding these weights. According to Campbell & Hale, this would help to create materials to meet the needs of students and examinees at different levels of development.

Campbell (1999) focused on laying the CNA foundations and explained how to measure translation difficulty. He proposed a cognitive approach for online translation (i.e., translating under time pressure) where translation difficulty was a function of the source text. His approach drew on models of working memory and language processing, and defined difficulty in terms of processing effort. Specifically, Campbell (1999, 38) proposed that "one way of gauging text difficulty in on-line translation is by identifying those lexical items that require higher amounts of cognitive processing". Campbell (1999, 39) explains how to measure translation difficulty:

> The source of evidence about the amount of cognitive processing is the mean number of renditions made by a group of subjects translating the same items; where (on the evidence of the subjects' offerings) a single choice is offered as the translation of an item, it is assumed that the item requires minimal processing and is therefore easy to translate. Where each subject offers a different rendition, then we assume that the range is available in principle to all the subjects and that large processing effort is required by each individual to make a choice from the range; the item is then a difficult one to translate.

This assumption is vital in CNA and in works of other authors that draw from it. Campbell (1999) used translation students with L1 Spanish, Arabic and Vietnamese. They were asked to translate into their L1s a 230-word text on anti-racism policy and a 249-word text on methadone treatment. The first step to calculate translation difficulty was arbitrarily dividing the original into chunks, based on the translations. The next step was counting the number of alternatives for each chunk and convert them into a raw score by dividing the number of renditions by the number of subjects. Then, raw scores were standardized by conversion to z-score ranging from 0 (mean) to 1 (standard deviation). Scores for all three L1s in the experiment were correlated. Finally, the scores for each original text chunk were correlated with the number of edits, to confirm that the number of renderings corresponds with its difficulty. Campbell focused only on the decision-making process, i.e., he did not evaluate the quality of the translations, but he concluded that translation difficulty is a function of the source text, at least in online translation.

Campbell (2000a) summarized his work on CNA, explained its relationship with theory, the range of applications, and tried to clarify how to build choice networks. This was the first time the author mentioned the term *choice network analysis*. Campbell (2000a, 38) argued that CNA in itself is theory-free, since it generates models that the researcher is free to make as simple or as complex as the hypothesis under investigation demands. He argued that the basic architecture of mental processing is connectionist, but then says that CNA is still couched in the metaphor of serial processing and that the translation process is linear. Finally, Campbell (2000a, 39) suggests that researchers should respect three principles when constructing a choice network: (1) it must account for every piece of data in the sample that is relevant to the domain of the theoretical framework of the investigator; (2) it must be linguistically plausible, that is, it should not defy the notion of grammatical constituency; and (3) it must be parsimonious—that is, it should contain the minimum number of nodes and branches but remain plausible at the same time.

One of the earlier concerns of Stuart Campbell and Sandra Hale was trying to capture universal translation difficulties, by analyzing whether translations from English into Arab, Spanish and Vietnamese were equally difficult. To do so, they compared "the renditions of a single string of translation by multiple translators in order to propose a network of choices that theoretically represents the cognitive model available to any translator for translating that string" (Campbell 2000b, 215). His approach assumed that decisions in translation involve the simultaneous marshalling of different kinds of information—lexical, syntactic, semantic, pragmatic, etc. (Campbell 2000a, 31–32). CNA would be based in the following five principles (Campbell (2000a, 32):

- Target texts can be used as a tangible source of evidence of mental processing in translation, and as an alternative to experimental data and think-aloud protocols.
- The products of a sample of participants translating the same text into the same language will reveal a range of differences and similarities in the behaviors of the participants.
- As the sample becomes larger, the complete range of behaviors of translators of that text between those languages is approached.
- A model of the mental processing underlying the translation of that text in that language combination can be inferred through a comparison and classification of the behaviors of the sample of participants.
- General principles about mental processing can be extracted from analyses of specific texts and language combinations and used as hypotheses for examining other texts and language combinations.

Figure 3 displays an example of a network for the sentence *The patient will be closely monitored,* translated into Spanish by several translation students. The tree shows all the translation choices represented in a choice network as evidenced in the target texts.

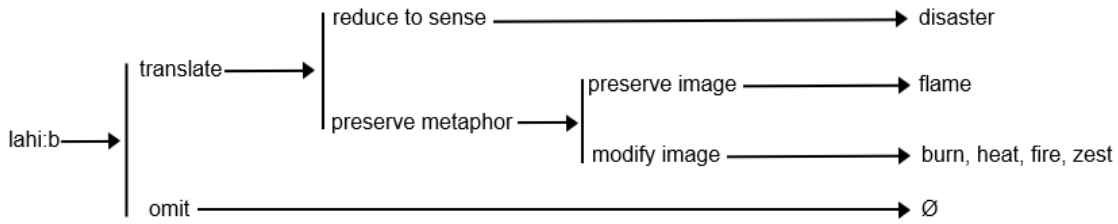



**Figure 2.** Choice Network (adapted from Campbell 2000a).

Campbell (2000a, 215) defines *online translation* as translation 'under pressure of time, which elicits the maximum automatic recognition of SL items and retrieval of corresponding TL items, and which allows the maximum processing resources to be freed up for controlled higher level operations'. Regarding difficulty, Campbell (1999, 37–39) states that "one way of gauging [source] text difficulty in online translation is by identifying those lexical items that require higher amounts of cognitive processing" and that we could operationalize that difficulty by "the mean number of alternative renditions made by a group of subjects translating the same item." That is, text difficulty would be related to the processing effort needed to translate certain item in a text. A single choice by all translators would mean minimal processing effort (easy to translate) and different renditions by all translators [in a sample] would mean the largest processing effort (difficult to translate).

Campbell (2000b) used CNA to investigate *competence,* using cross-clause ellipsis and relative clause translations L1→L2. Campbell focused on what he called "critical source text structures", since they would "trigger a range of behaviours across subjects, which in turn will allow the investigator to model underlying competencies" (Campbell 2000b, 224). Like the ones before, this study assumes that "translation processing is fundamentally linear, and that translators rely on a memory store to hold information from previous

sentences and then use it to construct subsequent sentences" (Campbell 2000b, 214). This idea is also reflected in his understanding of translation competence: "[a]n element of translation competence seems to be *to activate default equivalent structures* [emphasis added], perhaps best characterized by maxims of the kind ´translate source language structure X as target language structure Y unless there is a reason not to´" (Campbell 2000a, 214).

Campbell (2000b) also tackled automaticity in translation. According to many authors (e.g., Fabbro, et al. 1990; Anderson 1994; Fabbro & Gran 1994; Isham 1994; Isham & Lane 1994; Paradis 1994; De Groot 1997, 2000; Massaro & Schlesinger 1997; Schaeffer & Carl 2013) there are two routes for translating: the transcoding route (also known as *horizontal translation*) and the meaning-based route *(vertical translation).* Campbell probably draws from de Groot's notion of horizontal translation; that is, "the replacement of SL linguistic structures of various types (words, phrases, clauses) by the corresponding TL" (de Groot 1997, 30). In terms of the hierarchical model of the bilingual mental lexicon (Kroll & Stewart 1994), transcoding implies the replacement of a SL item with a TL item via the lexeme route rather than the conceptual route, that is, translation could be done directly from L2 to L1 without taking into account meaning.

Experts tend to have automatized many processes (Séguinot 1997, 108) but, since think-aloud protocols are not able to access them, Campbell suggested that CNA may be an excellent method to examine translator behavior. Thus, focusing on particular structures (grammatical choices, the recognition of underlying structures, memory limitations and the cognitive style of the translators), Campbell argued that cues compete to trigger various outputs. This information could be used to profile subjects so that they can be placed in appropriate instructional grades, as well as design appropriate syllabus objectives" (2000b, 227).

In the last paper of their series, Hale & Campbell (2002, 16) acknowledged that their "original approach also uses a rather broad brush to paint a picture of difficulty". They addressed the problem of accuracy, and tried to correlate the number of available choices with the level of translation accuracy. Once again, they claimed that when there are numerous options, each subject exerts a relatively larger cognitive effort in making a selection than there where there are few options, when each subject exerts relatively small cognitive effort (Hale & Campbell 2002, 15). They also distinguished between *options* and *alternatives.* Options are the set of possibilities available to a subject when faced with the translation of a specific item. This set of possibilities is arrived at empirically by analyzing the translation of the item by all subjects in a sample. Alternatives are the set of options from which a subject makes a selection. It is the short form of *alternative renditions.*

Hale & Campbell (2002) focused on ST's official terms, complex noun phrases, passive verbs and metaphors, since those items yielded a higher number of renditions in their previous research. They included 20 subjects (11 Spanish speakers and 9 Arabic speakers). They concluded that there is not a clear correlation between choices and accuracy and that "if subjects are faced with multiple choices this does not necessarily mean that the item in question is difficult" (2002, 29). Finally, they called for further research regarding text difficulty and the relationship between difficulty and accuracy—especially, to develop a procedure for grading texts used for translation teaching, and for measuring the reliability of translation examinations. Table 1 offers details on Campbell & Hale's research projects. In view of the nature of their work, three critical aspects stand out: sampling, languages and materials. Campbell (2000a) is not included because it does not have an empirical part.

| article | part. | languages | words translated | topic |
|---|---|---|---|---|
| Campbell (1998) | 16 | Arabic→English | Two texts | Unknown |
| Campbell & Hale (1999) | ? | English→Arabic/Spanish/ Vietnamese | Unknown | Unknown |
| Campbell (1999) | ? | English→Arabic/Spanish/ Vietnamese | 2 texts, 230 and 249 words | Policy statement: Anti-Racism Policy<br>Info passage: Methadone treatment |
| Campbell (2000b) | 9 | English→Arabic | 2 texts, 250 words and maybe 250 | Press release: Beirut<br>Press release: Vegetarian |
| Hale & Campbell (2002) | 20 | English→Arabic/Spanish | Two texts, ca. 260 words each | Press release: Health Reform<br>Press release: Tough on Drugs |

**Table 1.** Methodological aspects on Campbell & Hale's studies.

## 1.3. Applications of the CNA

Several authors other than Campbell and Hale have used CNA in their research. We illustrate this by obtaining a sample of these studies using the Bibliography of Interpreting and Translation (BITRA, Franco 2001-2023). BITRA was used instead of the Translation Studies Bibliography (Gambier & Van Doorslaer 2002-2023) database, since the former contains over 90,000 entries versus 37,700 entries of the latter, as of January 2023. Then, a manual search was performed because, as all databases, the last years have not been indexed yet. Some articles were removed from this list because they only mentioned CNA but did not use it in their projects. Other articles were removed because they were based on data collected for the authors' PhD theses, thus offering no new information regarding CNA.[1] Table 2 presents the complete list of the studies. The following paragraphs review the resulting eight studies in chronological order.

O'Brien (2006a) focused on whether applying controlled language rules to a source text would reduce post-editing effort. For comparative purposes, three subjects translated the text, rather than post-edit it. She analyzed post-editing effort using keylogging in combination with CNA. She chose sentences as the unit of analysis, since Hansen (2002) reported that pauses are individual, and Alves (2006) considered pauses erratic in nature. As indicators of cognitive effort, O'Brien used CNA and pause information. She concluded that controlling the input to MT leads to faster post-editing and that post-editing is, on average, faster than translating. She argued that CNA helped her to identify linguistic features not captured on her list of *negative translability indicators*—features that are problematic for MT. Additionally, O'Brien (2006a, 178) stated that CNA was a useful method since it "provided us with a systematic framework for recording the alternatives chosen by post-editors and pointed to those parts of the TT that the post-editors thought needed repairing". Thus, for O'Brien the CNA was a useful to yield an overview of alternatives, but not to determine difficulty.

[1] The four articles removed from the list were O'Brien (2005, 2006b), Pavlović (2009) and Data-Bukowska (2014).

| author | year | article |
|---|---|---|
| **O'Brien** | 2006a | Machine-translatability and post-editing effort: An empirical study using Translog and Choice Network Analysis |
| **Pavlović** | 2007 | Directionality in collaborative translation processes |
| **Bjørge** | 2007 | "The person in the middle": Strategies in translating LSP texts |
| **Palumbo** | 2008 | Translating Science. An empirical investigation of grammatical metaphor as a source of difficulty for a group of translation trainees in English – Italian Translation |
| **Ketola** | 2016 | An illustrated technical text in translation. Choice Network Analysis as a tool for depicting word-image interaction |
| **Salmi & Koponen** | 2020 | Valintaverkkoanalyysi konekäännöksen jälkieditoinnin tarkastelun apuna |
| **Cao** | 2021 | Wie risikobereit sind chinesische Studierende beim Herübersetzen? Eine empirische Studie mithilfe der Choice Network Analysis |
| **Martín & Cardona** | 2022 | Spoiled for choice? Uncertainty facing options in translation |

**Table 2.** Studies using CNA other than Campbell.

Pavlović (2007) studied L2→L1 and L1→L2 translation processes by novice translators in individual and collaborative translation. She aimed to identify features that differ significantly according to the translation direction, in order to improve translator training. She processed and analyzed her data from collaborative translation protocols (a verbal report obtained from group translation sessions), the evaluated target texts, Integrated Problem and Decision Reports (Gile 2004; a type of diary that accompanies a translation which mentions problems, tentative solutions, resources consulted, etc.), and choice networks. Pavlović concludes that novice translators encounter similar numbers and types of problems in both translation directions, but that their translations were more fluent and had a better quality when translating into their L1. Also, novice translators working collaboratively are likely to produce better translations than those working individually. She recommends that "the methods will be used most profitably in combination with other means of data collection available to the researcher" and that "CNA probably could be used in the development of translator e-learning tools" (Pavlović 2007, 180) but that "both CNA and IPDR methods offer less complete data than do verbal protocols" (78) and that one of the weakness of CNA is that "[...] is only based on translation products [unlike IPDR] (179).

Bjørge (2007) used CNA to illustrate the translations of a number of technical terms. She used a 266-word text on the insulation of external walls in wooden houses, with an illustration showing the construction. No Internet access, only dictionaries were allowed. Bjørge incorporated into her choice networks the translation strategies set out in Chesterman (2000, 15–16). She found a preference for explicitation when the terms had an underlying argument structure (subject-verb / object-verb). Finally, Bjørge (2007, 551) argued that CNA is a "useful way to approach the problem of evaluating the level of difficulty of the text" since the number of variant translations of the same text is an indicative of translational difficulty. This is, however, a circular reasoning, since she assumed what she was attempting to prove (that there is a correlation between the number of options and difficulty).

Palumbo (2008) combined CNA and error analysis to investigate the difficulties in translating scientific texts for advanced translation students. Specifically, he focused on grammatical metaphors. Palumbo

measured the difficulty translators experienced by looking at the editings they performed on their own drafts (more editing, more difficulty), the degree of variation between the TT (more variation, more difficulty) and the errors identified in the TTs (more errors, more difficulty). Palumbo used CNA as method for representing variation across translations. He found that lexical variation across TTs was higher than syntactic variation. He then compared these results with the error analysis and found several clusters in the ST that were difficult for translators due to their high nominal density. Palumbo concluded that his hypothesis was only partially supported, since the two more nominalized texts were associated with a higher number of difficulty indicators, but no further differentiation emerged between them.

Ketola (2016) worked on the interaction between images and words in technical translation. Ketola used CNA and translation diaries to analyze whether the images of an illustrated technical text can affect translations. One difference between the research of Campbell and that of Ketola was that she assumed that options only represent the translation solutions that the particular translators considered to be the most appropriate for the given context—and not that they represent all solutions available for translators. That is, she is referring to Hale & Campbell's (2002) *alternatives*. She concludes that an image "is capable of reattributing the meaning of the verbal element" and that CNA is a "useful tool for the empirical investigation of translation" (Ketola 2016, 94). However, she highly recommends to "triangulate CNA with a complementary method of acquiring into how the translation process unfolds" (Ketola 2016, 94) such as translation diaries, keylogging or eyetracking since it is "reasonable to ask how much we may really infer of a translator's cognitive processing simply by examining the results of this processing" (93)

Salmi & Koponen (2020) used CNA to analyze machine translation post-editing data. They used CNA to analyze items that are repeated in the post-edited text to compare differences between editors and MT engines. The authors could not determine the reason for the translation variation, nor were they able to determine whether the points that produced different solutions are those where the cognitive effort is higher.

Cao (2021) used CNA to investigate whether master's students at the beginning of their studies were risk-taking as Krings (1986) claimed. Cao only analyzed texts stretches that students identified as difficulty in a post-translation questionnaire. He could not draw any clear conclusion because 50% of the participants stayed with their first translation. Cao argues that CNA is an interesting methodology to be implemented in translator training, but it should be used in conjunction with other methods such as thinking-aloud protocols or IPDR, because CNA has limited explanatory power over the decision-making processes, let alone the cognitive processes.

Finally, Martín & Cardona (2022) studied the relationship between the number of options made by the whole set of participants and hesitation indicators of their individual processes. The authors used CNA to build choice networks and identify same translations by all participants. They drew from Muñoz & Cardona (2019) to study pauses and segment the task. Martín & Cardona (2022, 63) concluded that "there is no association between the options potentially available to translators and the degree of hesitation" because potential choices available for a translation task do not constitute a closed, definite, and homogeneous class, and therefore translators cannot have complete information about them, which would mean that translation processes cannot be fruitfully approached from the perspective of theory of games and logical models or

rational decision-making. Table 3 focuses on the same critical steps when analyzing the methodologies of Campbell and Hale research.

| article | participants | languages | other details |
|---|---|---|---|
| O'Brien (2006a) | 12 translators | English→German | Postediting of one text of 1777 words. IT user manual. |
| Bjørge (2007) | 19 translators | Norwegian→English | Translation of a technical text with an image. 266 words. |
| Pavlović (2007) | Two groups. Experimental group (12 students translating collaboratively)<br>Control group (54 students; 30 translating individually, 24 translating collaboratively) | English→Croatian | Translation of 2 texts of approximately 230 words. Travel Guides |
| Palumbo (2008) | 5 students | English→Italian | Translation of three scientific texts (225, 223 and 246 words: two journals and a tutorial for college students |
| Ketola (2016) | 8 students | English→Finnish | Translation of 500 words. Technical text. |
| Salmi & Koponen (2020) | 33 students | English→Finnish | Postediting of 1 general text of 385 words previously translated from English into Finnish using three different MTs. |
| Cao (2022) | 9 MA students | German→Chinese | Translation of 1 text of 190 words. Informative text. |
| Martín & Cardona (2022) | 19 BA students | English→Spanish | Translation of 1 text of 841 words. Touristic text in a form of a diary. |

**Table 3.** Methodological details of studies using CNA other than Campbell.

## 1.4. Further research with the same assumptions as the CNA hypothesis

The CNA hypothesis has made its way, directly or indirectly, into many current conceptual frameworks for translation. Although these frameworks sometimes do not even mention Campbell and Hale's work in their research, they obviously share the assumptions underlying the CNA hypothesis.

Tirkkonen-Condit (2004, 183) argues that "literal expressions may be used as a way to 'listen to' what the expression means prior to venturing a translation proper. If the literal equivalent makes perfect sense and does not violate the target language norms, there is no immediate reason to discard it" (Tirkkonen-Condit 2004, 182). In the same line, Englund Dimitrova (2005) says that literal solutions are provisional/interim solutions. Tirkonnen-Condit's statement is a first sketch of what later would be labeled the *monitor model,* where she argues that there seems to be a tendency for the translation process to be literal. Tirkonnen-Condit (2005, 407-408) argues that a literal translation is a default rendering procedure, which goes on until it is interrupted by a monitor that alerts about the problem in the outcome. Although she did not mention it, this implies that every translation that diverges from a literal one results in a higher cognitive effort. In other words, a deviation from a literal translation implies looking for a different translation and/or consider several options, and that would be more taxing for the translator.

Dragsted (2012) investigates the correlation between indicators of difficulty observable in translation product and translation process data. Dragsted recorded data from eye movement measures and pauses during the translation of a 100-word long text from English into Danish by eight MA students. She identifies three words with high variation across participants and three words with no or little variation. Then, Dragsted analyzes those words in relation to indicators of difficulty from process data. She found that the total reading time and the number of fixations on words with many (5-8) different renditions was significantly higher than the number of fixations on words with only one or two different renditions. She also found that pauses before critical words were longer when they had many alternatives, compared to when they only had one or two. Dragsted (2012, 95) concludes that "it is safe to conclude that target text variation is a reliable predictor of difficulty indicators observable in process data". According to Dragsted, this seems to confirm the assumption that the more lexical choices a translator has to consider, the more effortful the processing.

Schaeffer & Carl (2014) use the notion of translation choices and correlated it with the assumption that literal translation is the default rendering procedure. In their view, in a literal translation: (a) word order is identical in the source and target languages; (b) source and target text items correspond one-to-one; and (c) each source word has only one possible translated form in the given context (29–30). They quantified translation choices using CNA, and estimated translation effort for lexical selection by counting the number of translations for the same word. That is, the more different translations for a word, the more effortful the lexical selection. Carl & Schaeffer (2014) propose the concept of word translation entropy, which indicates how many translation choices a translator has for a given source text word. They argue that "it is more time consuming for a translator to translate a source language word which can be translated in various different ways, than a source word which can only be translated into one or small number of different target words, with high probability" and that "if post-editors translate a source word in many different ways, the SMT [statistical machine translation] system also has many translation options for that word" (Carl & Schaeffer 2014, 49). According to the authors, word translation entropy would then indicate the difficulty of the text based on translation variation. This statement may have been influenced by Krings's *Wörtlichkeitmaxime* (1896, 492) which states that if a translator have to choose between two alternatives that are equally appropriate, the translator will choose the most literal one.

Based on Shannon & Weaver's noisy channel model, Carl & Schaeffer (2017) explained with more detail *word translation entropy* (Htra) and also presented the notion of *relative translation distortion* (Cross) in order to measure literality. Htra is an indicator of **the number of alternative translations** for a word. Cross indicates (1) one-to-one word correspondence between ST and TT, and vice versa, and (2) the similarity in word order between ST and TT. They distinguish between states which are triggered through early priming mechanism and more cognitive-demanding later states. According to them, 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 on the execution of the following task (95). However, concerns have been raised about the replicability of priming effects (cf. Kahneman 2012, Cesario 2014, Rivers & Sherman 2018) and the concept has expanded too much since its inception, which has led to calls for identifying moderators of priming, such as the effect of the time gap between prime and target ( Sherman & Rivers 2021). Based on those analysis, Carl & Schaeffer (2017, 110) concluded that the foundation of

translation "seems to be based on unconscious memory processes: the implicit memory of source texts segments primes the translator to produce a translation which is structurally and lexically similar to the target text". This would be a consequence of a priming mechanism involved in translation and it is in line with CNA since "words with small HTra and/or Cross values are easier to process than words with high HTra and Cross values" (Carl & Schaeffer 2017, 110).

Finally, Carl & Schaeffer (2019) further elaborated on priming in translation and post-editing. Based on the notion of Jensen et al. (2009) that if the word order of the source sentence can be maintained in the target sentence there is a shorter total reading time during translation, they suggested that facilitation is correlated with translation entropy, in line with CNA. Carl & Schaeffer (2019, 58) mentioned that "easy translation choices more often lead to identical realization, while more difficulty translation choices tend to lead to different translation realizations". They conclude the "priming effects indicate the strength by which shared combinatorial nodes are activated. Shared combinatorial nodes trigger lexical and syntactic associations between source text and its translation, which—we take it—correlate with the literality of translation" (Carl & Schaeffer 2019, 64).

Schaeffer et al. (2016) investigate the relationship between the number of translation alternatives for a single word and eye movements on the ST. They reported longer reading times for words with more possible choices than for those with fewer ones. Carl & Schaeffer (2017, 95) argue that this would be in accordance with CNA, since "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 decision often leads to identical results while more variation in the translation often implies difficulty [sic] more difficulty decisions".

Vanroy, De Clerq & Macken (2019) investigate whether translations can indicate translation difficulty using three features: the number of errors made in a translation, word translation entropy, and amount of syntactic equivalence between ST and TT. They correlated those features with keylogging and eyetracking data to conclude that their features correlated with translation data. That is, when "a segment is hard to translate for a translator, the translation process is different from a segment that is easy to translate" (2019, 15). So, they claim that these features can be used as predictors of translation difficulty and, since translation entropy and syntactic equivalence can be modelled without a translation, they may be used to measure translation difficulty *a priori*.

Lastly, Schwieter & Prior (2020) review psycholinguistic studies on translation ambiguity that tend to share the same assumptions as the CNA. In psycholinguistics, Schwieter & Prior (2020, 18) define translation ambiguity as "a situation in which a word has more than one translation". There are several methods to measure ambiguity in psycholinguistics, but the most used is that of first translation, that is, each participant provides one single translation of a word, the first one that comes to mind. Using this method, it is possible to extract the most straightforward metric that is "a simple count of the **number of different translations** produced for each word presented in the source language" (Schwieter & Prior 2020, 5, bolded by the authors). Thus, we could tell unambiguous words (those receiving only one translation) from ambiguous words (those receiving more than one translation). After reviewing a body of research on translation choices,

the authors mentioned that translation ambiguity has consequences for bilingual processing since producing translations to such translation-ambiguous words is more difficult and incurs greater costs the lower the normative probability of the translation being produced (Prior et al. 2013). Furthermore, "this difficulty could stem from competition from other translation alternatives, difficulty in learning translation-ambiguous items or incomplete knowledge" (Schwieter & Prior 2020, 11).

## 1.5. Problems and limitations of CNA

This section summarizes the problems encountered by these scholars when using CNA, by topic.

**Segmentation.** The first and most evident problem of CNA is segmentation. Only Campbell (2000a) suggests how to construct a choice network, which will depend on the aim of the research and that the researcher should respect three principles when constructing a choice network (38-39). Segments may range from individual words (Hale & Campbell 2002, 21-22), strings of several words (Campbell 2000a, 34) or entire phrases (Pavlović 2007, 164-166). Thus, researchers using the same data set, even with the same goals, may reach very different results. This poses serious issues on the generalizability, reproducibility, and replicability of any CNA study.

**Linearity of the translation process.** Choice networks portrays the decision-making process of translators as a rather sequential matter. In fact, the notion that the translation process is a chain of problem-solving instances that occurs linearly is nested on CNA. Choice networks give the idea that the translation process was linear, sequential and neat, with instances where translators decide between different options. This is because choice networks are created on the basis of the translation products.

However, Campbell (2000a, 32) himself was not convinced of the linearity of the translation process when he mentioned that "while the research paradigm presented here is still couched in the metaphor of serial processing, I believe that something like the competition model will need to become the foundation in the future". Campbell believed that the competition model, a connectionist model proposed by MacWhinney, would explain better the mental processing into translation since "it appears that the brain relies on a type of computation that emphasizes patterns of connectivity and activation (MacWhinney 1997, 222).

Séguinot (1997) offered evidence of non-linear progression, and parallel processing in translation. She also found that translators tend to return again to accepted solutions (something that Nord (1988, 2005) called the looping model of the translation process). Jakobsen & Jensen (2008) also found that the translation process is in fact non-linear. Additionally, after analyzing her informants' translation diaries and compare them with their choice networks, Pavlović (2007, 175) stated that the networks are rather a post festum reconstruction of what might have gone on if the human brain was a sophisticated computer program. It is highly doubtful that any human translation process—group or individual—would have ever followed the decision-making steps [...] in such a disciplined, orderly way. Human translation processes are by all indication messier [...].

Finally, Hvelplund (2019, 4–5) also thinks linearity is doubtful: Translation is often seen as a linear process in which source text comprehension is followed by target text formulation. This comprehension-

formulation loop repeats itself until the translation has been finalized. There is ample evidence, however, that this understanding is simplistic. Translation is not exclusively linear with processing alternating between source and target texts but is instead characterized by re-reading, reading ahead, jumping back and forth inside the text, between source text and target text consultation of external resources, etc.

**Availability of translation options.** CNA hypothesis is based on the assumption that the more lexical choices a translator has to consider, the more effortful the processing of this item becomes. This might well be true but, how can we be sure that the set of options collected from a group of translators were all in the minds of each member of that group? Nothing in these studies supports the assumption that all options in multiple renderings were equally available for all translators. Assuming that all translators will see or face the same problems in the same spot is but a gross generalization. Since CNA only works with translation products, it only takes into account the solution written by the translator, not all the solutions that the translator may or may not have considered. Furthermore, a choice network cannot represent all the solutions available to translators, since the networks will vary depending on the number of participants in the study. As O'Brien (2006a, 116) puts it "if the group size is small, then, in theory, other renditions are possible. As many researchers of translation will testify, it is possible for one hundred translators to produce one hundred different renditions of the same source sentence".

The assumption that all renderings are equally available to all translators may be just a misinterpretation and simplification of Levý's minimax work. In the view of Levý, translation was a communication process that could be defined as a sequence of decisions by which the translator chooses from the available alternatives, guided by definitional instructions that define the paradigm and selective instructions that narrow the number of choices. The actual translation work is guided by factors that are highly pragmatical, leading the translator to use the minimax strategy. Basically, the idea behind the availability of options in the CNA hypothesis is what is left behind when you left experience and expertise out of the picture.

**Difficulty of the source text**. Other studies using keylogging or eyetracking seem to support that TT variation directly correlates with ST difficulty. Their results (e.g., Dragsted & Hansen 2008, Angelone 2010, Kruger 2016) show a positive correlation between the number of alternative renditions and the time spent (pauses or fixations) in that particular item. However, pauses and fixations may not necessarily indicate problematic stretches, but also other processes. This means that difficulty is not necessarily correlated with the number of renderings. This was addressed by Hale & Campbell (2002) when they decided to add accuracy into the equation and concluded that while it may sometimes be possible to assess the difficulty of a source text item by counting the number of the translation solutions produced, there is no clear correlation between the two.

There could be other explanations for choice networks with a large number of different translation candidates. O'Brien (2006a, 26) thinks that it can be attributed to translator creativity and individuality, while Ketola (2016, 90) says that they "might reflect that the particular item is open for more possibilities of interpretation; that the meaning evoked by the item was, in one way or another, indeterminate or ambiguous". Thus, according to Ketola, a higher number of renditions do not necessarily entail a higher translation

difficulty to translate, or that the item offered the translators a chance to be creative, or even something unrelated to either of these.

When looking for translation difficulty, the source text is the wrong place to search. Difficulty is not in the STs or the TTs, but in the translator's mind. Difficulty is something experienced by a person, and it crucially depends on this person's skills, knowledge, and circumstances. A text that was challenging for a translator might be very easy for another.

## 2. Difficulty in CTIS

In CTIS, Sun & Shreve (2014, 99) and Sun & Wen (2018) write that *translation difficulty* refers to 'the extent to which cognitive resources are consumed by a translation task for a translator to meet objective and subjective performance criteria'. Thus, difficult tasks are assumed to demand more effort than easy tasks. Research on translation difficulty diverts into two lines, depending on whether translation is made by humans or machines—the second line often focused on post-editing (cf. Sun 2019). Sun (2019, 144) writes that translation difficulty research seeks to answer two essential, complementary questions: (1) what makes a text difficult to translate and (2) how can we measure and predict the difficulty of a translation task. Drawing from Meshkati (1988), Sun proposes that factors impacting translation difficulty can be related to the task and to the translator. Task factors include readability and translation-specific problems. Translator factors concern steadier variables such as intelligence, aptitude, cognitive style, and working memory capacity, and affective variables such as confidence, motivation, and anxiety, which are more susceptible to change (Sun 2019, 144).

Research comparability makes translation difficulty also an important item when designing an experiment. However, translation difficulty has customarily been conceived of as a purely subjective element (Nord 2005). PACTE (2011) observed that translators perceive L1→L2 translation as more difficult than L2→L1 translation. Buchweitz & Alves (2006), Ferreira (2014) find that L1→L2 task takes longer and is more recursive than L2→L1 translation. It is also common to hear that L1→L2 translation is more difficult than L2→L1 translation, to the extent that some scholars have disfavored it (e.g., Kelly et al. 2003). Translation difficulty has been tackled from different angles in CTIS, namely by using readability formulas, workload measures, behavioral measures and, as we saw earlier, the Choice Network Analysis. Next sections explain these measures in more detail.

### 2.1 Readability formulas

*Readability* is 'the ease with which a reader can understand a written text'. Readability formulas are mathematical expressions combining at least two factors that are known to make reading and/or comprehension more difficult, such as lexical frequency and sentence length. In general, formulas are arrived at through back engineering. In a pool of texts, researchers determine the quantitative values of the features they want to include, have a sample of readers grade the difficulty of those texts, and then find a way to get from those

values to the readers' averaged judgments. Figure 1 shows the Flesch-Kincaid readability formula as an example.

$$0.39\left(\frac{\text{number of words}}{\text{number of sentences}}\right)+11.8\left(\frac{\text{number of syllables}}{\text{number of words}}\right)-15.59$$

**Figure 3.** The Flesch-Kincaid readability formula.

Readability formulas are often used to match texts to educational levels, to tray and make sure that texts will not be too difficult or too simple for the targeted readers. Readability measurements are useful because they are objective and can be performed automatically (Sun 2019, 147). However, the constants in the formulas are only the results of tracing back people's judgments and results will be different with different reader samples, text types, text features, goals and the like. This is one of the reasons why there are currently more than 200 formulas to measure text readability (Benjamin 2012). The best known are the Flesch Reading Ease formula, the Flesch-Kincaid Readability test, the Dale-Chall formula, the Gunning Fog Index, the SMOG index and the Automated Readability index. The first two are embedded in MS Word. Furthermore, indexes entail implicit decisions and assumptions on the nature of words, sentences and other language features and how they should be computed which are only evidenced when comparing one and the same readability index in several websites. The variation in its implementation usually yields different scores.

Readability formulas are also used in CTIS as a proxy of translation difficulty. Several researchers have used them to determine the difficulty of one source text or to compare the difficulty of two or more source texts they are using in their studies (e.g., Jensen 2009; Liu & Chiu 2009; Mishra et al. 2013). Nonetheless, Sun & Shreve (2014) found that translation difficulty level and readability were negatively and weakly related. Also, Zhou, Jeong & Green (2017) showed that most common readability indexes yield different readability scores. Specifically, a "higher sample size decreases the interquartile range of the standard deviation of estimates between sites up to about 900 words" (Zhou, Jeong & Green 2017). That is, text length influence the scores. This seems to be very important for CTIS, since many studies use short texts (200–300 words).

## 2.2 Workload measures

As for workload measures, Sun (2019, 148) distinguishes three major categories: subjective, performance, and physiological measures. Examples of subjective measures are the NASA-TLX assessment tool (e.g., Sun 2012, Sun & Shreve 2014), rating scales, and expert panels. Subjective measures may not be sensitive to measurable workload manipulations, since translation problems are ill-defined in nature. Performance measures employ workload indicators that measure the subject's activity, such as speed (time on task) and accuracy (number of errors). As for physiological measures, pupillary responses and EEG have been used to measure cognitive effort. However, Hvelplund (2011) did not find a strong relationship between cognitive effort and pupillary response in translation. This may be related to the fact that, as current research shows, pupillometry is related to cognitive load or effort, but also to arousal (Wang et al. 2018, Tapper et al. 2022).

## 2.3 Behavioral measures

Behavioral measures may be considered a fourth category of workload measures. They are mostly based on pause location and length while translating, as keylogged, and fixations and pupil dilation, as eyetracked. The data collected by methods can also be used to identify attentional changes and typing fluency in the translation process, and to analyze the translation flow and fluency (see §5 the Task Segment Framework and §6.4 Behavioral Fluency for the operationalization of behavioral fluency in this dissertation). Next section will explain in detail the concept of fluency in keylogging, as it is a central concept in this dissertation.

### 2.3.1 Fluency

Generally speaking, writing is a complex and cognitively demanding task that involves cognitive processes supporting the text production, transcription and monitoring of the writing process (Berninger & Amtmann 2003). Some of these processes—coordinated by the writer's working memory—are keyboard control, knowledge about the topic, language, planning, evaluating, revising, etc. The behaviors of the writers reflect cognitive processes during writing (Flower & Hayes 1981; Chenoweth & Hayes 2001; Berninger & Amtmann 2003; Hayes 2012) that can be observed in keylogged data when writers and translators are performing a task.

Some texts do not need much effort to be written, while other texts are the result of a very effortful process. The latter require more cognitive resources and effort to be completed, which can result in decreased efficiency, accuracy and speed of performance. This leads to lower levels of fluency in the behavior or task being performed. In writing research, fluent writing refers to a state of effortless writing characterized by "short pausing times, few revisions and a high production rate" (Van Waes & Leijten 2015, 80). It is related to temporal effort, understood as a measure to the resources that are required to complete a task or achieve a goal within a certain timeframe. Both fluency and temporal effort are intimately related to the concept of burst. A burst refers to a period of intense and focused writing that has been operationalized as "the number of characters produced between two pauses that exceed the given pause threshold (i.e., 2 seconds)" (Leijten & Van Waes 2013, 5). Texts are usually produced in bursts of approximately six to 12 words in length (Chenoweth & Hayes 2003, Friedlander 1989). Such variation depends on linguistic experience (Chenoweth & Hayes 2001, Friedlander 1989) and working-memory capacity (Chenoweth & Hayes, 2003). For proficient writers, "text[s) tends to be produced efficiently in longer bursts [and] pauses are more likely to happen at natural loci for planning such as clause and sentence boundaries", while, in the case of less proficient writers, "text tends to be produced less efficiently, and pauses appear in locations that suggest difficulties in typing, spelling, word-finding, and other transcription processes" (Deane & Zhang 2015, 1). Chenoweth & Hayes (2001), Chenoweth & Hayes (2003) and Hayes & Chenoweth (2006, 94) showed that burst length is intrinsically connected to fluency, since it reflects "the capacity of the translator to handle complex language structures".

It is now commonly accepted that fluent writing processes are characterized by short pausing times, few revisions and a high production rate (MacArthur, Graham, & Fitzgerald, 2008). Also, Kellogg (1996,

2004) demonstrated that initial planning leads to a decrease of cognitive effort in the transcription phase, positively influencing fluency. To summarize, fluency is multifaceted and shaped by the writer's pausing and revision behavior and production rate (MacArthur, Graham & Fitzgerald 2008; Van Waes & Leijten 2015). In this dissertation, these key features of fluency will be operationalized for translation and analyzed using the Task Segment Framework (Muñoz & Apfelthaler 2022).

## 3. A cognitive-translatological approach to translation difficulty

CTIS has applied many theories and concepts from cognitive sciences—particularly cognitive psychology, psycholinguistics and experimental psychology (Shreve & Koby 1997, xii), but also Cognitive Linguistics and the philosophy of mind and language. Often, CTIS adopted stances biased towards rationalistic views, seeking to explain the mind as a stand-alone device whose capacities are critical for the success of the task. This view on cognition is rooted on the classical information-processing and connectionist approaches that approach our mind as if it were a computer (Muñoz 2016a). Nonetheless, over the last 10 years CTIS has been slowly drifting towards an alternative to the old mind-as-computer metaphor, a set of situated views on cognition often known as cognitive translatology (Muñoz 2010). Using embodied, embedded, enacted, extended, and affective (4EA) approaches to cognition as a referential framework, CT has opened up to other aspects of cognition, such as the interaction with environmental affordances, attention, metacognition and control.

This dissertation uses the Task Segment Framework, a framework to analyze the translation processes proposed by Muñoz & Apfelthaler (2022), so a series of basic concepts and assumptions need to be clarified or defined. Thus, the following sections outlines the conceptual scaffolding framing the cognitive approach to the study of translation adopted here, as many of this constructs impact behavior and are reflected in keylogged data. First, *metacognition,* a key construct in the regulation of cognitive processes. Then two concepts related to metacognition will be defined: *attention* and *cognitive control.* Then, *cognitive effort* and *demand* are defined, since these concepts have been customarily operationalized in different ways in CTIS depending on the research purpose and the data collection tool. The section ends with the discussion of the construct of *task switching,* a cognitively demanding process relevant for the analysis of the translation process using the Task Segment Framework .

### 3.1. Metacognition

*Metacognition* is defined as knowledge and regulation of one's own cognitive system (Brown 1987) or "the ability to reflect upon, understand and thereby modulate one's own cognition" (Shreve 2009, 255). Cognition differs from metacognition in that the former is necessary to perform a task whereas the latter is necessary to understand how that task is performed (Schraw 2001). Also, metacognition is "conscious and volitional, it occurs as the result of active attention to the progress of an ongoing higher-order task" (Shreve 2009, 256). Metacognition is closely related with expertise: changes in metacognitive activity are highly associated with increasing expertise in the translation task (Shreve 2006). Thus, "metacognitive abilities are developed over time, which implies that translators with various levels of experience may exhibit different metacognitive behavior" (Mellinger 2019, 4).

Two main components are generally identified under the term *metacognition*: metacognitive knowledge (knowledge of cognition), and metacognitive regulation or metacognitive skillfulness (control over cognition). *Metacognitive knowledge* refers to "explicit awareness of one's extant cognitive resources, current inventory of cognitive strategies, and repertoire of task knowledge" (Shreve 2009, 256) and has been divided into declarative, procedural, and conditional knowledge (Jacobs & Paris 1987; Schraw 1994). Declarative and procedural knowledge of the translation task will likely precede any ability to regulate cognitive behavior (Mellinger 2019, 4). Metacognitive regulation refers to the conscious and not-conscious decisions that we make based on the output of our monitoring processes.

The components of metacognition act simultaneously and at different stages of the translation process. Metacognitive activities occur before (planning), during (monitoring) and after (evaluating) cognitive activities. Task awareness allows us to "reflect on the task, recognize its processes and sequences and incorporate changes to the task where necessary" (Shreve 2009, 257). This would be a precondition for metacognitive activity to occur. Incomplete declarative or procedural knowledge or a lack of task awareness may result in a disconnection between metacognitive behavior and the translation product (Mellinger 2019).

## 3.2. Attention

*Attention* is the cognitive process of selectively concentrating on one aspect of the environment while ignoring other features. Attention is related to processes such as control, which is usually conceived of as one of its most fundamental functions: selecting some processes for engagement over others (e.g., Cohen et al. 1990; Deco & Rolls 2005; Ardid et al. 2007). Early models of attention assumed that the vast onslaught of raw uninterpreted sensory input that barrages our sensors must be filtered down to a small subset of processed cognitive items that would be analyzed by a central executive with limited capacity (Spivey & Huette 2014, 306). In other words, external stimuli influence mental processing. However, mental processing also influences external stimuli. When seeing attention as embodied in motor movements, the result is that while the environment is catalyzing events in the brain, the brain is simultaneously catalyzing events in the environments (311). Thus attention (and the mind) would be an emergent property of an embodied brain interacting with its environment.

In CTIS, attention has been often neglected. Castro (2008), Jakobsen & Jensen (2008), Hvelplund (2011, 2017) and others have studied attention distribution between ST and TT mainly using eyetracking and keylogging. According to Hvelplund (2011), attention would be devoted to three main cognitive processes: ST comprehension, TT production, and switching between two linguistic codes. However, Leijten et al. (2014) and Muñoz & Apfelthaler (2022) mention that writing process research (and in this case, translation process research) often overlooks important components, such as searching for information and attention management. Behaviors such as the reallocation of attentional resources should be given more importance, since they may hint at different processes during the translation task.

## 3.3. Cognitive control

The construct of cognitive control grew out of the literature on attention, and remains intimately bound to it, although it has also been closely associated with effort and motivation (Cohen 2017, 6, 12). Also known as *executive function* or *executive control, cognitive control* can be loosely defined as "the ability to pursue goal-directed behavior, in the face of otherwise more habitual or immediately compelling behaviours" (Cohen 2017, 3). It thus refers to managing cognitive processes—not only working memory and problem solving, but also planning and execution, among others (Chan et al. 2007). The components of cognitive control (e.g., inhibition, updating and shifting) are relatively independent, but interrelated. Cognitive control is important for CTIS because of its unitary and diverse nature (Miyake et al. 2000). It enables complex cognition in nonroutine situations, such as in multitasking, so it should be taken into account when studying the translation process and expertise in translation.

Cognitive control is important because control processes govern human behavior and cognition, so it may be possible to improve or alter control processes in order to improve, for example, task performance. Developing expertise in a certain task may lead to transferring some of the acquired abilities to other behaviors (partially) involving the same processes, and this transfer may be related to cognitive control (Van der Linden et al. 2018). In brief, it can improve learning. From an embodied perspective, the connection between cognitive control and action is bidirectional: "actively exerting cognitive control implies the effective exercise of the underlying processes, which in turn promotes their maintenance" (Hommel & Kibele 2016, 35).

Bilinguals seem to differ from monolinguals in cognitive control processes. Furthermore, individual differences within bilinguals can explain their success in controlling languages (Morales et al. 2016, 288). Festman et al. (2010), Roelofs, Piai & Rodríguez (2011) and Mercier et al. (2013) have focused on individual differences in cognitive and language control skills in bilinguals. Coordinating all the simultaneous processes an interpreter is engaged in when at task seems to demand significant amounts of cognitive control and attention (Hervais-Adelman & Babcock 2020). In CTIS, cognitive control has mainly been investigated in interpreting tasks and together with language control (review in Hervais-Adelman et al. 2011).

Miyake et al. (2000) and Hirsch et al. (2019) argue that the components of cognitive control are related as well as separable, and that performance costs in multitasking do not measure the components of cognitive control in an isolated and differentiated manner. This could be extrapolated, in fact, to all the cognitive processes involved in the translation process. Thus, it is important to consider that all the cognitive processes (also in translation) are separable, but also interrelated.

## 3.4. Cognitive effort and demand

*Cognitive effort* is considered to reflect '[…] the cognitive capacity that is actually allocated to accommodate the demands imposed by the task' (Paas et. al 2003, 64). *Cognitive demand* will be used to refer to the tendencies in task features to prompt participants to exert higher or lower mental efforts (Muñoz, personal communication). Cognitive effort is quantifiable using individual measurements and cognitive demand is measurable as a tendency in large groups of individuals responding to certain features, such as words with different frequencies. Since traditional CTIS concentrated to a large extent on describing translation as a

problem-solving and decision-making process (Risku 2012, 6), cognitive effort (often dubbed *load*) was generally operationalized in terms of pause length (e.g., Krings 1986, Lörscher 1991, Jakobsen 2003, PACTE 2005, Alves & Couto Vale 2009, Dragsted 2010, etc.), pupil dilation (Seeber 2013) and gaze fixations (Hvelplund 2019). Subjective measures were also used, mainly the NASA-TLX (Sun 2012). Recently, cognitive effort has been studied principally in interpreting, using EEG (Petsche et al. 1993), fMRI (Hervais-Adelman et al. 2011), PET (Rinne et al. 2000) and pupillometry.

## 3.5. Task switching

In cognitive translatology, a *task* is an activity or course of action commissioned by somebody in authority, often expected to be accomplished within a period of time or by a deadline, usually as part of a larger project. Thus, a task refers to any and all multilectal mediated communication activities, but it is also a recursive, nested category, so it may also refer to parts of such tasks (Muñoz & Apfelthaler 2022, 19). Good task switching refers to the 'ability of humans to change the task currently worked on and still perform the involved tasks quite accurately even if the stimuli and motor responses involved in the tasks are quite similar or event identical' (Schultheis 2007, 748). Thus, task switching requires an organized reconfiguration of mental resources in a multitasking situation. This links cognitive control to task switching, since cognitive control is required during multitasking (Miyake et al. 2000).

Miyake et al. (2000) and Hirsch et al. (2019) show that people slow down when they switch between tasks. Hirsch et al. (2019, 63–64) offer two explanations for switching-related performance costs: (1) to perform a task, a task set needs to be activated. That task set has to be reconfigured when the task changes; (2) to perform one of two tasks, the irrelevant task set needs to be inhibited. When the task switches, the persisting inhibition of the previously irrelevant but now intended task set, and the persisting activation of the previously relevant but now unintended task set have to be overcome. Task-switching and dual-tasking often result in performance costs in both speed and accuracy. This indicates that these performance measures rely on the same processes (e.g., Meiran 1996; Halvorson et al. 2013; Han & Marois 2013). Muñoz & Cardona (2019) mention that task switching often entails a slower and less accurate performance on a given task A on a trial after another trial of a different task B (alternating or switch trial) compared to performance on task A after another trial of task A (repetition trial). So, if you change between different activities, there will be a switching cost (Muñoz & Apfelthaler 2021). In sum, there seems to be a cognitive cost for task switching in translation. This study addresses task switching using the Task Segment Framework as a basis, focusing particularly on the levels of fluency of the task segments.

## 4. Pauses and Segmentation in CTIS

Some lines of research on the translation process have focused solely on translation problems that were later called *rich points* (PACTE 2005, 2008, 2011) such as false friends, culture-bound items, idioms, etc. This approach fosters the notion that "only translation units containing rich points may have a greater likelihood of triggering problem-solving behaviors" (Angelone 2018, 17) and stands on the notion that translating is just a "complex series of problem-solving and decision-making processes" (House 2000, 150). This approach can also be observed in several lines of work within CTIS, which tended to consider pauses as flagging rich points, as pauses were considered to indicate problems. However, adopting this framework leads to focusing only on some particular problematic translation units (dismissing the rest of the text) and explains why "our discipline's interest tend to stop at the lexical level" (Shreve & Diamond 2016, 150). Rich points "may ultimately offer more of a rudimentary substratum rather than a holistic representation of the unique problems encountered by the individual translator" (Angelone 2018, 18). Therefore, the discipline was in need of a better approach to segment the text.

Shreve & Diamond (2016, 150) state that the translator appears to work on discrete "chunks" of textual material. They argue that translators focus on a specific ST segment that can be specified via eyetracking and keylogging technologies, and extract its meaning (although cognitive translatology argues that meaning is constructed). Thus, Shreve & Diamond (2016, 150) posit a fundamental cognitive unit, a "chunk of text processed by the translator as a coherent mental package where underlying 'next order' processes of comprehension, transfer, and production intersect to produce the discrete behavior identified as a translation".

*Chunking, text segmentation, translation units, activity units* and similar terms are frequently interrelated in the literature of CTIS. However, there is still no agreement on how to define these concepts since their definitions depend heavily on the authors' conceptions: a "text string comprehended produced between two pauses of a certain duration" (Dragsted 2005); a segment of whatever extension or nature that attracts the translator's focus of attention at a given time in the translation process (Alves & Couto Vale 2009, 253; Alves et al. 2010, 124); the translator focus of attention at a given time that is a combination of reading and writing activities (Carl & Kay 2011, 952); segment of translation activity records that last at least one second (Lu et al. 2020; Martínez et al. 2014).

Alves & Couto Vale (2017, 91) argue that "a TU begins with a reading phase that is registered as a pause [...] and evolves in a continuous production phase until it is interrupted by a pause. This pause may be a pause for planning or searching for a translation alternative, an assessment of the previous production or the beginning of a new reading phase". Thus, their translation unit is captured as a TT production segment located between pauses that can be mapped on to an ST segment (Alves et al. 2010, 125). Here, production segment would refer to a text extract observable in TTs or in the text production process, and a translation unit is identified in time by pause intervals reflecting the translator's focus of attention. This is similar to the definition of segmentation given in natural language processing: the process of extracting coherent blocks of texts (Deepak et al. 2012) or a region of interest (Oyedotun & Khashman 2016). The segment type that is used the most in NLP is word segment (Pak & Teh 2018).

In many of the aforementioned definitions of translation unit, there are still some nuances of the translation-as-a-problem-solving-activity approach or information processing perspective. The processes of comprehension, transfer and production are a construct of operations and states at the mental processes at hand when translating. Hence, they have to be understood in terms of their constituents: the mental processes of attention, language use, memory, perception, metacognition and problem-solving (Shreve & Diamond 2016, 150). According to Kenny (2011, 80), translation units from a cognitive perspective are:

- source oriented, in that they are defined by attentional focus on the source text, although newer technologies are also directing researchers' attention to target texts.
- dynamic, in that they emerge during real-time translational processing of source texts and are not restricted to any particular length or structural boundaries, although their extent may vary with varying levels of translator expertise.
- problem-oriented, either because researchers focus on those aspects of translation that prove to be problematic, or, because the data elicitation techniques used by researchers favor the discovery of problems in the translation process.
- difficult to identify, given that they are dynamic; but also because access to cognitive processes is always indirect, and different ways of eliciting data about cognitive processes tend to yield different results; and because there is no agreement in the literature on the best way to identify them.

Kenny's summary is accurate only for some cognitive approaches to translation as many of the approaches reviewed here focused solely on the text, that is, their approach was linguistic in nature, not cognitive.

Based on keylogging data, pauses may be used to chunk and segment the target text into translation units (e.g., Dragsted 2005, Muñoz & Martín 2018, Sturm 2020). The pause threshold used to define such segments generally varies between 1 and 5 seconds (Alves & Couto Vale 2009), although more recent literature underscores the need for personalizing this threshold (Dragsted 2005, Rosenqvist 2015, Muñoz & Apfelthaler 2022). However, it is a very common practice leaving aside the information on searches from the translation units.

Hence, research on bursts is essential. Leitjen & Van Waes (2013, 5) define burst as "the number of characters produced between two pauses that exceed the given pause threshold (i.e., 2 seconds)". Texts are usually produced in bursts of approximately 6 to 12 words in length (Chenoweth & Hayes 2003, Friedlander 1989). Such variation depends on linguistic experience (Chenoweth & Hayes 2001, Friedlander 1989) and working-memory capacity (Chenoweth & Hayes 2003). For proficient writers, "text[s) tends to be produced efficiently in longer bursts [and] pauses are more likely to happen at natural loci for planning such as clause and sentence boundaries", while, in the case of less proficient writers, "text tends to be produced less efficiently, and pauses appear in locations that suggest difficulties in typing, spelling, word-finding, and other transcription processes" (Deane & Zhang 2015, 1). The importance of pause bursts stems from the fact that they facilitate drawing inferences on pause and revision behavior which in turn may be related to the use of different cognitive resources, namely, pauses are assumed to signal cognitive effort in mentally taxing processes. There are pauses of different length that are usually taken to indicate different cognitive phenomena.

Moreover, pauses tend to vary among subjects. The next section address the problem of how to operationalize pauses and presents a novel framework to study translation processes.

## 4.1. Operationalization of pauses in keylogging research

In order to segment the text, it seemed necessary to define what counted as a relevant pause in order to segment the text. When operationalizing pauses, translation scholars have used different approaches. Indeed, there is a lot of variation among studies and the selection of pause value is arbitrary. The first study that used a fixed pause threshold in translation was Krings (1986). He set a meaningful pause at 3000 ms. Lörscher (1991), Angelone (2010) and Göpferich (2010) used a minimum pause value of 2000 ms. Jensen (2000) analyzed all pauses over 4000 ms. Jakobsen (2003), Englund Dimitrova (2005) and the Laboratory for Experimentation in Translation (LETRA) used a 5000-ms pause boundary (da Silva 2015). Later, Jakobsen (2005) suggested 2400 ms. Dragsted et al. (2009) considered a significant pause to be over 2500 ms. The situation is similar in writing research, where the most common pause threshold is 2 seconds (Van Waes & Leitjen 2015). However, comparing all subjects on the basis of the same pause unit value would amount to comparing the motion of a turtle and a leopard as if they both belonged to the same species (Dragsted 2005, 53). In other words, having an arbitrary predefined pause threshold is problematic because it does not consider differences in writing ability (Rosenqvist 2015, 19).

In the last 20 years, the only exceptions (to our knowledge) were Dragsted (2004), Immonen (2006, 2011), and several works by Muñoz and colleagues. Dragsted (2004) calculated the size of the translation unit analyzing individual typing speed and the time spent by each of the subjects. By doing so, the length of a significant pause varies from subject to subject and she was able to capture the writing rhythm of slow and fast writers. Immonen (2006) did not employ a predetermined threshold for pauses, but rather examined patterns of pauses in fluent translation and monolingual text production. Immonen aimed to investigate how pauses were distributed in fluent text production and translation and how this distribution might differ between text production and translation. She considered that pauses as short as 0.001 seconds were of interest. Immonen's focus was on fluent text production, which refers to typing without interruptions from corrections, deletions, or cursor movements. By using such a minimal pause threshold, the author was able to identify even the slightest variations in the translation process. Muñoz and colleagues used personalized thresholds and differentiated between long, mid and short inter-keystroke intervals. These studies later derived in the operationalization of the pauses used in the Task Segment Framework (Muñoz & Apfelthaler 2022). Martín & Cardona (2022) also used the pause thresholds from Muñoz & Cardona's (2019) approach to task segmentation.

The problem that posits this brief summary on the operationalization of pauses is precisely what should a relevant pause be considered to be in order to segment the text, since most studies do it in a different fashion. The oversimplification of the models and their operationalizations "may lead to typing speed distortions higher than 20%, to missing 30% of the recorded behavior in terms of time, and also to render more than 40% of the potential process units unfit due to the way deletions and corrections are handled" (Muñoz & Olalla-Soler 2022, 17).

Traditionally, pauses at or above a predetermined cutoff point are customarily (and wrongly) associated with problems, intrinsic ST difficulty, and higher cognitive effort (Muñoz & Olalla-Soler 2022, 12-13). Most of the aforementioned studies only considered long pauses in their studies, since they assumed that pauses beyond their chosen threshold indicate a problem-solving spot. However, long pauses not necessarily indicate only problems. Krings (1986, 137), Jakobsen (2003, 89) and Alves & Couto Vale (2009, 255) recognize that it is not clear how long a gap needs to be to qualify as a pause. Englund Dimitrova (2005, 96–97) mentions that there is no way of knowing when exactly a pause length signals a problem or planning. Kumpulainen (2015, 48) acknowledges that "a pause may signify both problem-free and problematic processing". In other words, many long pauses are devoted to other activities that require the cognitive resources otherwise dedicated to typing such as reading or planning. In fact, longer pauses in writing host all major cognitive processes—e.g., planning and revision (Olive, Alves & Castro 2009), sometimes occur due to switching from the ST to the translation (Dragsted & Hansen 2008, 25) or due to scrolling and moving the cursor elsewhere (Angelone 2010). Long pauses are also devoted to reading the original, or both the original and their own draft (Dragsted 2012, 92; Kruger 2016, 48). This suggests that (long) pauses tend to be intentional (Muñoz & Apftelhaler 2022, 23) and can be used as chunking touchstones demarcating the initial and final boundaries of interesting text stretches. Many approaches that use pauses to flag translation problems only mark the beginning, but it is not known where the end of the problematic segment is. In contrast, the Task Segment Framework marks both the beginning and the end of a task segment, but pauses are not used to flag translation problems, which are but one of the activities happening during such pauses. Muñoz & Martín (2018) and Muñoz & Apftelhaler (2022) proposed a novel way of chunking texts and analyzing pauses. The next sections addresses the Task Segment Framework in detail.

## 5. The Task Segment Framework

The Task Segment Framework (TSF, Muñoz & Apfelthaler 2022) applies to study translation processes as recorded with keyloggers and will be summarized in what follows. Keylogged typing flows are chains of typed actions and interspersed interkeystroke intervals (IKIs). IKIs can be defined as the timespan between two actions, and can be classed in two ways: according to their motivation (willful and unintended) and according to their length (pauses, respites, delays, and lags). Long time lapses are assumed to be voluntary and to interrupt the typing flow and they are used to chunk the flow of keylogged translation data into segments with registered behavior, not necessarily text excerpts (task segments, however, may contain text excerpts). In the TSF, the term *pauses* is restricted to voluntary interruptions of the typing flow, where translators recruit the mental resources they devoted to typing and reallocate them to subtasks that usually cannot be keylogged such as assessing, reading, planning, etc. Hence, pauses technically are not part of typing, since typists voluntarily (and transitorily) ceased their activity. *Delays* and *respites,* in contrast, are IKIs flagging unintended typing disfluencies. *Delays* tend to be shorter and are motivated by mechanical or typing causes. *Respites* are longer, may become conscious and noticeable, and they are associated with task-related aspects of cognitive performances. Respites are longer than delays, often noticeable without any equipment. Respites are assumed to flag changes on attentional states related mainly to the action in progress, and therefore, with

processing difficulties. Finally, lags are the shortest type of IKIs. They are not subjected to study, not because they are not relevant, but because they are not a priority given today's research equipment. Figure 4 presents a classification and operationalization of IKIs according to their motivation and length.

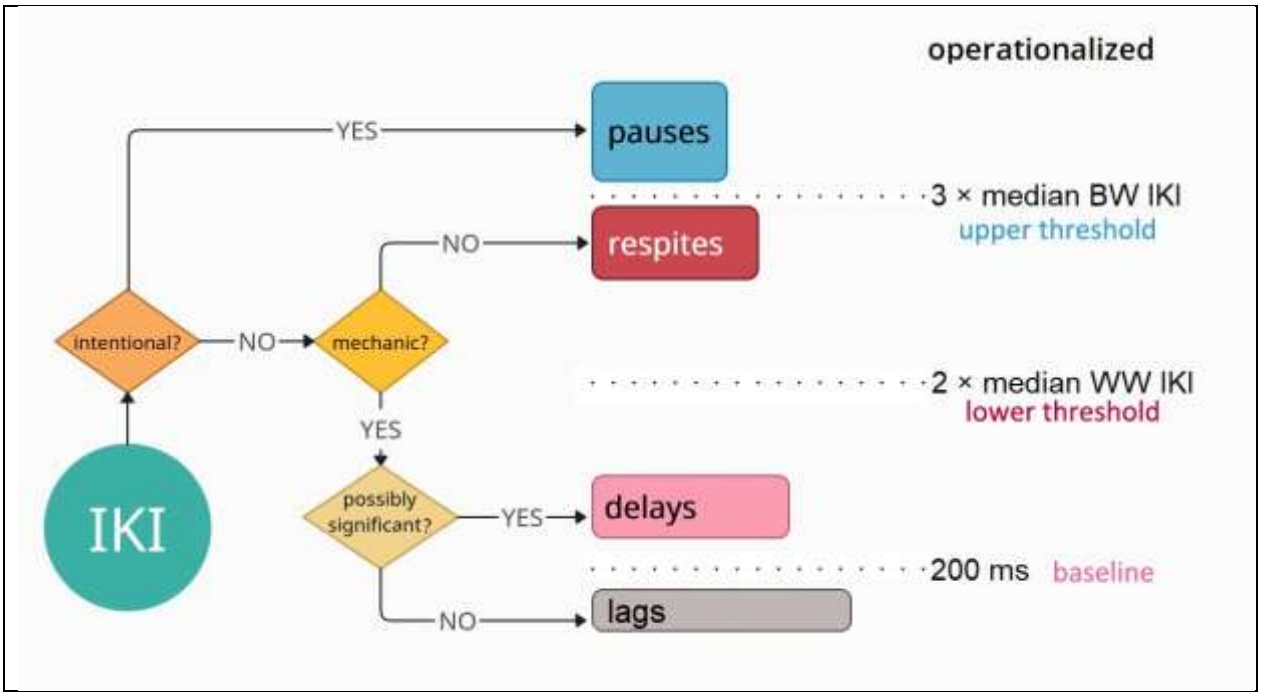



**Figure 4.** Classification, operationalization and types of IKIs

The TSF uses pauses to break down the translation flow into segments. These bursts or chunks of uninterrupted activity are called *task segments,* behavioral units that may or not contain language. Translation logs can be studied as a series of alternating subtasks:

- ADD: producing new text.
- CHANGE: changing existing texts.
- SEARCH: searching for information.
- HCI: purposefully interacting with tools in ways that do not seem immediately related to the task.
- FILLERS: apparently purposeless events.

Each subtask labels a specific behavioral repertoire and its hypothesized cognitive counterparts. For instance, in SEARCH translators tend not to use capital letters and often they do not care for typos and misspellings, but in ADD, these rules are enforced. Translators work better when one behavioral repertoire is active, so they do not apply potentially conflicting rules at once. MIX task segments correspond to combining at least two subtasks in a task segment (e.g., SEARCH + ADD). Finally, FILLERS do not necessarily contain work on the target text. They are task segments reflecting minimal, ineffective, apparently purposeless clicks, cursor moves, etc.

One of the applications of the TSF is to describe translators' typing flows in terms of fluency and effectiveness. Subtask are assumed to be potentially associated with particular behavioral repertoires, so tasks segments that "only contain events and building blocks of one subtask are thought to be more fluent, in that they are hypothesized not to entail a cognitive effort as high as task segments where more than one behavioral repertoire is active or where task switches between two or more behavioral repertoires take place" (Muñoz & Apfelthaler 2022, 25).

To distinguish lags from all other kind of IKIs, Muñoz & Apfelthaler (2022, 21–23) set a minimal baseline at 200 ms because (a) typists take about 200 ms to stop typing once they decide to do so (Logan 1982); (b) conscious episodes within cognitive cycles of recurring brain events usually start 200—280 ms after stimulus onset (Madl et al. 2011); (c) earliest activations of lexico-semantic information first occur around 200 ms (Pulvermüller 2001); (d) average switch costs entails an extra cost of at least 200 ms (Monsell 2003); (e) the time between visual stimulus onset and detection is 150-200 ms, and then another 150-200 ms before subject react to a stimulus by pressing a key (Amano et al. 2006); and (f) the average fixation length in reading is 200 ms (Smith & Levý 2010). Setting the baseline at 200 ms means that lags from 1 to 199 ms are ignored, even when computing timespans and speed, and will not be subjected to study. This does not mean, they argue, that such small and very frequent IKIs are not important, but only that currently they are not a priority given todays' research equipment. In the TSF, hence, 200 ms is considered the minimum unit of relevance.

The TSF also calls for two thresholds: an upper threshold—as of January 2023, it is set at three times the median value for IKIs between words—divides the translation process into task segments. It thus provides a basis for a cogent, informative representation of the process and also distinguishes between pauses and respites. A lower threshold aims to distinguish between respites, i.e., task-relevant IKIs (those possibly reflecting attentional changes, control variations, re allocation of cognitive resources as evidenced by disturbances in the typing flow) and delays. The latter would be mainly due to mechanical causes, such as pressing two contiguous keys with the same finger or having to combine a letter key with shift or a dead key to enter diacritics. Delays are not represented graphically in the TSF, but they are used in the calculations. Table 4 shows the translation process of the sentence *In large part, the belief in vampirism grew out of a lack of knowledge about the natural processes of decomposition after death, which can, under certain conditions, be delayed for a long period of time.* into Italian. As seen in Table 4, pauses are conventionally presented before the contents of each a task segment, so the representation has at least two columns. Respites are symbolized with light blue dots within text production. Produced target text is black and the text entered elsewhere (mainly, browser searchers) is green. Red symbols point to deletions or text selection. A full TSF code list as of January 2023 is to be found in Appendix A.

| | |
|---|---|
| 30710 | I |
| 1400 | n_gran_parte,••_ |
| 13104 | la_credenza_del_vampirismo_ |
| 1566 | na•cque••_d•alla_mancanza_di_conoscenza_riguardo_ |
| 1439 | il_••processo_naturale_di_decomposizione_dopo_la_morte |
| 2700 | ,_che_pul,_☒3•ò,_ |
| 26690 | in_•3•determinare_☒3te_circosa☒tra•☒☒anze,_ |
| 9759 | ‖TB‖⊙|WB|⊙|WB|•de☒3be_delayed¶|WB|•3•‖TB‖⊙|TT|<br>••subire_ti☒2ritardi••_ |
| 1540 | per_un_lungo_•lasso_dit☒_tempo.¶•3•◌⇳ |
| 7453 | ‖TB‖⊙|WB|•4•◌2|WB|⊙saò•☒poni•3•fica••zione•¶|WB| |
| 1625 | ◌ |
| 2125 | ⊙_◌2c◌a◌⊙|WB|•4•◌2⇳ |
| 2093 | ⇳‖TB‖⊙|TT| |
| 2578 | ‖TB‖⊙|WB|◌|WB|⊙damp¶|WB|••‖TB‖⊙|TT| |

**Table 4.** Example of a representation translation process using the TSF.

In conclusion, for decades, pauses in CTIS were classified as to their length to identify which ones separated translation units or indicated problems. However, translators may also solve problems when they are typing, and pauses can indicate many other processes besides problem solving. This indicates that pauses should be of a different nature. Even today, most approaches to segmenting the translation process in CTIS tend to be linguistic in nature and not cognitive. The TSF, in contrast, offers a way to personalize pause thresholds, which would allow to take into account writing differences between subjects and sessions. Muñoz & Apfelthaler (2022) were probably inspired by the notion of burst from writing studies and contend that there are willful IKIs, which in themselves are part of the task but not of typing, and involuntary IKIs, that belong to typing and indicate problems. In the TSF there is not necessarily a direct, constant correspondence between linguistic units and behavioral units. The Task Segment Framework offers a new and fresh way to see the translation process, this time from a cognitive perspective. That is why it was adopted in this study.

## 6. Chapter summary

This chapter laid out the conceptual framework of this dissertation. The CNA proposed a way to measure difficulty based on the translation choices found on translation products. However, it attempts to explain difficulty based on results alone, since it works on texts, not on behavior. Through this chapter, we moved from this text-based approach to a behavioral approach of the translation task. Other ways to measure difficulty used in CTIS that depart from a process perspective were also discussed, with a particular focus on

the concept of fluency, which has been developed in language research such as speech studies, reading studies and writing research.

It was also necessary to discuss the regulation of cognitive processes involved in translation, as many of these concepts were often overlooked in the study of the translation research. Of particular relevance for this dissertation is that these processes affect the fluency of translators and are reflected in keylogged data. This, together with the discussion on the different approaches to interpret and operationalize pauses in cognitive translation studies, made evident that a new way to analyze the translation process was necessary. This dissertation used the Task Segment Framework (TSF), an analytical framework to study the translation process as recorded with keyloggers, in order to describe and analyze the behavior of translators. This research project departs puts the basic tenets of the CNA—namely that many choices means more difficulty, and that one choice means less difficulty— to the test. To do so, it applies a behavioral approach to keylogged data and uses several process-based indicators of fluency analyzed with the TSF to determine whether the CNA can truly measure difficulty.

# INFORMANTS, MATERIALS AND METHODS

This chapter begins by presenting the research questions and hypotheses and only then describes the informants, the materials and the methods of the study. First, the informants of the study are profiled. Then, the text selection procedure, materials and tools are explained. Finally, the task procedure, data collection, the preparation of the data for the analysis and the data to be analyzed are explained.

## 1. Aim of the study

The overall purpose of this dissertation is to test empirically the Choice Network Analysis hypothesis. To address this purpose, this study seeks to determine whether the CNA can measure difficulty operationalized as behavioral fluency.

## 2. Research question

A general research question was formulated to deal with the CNA hypothesis.

(RQ): Is the CNA framework able to measure difficulty?

## 3. Hypotheses

Four hypotheses were tested in the study in order to find out whether the CNA can measure difficulty or not. H1 and H2 are text-based hypotheses that are part of what it could be called a bigger hypothesis encompassing both hypotheses: there is no positive correlation between the number of renditions and ST difficulty. In both H1 and H2, the CNA was used in order to identify text stretches with different and the same rendition, and then those stretches were analyzed using behavioral fluency indicators. H3 and H4 are complementary hypotheses that deal with CNA from a purely process-based approach.

Hypothesis 1 (H1): There is no positive correlation between a different number of renditions by all participants and a high level of difficulty of a text excerpt.

Behavioral fluency was used as operational definition of difficulty in this study. In this product-based hypothesis, behavioral fluency was operationalized using the following indicators: text span in one task segment, task segment only for production (mono TS), no respites in the TS, no typos/deletions in the TS

and, typing speed faster than the median. This hypothesis states that the fact that all translators have chosen a different translation for a certain text stretch does not mean that that text stretch was more difficult to translate.

### Hypothesis 2 (H2): There is no positive correlation between a single rendition by all participants and a low level of difficulty of a text excerpt.

The same indicators have been used to calculate behavioral fluency as in H1. Hypothesis 2 posits that the fact that all translators chose the same translation for a certain text stretch does not mean that that text stretch was easier to translate.

### Hypothesis 3 (H3): There is no positive correlation between pauses and behavioral fluency.

Translation process research commonly assumed that pauses above a certain threshold are indicators of difficulty. This hypothesis explores this assumption by positing that pause and behavioral fluency are not correlated to each other, which would mean that pauses do not necessarily indicate difficulty/problems. Behavioral fluency was used as operational definition of difficulty. However, since this is a process-based hypothesis, it was operationalized using four indicators from the previous hypotheses: task segment only for production (mono TS), no respites in the TS, no typos/deletions in the TS and, typing speed faster than the median.

### Hypothesis 4 (H4): There is no positive correlation between pauses and typing speed.

This process-based hypothesis is an advancement of H3. It is assumed that the pause will not have a correlation on the typing speed of the subsequent task segment.

## 4. Independent variables

The independent variables in this study are groups, text, task and number of renditions. There are two groups in this study: an Italian-L1 group and a Spanish-L1 group. Details concerning the groups, text and number of renditions are provided in §6, 7 and 8, respectively, and operational definitions of the dependent variables are provided in the next section.

## 5. Dependent variables

The main dependent variable of this study is difficulty, measured using an empirical construct, behavioral fluency, and a subjective indicator, perceived difficulty. Behavioral fluency was measured using the following indicators based on the TSF: text span in one task segment, task segment only for production (mono

TS), no respites in the TS, no typos/deletions in the TS and typing speed of the TS faster than the median. Several of these indicators are often used in writing research to measure fluency. Perceived difficulty was measured through a post-task questionnaire using a 7-point Likert scale. Finally, pause and typing speed were used as dependent variables for the process-based hypotheses.

## 6. Informants

The informants were recruited from two universities, one in Spain and the other one in Italy, between September 2020 and May 2021. Inclusion criteria were being registered in a program in Translation and having English as L2. Students were presented with the overall aims of the project and clearly informed of pertinent details. Then they signed a consent form meeting the standards of the University of Bologna and filled out a pre-task questionnaire with their sociolinguistic information for profiling purposes. After the three translation sessions, students filled out a questionnaire about their own impressions on the translation tasks.

The informants from Spain were 25 BA translation students (average age 20.3; min. 20, max. 24), 20 females, 4 males and 1 informant who responded *other*. Out of the total, sixteen declared Spanish to be their L1, six declared to have both Spanish and Basque as L1, two declared Italian to be their L1, and one declared to have Spanish and Bambara as L1. Table 5 presents a summary of the self-reported language proficiency by the Spanish informants.

| language (CEFR) | languages |
|---|---|
| L1, undeclared | Spanish 16; Spanish + Basque 6; Italian 2; Spanish + Bambara 1. |
| C2-C1 | English 25; Basque 3; Spanish 2; French 2; German 2. |
| B2-B1 | French 16; Basque 8; German 6; Italian 3; Russian 1; Romanian 1. |
| A2-A1 | Italian 4; French 2; Russian 3; Modern Greek 2; Japanese 1. |

**Table 5**. Language proficiency as stated by the informants from Spain.

The Italian informants were 6 MA female translation students that just finished their last semester (average age 24.8; min. 24 max. 28). All the informants declared Italian to be their L1. Table 6 shows a summary of the self-reported language proficiency by the Italian group.

| language | proficiency (CEFR) | languages |
|---|---|---|
| L1 | native | Italian 6 |
| L2 | C2-C1 | English 6; Spanish 6 |
| L3 | B2-B1 | French 2; Portuguese 2; Russian 1 |
| L4 | A2-A1 | French 1 |

**Table 6.** Language proficiency as stated by the informants from Italy.

## 7. Materials

Informants used MS-Word documents automatically opened by Inputlog to translate the texts. They were given an explanation on how to install Inputlog in a Word document and were requested to perform a short mock translation in order to be sure that Inputlog worked properly. Spanish informants had no experience with Inputlog while Italian informants already had experience with Inputlog, since they participated in a research project carried out in 2020. They used their own computers and Internet connection. Informants were provided with the following materials (Appendix B):

- Invitation and instructions sheet
- Instructions on how to use Inputlog
- Informed consent
- A pre-task questionnaire
- Translation commissions
- Texts to be translated
- A post-task questionnaire

Next sections details the text selection procedure, the texts used and task procedure.

### 7.1. Text selection

Wu (2019, 199) pointed out that the "parameters of text characteristics have not been rigorously defined" in translation studies; therefore, we wanted to find stable criteria that were applicable to many languages and that facilitate the comparability between different studies. We also wanted to avoid another strategy used by other studies, that is, characterizing the texts, but only mentioning that they selected a text and then profile it using mostly readability formulas.

| | materials | | | materials | |
|---|---|---|---|---|---|
| **study** | text | words | **study** | text | words |
| Jakobsen (2003) | 4 | 367, 522, 760, 1001[a] | Alves et al. (2014) | 2 | 189, 190 |
| Dragsted (2005) | 2 | 212, 127 | Balling & Carl (2014) | 6 | 110–160 |
| Rydning (2005) | 1 | 200 | Carl et al. (2015) | 6 | 110–161 |
| Alves & Couto Vale (2009) | 1 | 82 | Silva et al. (2015) | 2 | 82 |
| Dragsted (2010) | 1 | 100 | Huang, Jin (2016) | 3 | 100 each |
| Alves et al. (2010) | 1 | 318 | Hvelplund (2016) | 3 | 148, 139, 132 |
| Prassl (2010) | 5[b] | 27 | Kruger (2016) | 1 | 180 |
| Hvelpund (2011) | 3 | 148, 139, 132 | Hvelplund & Dragsted (2018) | 4 | 954, 1030, 1088, 789[a] |
| Kolb (2011, 2013) | 1 | 637 | Araghian et al. (2018) | 1 | 259 |
| Dragsted (2012) | 1 | 100 | Heilman et al. (2018) | S[c] | ? |
| Ferreira (2012) | 2 | 237, 243 | Nitzke (2018) | 6 | 100 – 148 |
| Giozza & Gatti (2012) | 3 | ? | Witczak & Jaworski (2018) | 4 | 79, 83, 87, 83 |
| Dragsted & Carl (2013) | 3 | 132–148 | Schaeffer et al. (2019) | 6 | ? |
| Ferreira (2013) | 4 | 243, 235, 187, 189 | Li (2020) | 1 | 196 |

a – characters; b – segments; c – sentences

**Table 7.** Text length in studies that used keylogging to analyze the translation process.

We are not interested in an absolute characterization of the text, but to profile texts relative to each other, in order to make them comparable, since subjects' behavior may vary as a function of the text they are facing. Thus, the first step in our research was to collect a set of texts. Muñoz (2012, 17–18) notes that texts used in translation tasks are approx. 50–200 words. Longer texts are preferred because a translation task is divided into different phases and translation behavior changes during these phases (Breedveld 2002, Muñoz & Martín 2018). Another reason to use long texts is that "higher sample size decreases the interquartile range of the standard deviation of estimates between sites up to about 900 words" (Zhou, Jeong & Green 2017). In other words, shorter texts are difficult to profile. To have a glance at the current situation in CTIS research, We sampled empirical process studies registered at the Bibliography of Interpreting and Translation (BITRA, Franco 2001–2023). We looked for keylogging studies with at least 10 citations, an arbitrary threshold to obtain a small, manageable sample of quality work. Table 7 shows the resulting 29 studies with their correspondent texts and text length. The average text length in the studies that reported it in number of words (or that attached the text in an annex) is 165 words. Thus the situation has not changed much in the last 11 years. In any case, working with such short texts can make us associate unique features displayed when translating the first paragraphs, and take them as the reference for normal behavior (Muñoz 2012).

We collected 21 texts, each one between 800-1000 words long. As seen in Table 8, there are 3 subsets of 7 texts each that share certain textual features and were collected from the same website for this study. For each subset a code was assigned when profiling them: IN for dialogic texts, DE for the informative texts and OR for the technical/instructive texts. More information about text profiling in §7.3.

| number of texts | predominant structure or function | source |
|---|---|---|
| 7 | informative | nationalgeographic.com |
| 7 | dialogic | writersandartists.co.uk |
| 7 | technical/instructive | accessdata.fda.gov/scripts/cder/daf/ |

**Table 8.** Texts and their textual features used in the text selection procedure.

Jensen (2009) distinguishes between difficulty and complexity. The notion of *difficulty* is based on the translator and can vary from one translator to another. Text *complexity* is a quantifiable approximation to potential text difficulty, based on text features, such as sentence length and word frequency. Thus, we can determine text complexity on factual linguistic criteria. The selected parameters follow a tradition started by the PETRA group in the CODIGO research project. CODIGO's original proposal consisted of 31 parameters plus a list of specific words (Amigo 2014, 637-638). In this dissertation, texts were profiled using a few of those parameters, which separately have been proved to be a reliable indicator of potential text complexity (see Section 4.2). Table 9 shows the parameters used to characterize texts for this study.

| criteria | | |
|---|---|---|
| **lexical** | **syntactic** | **textual** |
| word frequency<br>word concreteness<br>proper nouns<br>numbers | sentence length<br>modifiers per noun phrase | type-token ratio<br>connectives<br>paragraphs |

**Table 9.** Parameters used to profile the texts for this study.

The parameters were selected taking into consideration that CTIS works with several languages and in order to facilitate the comparability between studies. Table 9 shows the parameters used to characterize the texts for this study.

## 7.2. Computing the parameters

Since (1) this study works with original texts that will be translated into several languages, (2) we wanted to find stable criteria applicable to many languages, and (3) we wanted to facilitate the comparability between different studies, a specific way to compute our parameters in order to determine text complexity was designed. Function words (e.g., prepositions, articles, conjunctions, etc.) work mainly to establish grammatical relationships between content words. On the other hand, content words name objects, actions, and their ways and qualities (e.g., nouns, adjectives, verbs excluding modals and auxiliary verbs and adverbs). Where applicable, content words were used, since they carry the semantic information of an utterance. Also, in contrast to many previous studies, the median was used to compute the parameters instead of the mean, because the mean is more sensitive to the influence of the outliers (Wengelin 2006, Fuchs & Krivocapic 2016), thus making the median is a better measure of centrality as compared to the mean. This allowed us

to obtain more characteristic values from the set of texts. The next sections describe in detail why and how we computed each of the parameters for the text selection.

### 7.2.1. Word frequency

In cognitive psychology, word frequency is assumed to correlate positively with word familiarity (Read 2000, 160), that is, "the more frequently a word occurs in a language, the more likely it is to be known to the recipient" (Jensen 2009, 69). The frequency effects in language processing are widely documented. E.g., Ibrahim et al. (2017) found that high frequency words are processed faster. Eye-tracking studies on self-paced reading time show that more processing time is allocated to rare words than to high frequency words (Just & Carpenter 1987; Rayner 1998; Pollatsek, Slatery & Juhasz 2008). In brief, more familiar words are processed more quickly, and less frequent words more slowly (Hasher & Zacks 1984). Word frequency is one of the most common parameters used by most readability indexes (Sun 2012) and it is also used as a measure of text complexity in national standards for school children, such as the Common Core Standards in the USA.

In CTIS, Mauranen (2004) used the distribution of most frequent words as an indicator of lexical interference and discovered that the distribution of very frequent words is different between translated texts and non-translated texts in the same language. Jensen (2009) employed word frequency as an indicator of translation difficulty. Zanettin (2013) surveyed 20 studies that used corpora and corpus linguistics methods to investigate the hypothesis of translation universals and two of the common parameters used in these studies were word frequency and sets of rarely occurring words. For all these reasons, Angelone (2018, 24) stated that the "[…] percentage of difficult words may be a very reliable indicator of text complexity" and since less frequent words are retrieved more slowly, we may entertain that the percentage frequency is a good indicator of complexity.

Wu (2019 202) used *sophisticated word type* in order to measure word frequency. He defined sophisticated word as "those [words] that are outside the top 2,000 frequent words in the British National Corpus [BNC]". Following Muñoz's suggestions (personal communication), Puerini (2021) categorized word frequency using 5 bands ranging from 0 to 15,000 in the BNC. Following this procedure, we profiled the text as a percentage of frequent words with frequency values between:

(1) 0000 – 3000
(2) 3,001 – 6,000
(3) 6,001 – 10,000
(4) 10,001 – 15,000
(5) 15,001 – 21,000
(6) 21,001 – 28,000
(7) 28,001 – 36,000
(8) 36,001 – 45,000
(9) 45,001 – 55,000
(10) 55,001 – above

For this purpose, the top frequent 60,000 lemmas in the Corpus of Contemporary American English (COCA) were used. The COCA contains more than one billion words of text from eight genres—it is the most used corpus worldwide, and 5–6 times larger than the British National Corpus (BNC).

### 7.2.2. Word concreteness/abstractness

The interest in concreteness grew as a result of the dual-coding theory (Paivio 1971) and within the embodied approaches on cognition (Barsalou 1999). De Groot et al. (2002, 92) argue that concreteness "distinguishes words by the extent to which they can be experienced by the senses. Words that arouse a mental image easily are therefore called 'concrete', whereas words for which it is hard to arouse an image are called 'abstract'". That is, words that are more concrete refer to things you can hear, see, taste, or touch. Sun (2012, 13) argues that "it is commonly believed that abstract texts […] will be harder to understand than concrete and imaginable texts describing real objects, events or activities […]". Passages that express difficult ideas tend to contain abstract words, while easy passages dealing with familiar, concrete ideas tend to use familiar words (Rayner & Pollatsek 1989, 319; Chall & Dale 1995). In cognitive science, this is known as *the concreteness effect,* i.e., the observation that concrete nouns are processed faster and more accurately than abstract nouns in a variety of cognitive tasks. This has been demonstrated in several psycholinguistic studies (Paivio 1991). Thus, concreteness may be a good parameter to assess lexical complexity (Reilly & Kean 2007; Westbury & Moroschan 2009).

Furthermore, concreteness is closely related with word frequency. Corpus analyses have shown that abstract words are on average longer and more derivationally complex than concrete words. In translation studies, Tokowicz et al. (2002) found that concrete-word translations are semantically more similar across languages than abstract-word translations are (de Groot 1992; de Groot et al. 1994). They reported significant correlations between concreteness and the number of translations (translation choices), such that the concrete nouns in their sample tended to have fewer translations than did the abstract nouns. So far, it is safe to assume that concrete words are processed faster than abstract words thus making a text more or less complex.

The process to measure word concreteness was similar to the word frequency one. In this case we used the concreteness ratings by Brysbaert et al. (2014), since this study overcomes several limitations of previous concreteness ratings. A difference is that the concreteness ratings had less words than the COCA (40000 vs 60000 words), resulting in less levels compared to word frequency.

(1) 0000 – 3000
(2) 3,001 – 6,000
(3) 6,001 – 10,000
(4) 10,001 – 15,000
(5) 15,001 – 21,000
(6) 21,001 – 28,000
(7) 28,001 – 36,000
(8) 36,001 – above

### 7.2.3. Proper nouns

Cognitive psychologists assume that proper names have different meanings to different subjects, according to levels of expertise with different categories (e.g., Noam Chomsky represents different things for different people: an intellectual rival, an intellectual ally, a linguist, a political activist, a father, or perhaps often nothing). Maybe the most important difference between some philosophers' views and some cognitive psychologists is that the latter assume there is a mental representation in the head of a subject while the former assume

that meaning is independent of what is mentally represented (Bredart, Brennen & Valentine 2002, 29-30). From a linguistic point of view, Matushansky (2009, 573-574) argues that "most analyses view proper names as syntactically simplex and with no internal structure whatsoever" , but according to the definite description approach, proper names can be both semantically and syntactically complex, i.e. they can be syntactically decomposable into a definite article and a predicate.

In translation studies, proper nouns are regarded as complex mainly because of the uncertainty about what to do with them when translating. For instance, Newmark (1993) states that proper nouns have always been regarded as a translation difficulty in any text: in literature, it has to be determined whether the name is real or invented; in non-literary texts, translators have to ask themselves what if any additional explanatory of classificatory information has to be supplied for the TL readership. This has been reflected in TS, where proper nouns are usually regarded as a category into the so-called culture-specific items, realia, cultural words, culture-specific reference, etc. Thus, it is possible to assume that the presence of proper nouns may increase the complexity of a text. The number of proper nouns in the text was identified. Repeated proper nouns were counted as one. Then the occurrence of proper nouns was expressed by 1000 words.

### 7.2.4. Numbers

Numbers have not been regarded as something difficult for translators. The only exceptions are found in simultaneous interpreting research, where scholars have argued that the processing of numbers is difficult to interpreters, especially in simultaneous interpreting (Mazza 2001; Korpal 2016; Korpal & Stachowiak-Szymczak 2020). In experimental psychology there have been a lot of interest in numbers. Although there is evidence that number words can be named without semantic mediation (Duyck & Brysbaert 2004), some researchers claim that Arabic numbers can also be named without mediation (e.g., Campbell 1994; Cipolotti & Butterworth 1995) and others reject that claim (e.g., Brysbaert 1995; Fias 2001). More importantly for our area of study, Duyck & Brysbaert (2004) have found that the semantic magnitude of a number affects translation in both directions. Specifically, it takes more time to translate large quantity numbers than smaller quantity numbers in both directions.

We believe that numbers are complex for translators not because they are complex by themselves, but because it is related with translation subtasks and processes. Speaking of the translation process at a macro level, Breedveld (2002) stated that cognitive activities during translating differ through time, and the process has stages that differ from one another with respect to both their aim and the distribution of activities. Muñoz & Martín (2018) also found several translation periods during the translation process (including an orientational period lasting 4-10 minutes) in which translators behaved differently. At a micro level, when translators face a number in a text, they have to ask themselves whether they are going to copy it (write it again or paste it), convert it, etc. which converts a numeric expression in a segment difficult to handle. Thus, it is highly probable that they will have to switch between tasks, leading to higher costs regarding cognitive processes. Numbers in the texts were computed and expressed as the rate of instances per 1000 words.

### 7.2.5. Sentence length

One of the most common and traditional parameters to measure the linguistic complexity of a text is sentence length since vocabulary difficulty and sentence length are the strongest indexes of readability (Chall & Dale 1995; Kintsch & Miller 1981). Most readability formulas such as the Flesch-Kincaid Readability test (Kincaid et al. 1975), the Fry Readability Formula (Fry 1977) and the Dale-Chall readability formula (Chall & Dale 1995), and the Lexile framework use sentence length in their formulae. It is also used as a measure of text complexity in national standards for school children such as the Common Core Standards in the USA.

In translation studies, sentence length is often used as an indicator of text simplification. Studies compare sentence length of STs and their corresponding TTs and shorter average sentence lengths in the TTs is described as simplification. Laviosa (1996) studied simplification and concluded that a comparatively lower average sentence length can be considered as an aspect of simplification. Laviosa (1997, 1998) compared the Translational English Corpus and the BNC in order to isolate the linguistic indicators of simplification. Her results showed that one of the indicators was sentence length (together with type-token ratio and lexical density). Wen (2009) used sentence length to investigate simplification in a corpus of translated Chinese texts. Her results suggest that translations have significantly shorter mean sentence lengths and are, therefore, syntactically simpler.

Furthermore, researchers have used sentence length to investigate translation style in corpus-driven studies. For instance, Baker (2000) used sentence length (and standardized type-token ratio) in order to compare the translation style of two translators. Johansson (2011) also used sentence length and standardized type-token ratio to investigate variability where several translators are faced with the same task. Huang & Chu (2014) used Baker's parameters to compare the style of two literary translators using a corpus of their translations. Hence, as Angelone (2018, 24) stated, this lexicogrammar parameter may be a very reliable indicator of text complexity. Sentence length is usually calculated averaging the number of words in each sentence within the text. In this study, it was measured in the same way, but (1) taking only content words into account within the text and (2) calculating the median, not the average.

### 7.2.6. Modifiers per noun phrase

One of the most important measures of syntactic complexity that are predicted to place a high load on working memory is the number of modifiers per noun phrase, since sentences with preposed clause and left-embedded syntax require comprehenders to keep many words in working memory before getting to the meaning of the main clause (Graesser & Forsyth 2013, 484). Usually, this is measured using the mean number of modifiers per noun phrase (MNP) because it is closely related to phrasal complexity (Gentil & Meunier 2018). This might be because noun phrases carry much of the information in a text (Barker 1998). Green et al. (2012) explain that the reason why MNP relates with complexity is due to the burden upon parsing: The inclusion of modifiers increases the length and complexity of the string of words that a reader has to hold in the mind while imposing a syntactic pattern upon in.

To our knowledge, there are no studies in CTIS which use MNP to measure text complexity. However, this parameter has been used extensively in L1 and L2 writing (e.g., Crossley et al. 2017, Chon & Shin 2020). We believe that including this parameter is important for CTIS, since a higher number of modifiers per

noun phrase may place higher cognitive demands in a task that already calls for important cognitive efforts. The median number of modifiers per noun phrase was calculated using Coh-Metrix.

### 7.2.7. Type-token ratio

*Type-token ratio* (TTR) refers to the number of unique words (called types) divided by the number of tokens of these words. It is perhaps the best-known measure of lexical diversity. It is considered to be a first measure of lexical richness of a corpus (Baker 1995; 1996; Laviosa 1998; Quinci 2015, 57). Although one of the main criticisms to TTR is that it depends on corpus size (Voleti et al. 2019, Lv & Liang 2019; Quinci 2015) we can reduce this problem by (1) comparing equally long texts (Bolasco 2013, 209; Fergadoitis et al. 2015), and (2) using a standard measure such as a base length (Zanettin 2000) or (3) using another tool to measure it such as the moving-average TTR (Covington & McFall 2010).

In translation studies, TTR has been used to research the lexical simplification hypothesis (Baker 1993) which claims that TTs are less informationally dense and less lexically varied than STs—that is, simpler. This kind of research has been carried out both in translation (Laviosa 1996; Wen 2009) and interpreting (Lv & Junying 2019) to compare lexical simplification between ST and TT. Although we are not dealing with simplification, in these studies they are ultimately measuring the complexity of different texts using TTR. Quinci (2015) also used the type-token ratio, among other measures, in order to define translation competence. She analyzed linguistic patterns in a parallel corpus of 239 translations to observe whether the linguistic output and procedural practices varies among translators with different levels of translation competence. Rodríguez (2013, 2017) used several corpus-related software applications to calculate type-token ratio in order to correlate it with translations' acceptability. Thus, TTR is a good way to gauge lexical diversity at the text level (Pallotti 2015). The TTR for content words was calculated using Coh-Metrix.

### 7.2.8. Connectives

Connectives are cohesive devices that can help in the comprehension process for skilled readers by signaling the nature and the relation between events (Costermans & Fayol 1997; Sanders & Noordman 2000; Degand & Sanders 2002) and, together with discourse markers, they have the special function of linking clauses and sentences in the text base (Halliday & Hasan 1976; Sanders & Noordman 2000; Louwerse 2001). Unsurprisingly, "a higher relative frequency of these connectives increases cohesion in the text base […]" (Graesser & Forsyth 2013).

Cain & Nash (2011, 33) suggested that connectives should inform assessment of text complexity, even for young readers. Other related studies investigated missing discourse connectives and they found that one of the text complexity issues is missing discourse connectives (Schiffrin 1987) both for humans and natural language processing software (Burstein et al. 2010). Also, there is much evidence in the literature to claim that the presence of an appropriate connective between two clauses leads to faster reading times (Haberlandt & Bingham 1978), better memory and higher ratings of textual coherence (Caron, Micko & Thuring 1988), and facilitates inference making when the relation between events is not explicitly stated (Ferstl & von Cramon 2001; Millis, Golding & Barker 1995; Murray 1997).

Despite this, connectives have not been of interest in translation studies. To our knowledge, one of the exceptions is the work of Denver (2007) who did an empirical study where translation students and professional translators had to translate a text with some of its connectives deleted in order to compare inferencing between the two groups. Her results showed that both groups exhibited a comparable behavior regarding explicitation i.e., both groups added connectives into the TT in order to make their translations more readable.

We believe the number of connectives of a text is a very informative parameter regarding text complexity, although the researcher should be careful and select texts in which the connectives are used in an appropriate way. Only in that way we can be sure that connectives promotes comprehensibility. The occurrence of connectives by 1000 words was calculated using Coh-Metrix.

### 7.2.9. Paragraphs

Paragraphs are usually not considered when analyzing linguistic complexity of a text. Nonetheless, "a paragraph is a segment which tends to hold highly related information [so] […] long paragraphs are likely to contain more information" (Waltl & Metthes 2014, 159). To our knowledge, there are no investigations in translation studies that use paragraphs to assess text complexity, but there are two relevant studies in related fields that seem to prove the utility of this criterion. In a study analyzing linguistic complexity of political debates, Liuwe & de Landtshee (2016) found a weak positive correlation between the number of words that are used and the level of complexity. They posit that, the longer paragraphs are, the more complex they tend to be. More importantly, Waltl & Metthes studied complexity indicators via structural and linguistic metrics on German laws (regulations) and found that "the average length of paragraphs seems to have a major impact [on readability] than the absolute length, showing higher complexity" (Waltl and Metthes 2014, 159). The number of paragraphs in the text was identified. Then, the occurrence of the paragraphs by 1000 words was calculated.

## 7.3. Identification of outliers

After profiling the texts, the median and the median absolute deviation (MAD) for each parameter was calculated in order to identify the outliers for each parameter. Given the non-parametric distribution of the data, the standard deviation, which is used for normally distributed data and calculated relative to the mean, could not be used. Instead, it was decided to use the MAD and the median. In the case of non-parametric data, a dispersion statistic centered around the median is recommended, as it yields shorter, more conservative and robust ranges. To see a clearer picture, we repeated this process multiplying the MAD by two (see Table 10). Red cells indicate outliers. For the calculations of word frequency and concreteness, refer to Appendix D. The more similar texts were OR05, OR06, IN11, DE03, DE05, DE06 and DE07, as they presented the least number of outliers. Finally, texts OR05, IN11 and DE03 were selected. The reason behind was that all these texts only had one outlier and, in fact, they shared it: word frequency. From now on the selected texts will be referred as Text A (DE03), Text B (OR05) and Text C (IN11).

| | lexical complexity | | | | syntactic complexity | | textual complexity | | |
|---|---|---|---|---|---|---|---|---|---|
| text | wf | conc. | names | numbers | sentence length | mod. np | ttr (content) | connect. | paragr. |
| OR01 | | | 24.8 | 3.5 | 7 | 0.691 | 0.688 | 112.028 | 23.6 |
| OR02 | | | 9.1 | 15.9 | 7 | 0.682 | 0.655 | 87.203 | 14.7 |
| OR03 | | | 3.6 | 3.6 | 8 | 0.796 | 0.67 | 107.879 | 30.2 |
| OR05 | | | 11.1 | 14.2 | 6.5 | 0.763 | 0.701 | 105.847 | 23.3 |
| OR06 | | | 13.3 | 15.6 | 7.5 | 0.698 | 0.73 | 111.356 | 20.0 |
| OR07 | | | 11.4 | 10.3 | 7 | 0.71 | 0.684 | 99.542 | 27.4 |
| OR08 | | | 4.1 | 8.3 | 11 | 0.707 | 0.624 | 79.3 | 13.4 |
| IN07 | | | 3.5 | 7.0 | 6 | 0.961 | 0.539 | 117.16 | 18.6 |
| IN08 | | | 1.1 | 42.1 | 7 | 1.06 | 0.558 | 106.152 | 45.5 |
| IN09 | | | 3.1 | 25.1 | 10.5 | 1.089 | 0.524 | 97.768 | 36.5 |
| IN10 | | | 1.1 | 13.9 | 10 | 1.351 | 0.397 | 120.985 | 45.0 |
| IN11 | | | 2.4 | 24.4 | 8 | 1.117 | 0.62 | 85.679 | 31.7 |
| IN12 | | | 1.2 | 42.8 | 7 | 1.027 | 0.603 | 90.584 | 40.4 |
| IN13 | | | 4.3 | 15.1 | 10 | 1.077 | 0.712 | 81.699 | 36.7 |
| DE01 | | | 15.6 | 9.6 | 11.5 | 1.075 | 0.643 | 69.295 | 21.6 |
| DE02 | | | 17.0 | 12.2 | 15.5 | 1.197 | 0.691 | 64.951 | 31.6 |
| DE03 | | | 8.6 | 16.2 | 9 | 0.988 | 0.726 | 89.056 | 20.5 |
| DE04 | | | 31.0 | 16.0 | 15 | 0.996 | 0.625 | 72.883 | 25.7 |
| DE05 | | | 10.4 | 22.0 | 12 | 0.967 | 0.659 | 45.721 | 31.3 |
| DE06 | | | 37.9 | 26.3 | 11 | 0.996 | 0.704 | 75 | 21.1 |
| DE07 | | | 18.2 | 18.2 | 9 | 0.834 | 0.731 | 78.475 | 27.2 |
| MED | | | 9.1 | 15.6 | 9 | 0.988 | 0.659 | 89.056 | 27.2 |
| MAD | | | 6.0 | 6.0 | 2.0 | 0.129 | 0.042 | 16.173 | 6.1 |

**Table 10.** Corpus analysis using the parameters + MAD.

## 7.4. Source texts

After the text selection procedure, three source texts were selected (Text A, Text B, Text C, see Appendix B). Text A was from *National Geographic,* and was about how 18th century people identified and tried to "kill" vampires; Text B was from *Writers & Artists,* and was the transcription of an interview with the writer Mary Watson; Text C was from the US Food and Drug Administration, and was the full prescribing information of the prescription medicine Natesto. All texts were split into two parts, taking into account the textual structure of the STs and the number of words of the texts (see Table 11).

| | words | | |
|---|---|---|---|
| text | total | Part 1 | Part 2 |
| A | 922 | 454 | 468 |
| B | 965 | 555 | 410 |
| C | 814 | 375 | 439 |

**Table 11**. Number of words of the texts

## 7.5. Translation commission

Just before the translation task, informants had access to the source text and to the translation commission (Appendix B). The translation commission was a mock brief from a translation agency. Each text had its own translation commission. Informants were asked to produce a translation.

# 8. Tools

The tool used in this study was the keylogger Inputlog. Inputlog is a keystroke logging program enabling researchers to observe writing process dynamics and collect fine grained data. The program logs keyboard, mouse and speech events in MS Word together with a unique stamp. Information such as event, timestamp, character position, pause time, etc. are stored unobtrusively for later processing. Inputlog records not only what is being written in the ST, but also records searches in web browsers. This allows for a very ecological data collection procedure, since participants can work using their own setup and computer, and look for information just as in a normal task, as long as they use MS Word to write the translation. The program also provides a wide range of analyses opening new perspectives to a better understanding of the (cognitive) complexity of writing (Leijten et al. 2019, 8). The advantages of Inputlog over Translog is that (1) it uses a familiar word processor, (2) it can be used at home, outside of a laboratory setting, (3) it records the events outside of the program, (4) it has other useful features, such as the pause analysis. In this study, we used Inputlog version 8.0.0.6.

Inputlog's General analysis provided us with information about each event in the translation session (id), when it starts *(startTime),* when it ends *(EndTime),* the pause before the event *(pauseTime)* and the actual event *(output),* among other relevant information.

# 9. Task procedure

In order to adhere to the best practices on naturalistic data collection of the MC2 Lab[2], informants started three translation tasks in class and finished them at home, using their own computers. Each text was translated into two one-hour session, in three consecutive weeks, thus each text was split into two halves. They

[2] www.mc2-lab.net

could translate the second half in the same day, provided there were at least three hours between both sessions. On the contrary, they were encouraged to not let more than three days pass between the translation of the first and the second half. The translation of the first half was in a group setting, so they could share problems and solutions. The second half, however, was individual. In that way, students of the same university had first a group translation session and then an individual translation session. Only the individual translation session, carried out at their homes was analyzed. Informants were not informed that the first one-hour session of each text would not be analyzed in this study.

Informants were free to use all the online resources they wanted for their translation task, except machine translation tools such as Google Translator or DeepL. Students in Spain translated the text into Spanish, while students in Italy translated the text into Italian.

The data was collected between September 2020 and May 2021, during the Covid-19 outbreak. The study had three steps: (1) Pre-translation questionnaire, (2) Translation tasks, and (3) Post-translation questionnaire. All these documents can be found in Appendix B. The informants first signed an informed consent for the processing of personal data. Then they filled in a questionnaire where they volunteered personal and background data. The questionnaire was filled using a nickname, which was also used in the informant field of Inputlog before they started recording their texts. The pre-task questionnaire collected general, demographic, language acquisition, language usage and mass media usage information of the informants. This information was going to be used to profile the informants before the translation tasks in order to select the ones with better language proficiency. However, due to the covid outbreak, some universities that were going to collaborate were not able to do so, which meant we had to use all the informants and most information of the pre-task questionnaire was not analyzed.

Once the questionnaires had been collected, the informants carried out the translation tasks. Informants had access to the text and translation commission just before the translation task. To minimize the task order effects (Mellinger & Hanson 2018, 6), the translation order of the texts was randomized (see Table 12).

| University | Week 1 | Week 2 | Week 3 |
|---|---|---|---|
| Spain | Text A | Text B | Text C |
| Italy | Text B | Text C | Text A |

**Table 12.** Translation task order

After the third translation task was finished, informants filled in a post-task questionnaire about their own impressions on the translation tasks, that is, it collected information on what informants found difficult to translate. Before analyzing the data, each participant was assigned to a group (IT or ES) and given a number in order to further anonymize their data.

## 10. Data collection

Keylogged data was analyzed using the Task Segment Framework (Muñoz & Apfelthaler 2022). Tables 14 to 19 show the median values for pauses within (mWw) and between words (mBw), both in seconds and milliseconds, which were used to calculate the lower threshold (LT) and the upper threshold (UT). They also show the time employed in the task by each participant, and the number of task segments (TS), pauses and respites they had.

### 10.1. Informants from Italy

Table 13 shows the information of the translation tasks of the Italian informants.

| Inf | text | mWw | mBw | LT | UT | TD | TSs | pauses | respites |
|---|---|---|---|---|---|---|---|---|---|
| **IT01** | A | 0.243 | 0.430 | 486 | 1290 | 00:43:47 | 285 | 284 | 392 |
| **IT02** | A | 0.268 | 0.447 | 536 | 1341 | 00:36:39 | 226 | 226 | 446 |
| **IT03** | A | 0.229 | 0.323 | 458 | 969 | 00:41:40 | 301 | 309 | 211 |
| **IT04** | A | 0.255 | 0.347 | 510 | 1041 | 00:47:29 | 243 | 242 | 220 |
| **IT05** | A | 0.245 | 0.334 | 490 | 1002 | 00:47:17 | 308 | 307 | 380 |
| **IT06** | A | 0.256 | 0.386 | 512 | 1158 | 00:42:48 | 316 | 315 | 475 |
| **IT01** | B | 0.254 | 0.431 | 508 | 1293 | 00:42:54 | 296 | 295 | 209 |
| **IT02** | B | 0.275 | 0.532 | 550 | 1596 | 00:31:46 | 188 | 188 | 413 |
| **IT03** | B | 0.232 | 0.338 | 464 | 1014 | 00:34:59 | 265 | 264 | 161 |
| **IT04** | B | 0.249 | 0.41 | 498 | 1230 | 00:38:50 | 317 | 317 | 215 |
| **IT05** | B | 0.242 | 0.341 | 484 | 1023 | 00:48:25 | 371 | 370 | 428 |
| **IT06** | B | 0.248 | 0.436 | 496 | 1308 | 00:44:51 | 266 | 266 | 407 |
| **IT01** | C | 0.248 | 0.36 | 496 | 1080 | 00:52:20 | 304 | 303 | 381 |
| **IT02** | C | 0.267 | 0.476 | 534 | 1428 | 00:51:04 | 254 | 253 | 664 |
| **IT03** | C | 0.233 | 0.317 | 466 | 951 | 00:47:51 | 375 | 375 | 225 |
| **IT04** | C | 0.252 | 0.339 | 504 | 1017 | 00:51:20 | 350 | 349 | 428 |
| **IT05** | C | 0.241 | 0.335 | 482 | 1005 | 00:58:35 | 395 | 394 | 430 |
| **IT06** | C | 0.252 | 0.376 | 504 | 1128 | 00:51:34 | 356 | 355 | 633 |

**mWw,** median within words; **mBw,** median between words; **LT,** lower threshold**; UT,** upper threshold; **TD,** task duration; **TSs,** task segments

**Table 13.**Task, pause and respite values for Texts A, B and C, Italian group.

### 10.2. Spanish informants

As mentioned in Informants (§3), 25 students from the university in Spain registered for the translation task. Nonetheless, only 23 of them submitted their data. Tables 14-16 shows the information of the translation tasks of the remaining 23 informants.

| Inf | text | mWw | mBw | LT | UT | TD | TSs | pauses | respites |
|---|---|---|---|---|---|---|---|---|---|
| ES01 | A | 0.243 | 0.43 | 486 | 1290 | 00:43:47 | 269 | 268 | 321 |
| ES02 | A | 0.268 | 0.447 | 536 | 1341 | 00:36:39 | 223 | 222 | 250 |
| ES03 | A | 0.229 | 0.323 | 458 | 969 | 00:41:40 | 190 | 189 | 520 |
| ES04 | A | 0.255 | 0.347 | 510 | 1041 | 00:47:29 | 264 | 263 | 676 |
| ES05 | A | 0.245 | 0.334 | 490 | 1002 | 00:47:17 | 186 | 186 | 573 |
| ES07 | A | 0.245 | 0.379 | 490 | 1137 | 00:39:37 | 213 | 212 | 385 |
| ES08 | A | 0.26 | 0.428 | 520 | 1284 | 00:39:06 | 202 | 201 | 251 |
| ES10 | A | 0.253 | 0.464 | 506 | 1392 | 01:00:22 | 362 | 361 | 525 |
| ES11 | A | 0.268 | 0.491 | 536 | 1473 | 00:59:37 | 220 | 219 | 704 |
| ES12 | A | 0.251 | 0.604 | 502 | 1812 | 00:56:44 | 266 | 265 | 381 |
| ES13 | A | 0.244 | 0.43 | 488 | 1290 | 00:41:16 | 241 | 240 | 834 |
| ES15 | A | 0.258 | 0.419 | 516 | 1257 | 00:40:26 | 253 | 251 | 450 |
| ES17 | A | 0.288 | 0.644 | 576 | 1932 | 00:59:37 | 166 | 165 | 402 |
| ES19 | A | 0.273 | 0.516 | 546 | 1548 | 00:58:58 | 319 | 318 | 635 |
| ES20 | A | 0.265 | 0.599 | 530 | 1797 | 00:55:48 | 258 | 257 | 550 |
| ES21 | A | 0.258 | 0.419 | 516 | 1257 | 00:40:26 | 201 | 200 | 391 |
| ES22 | A | 0.235 | 0.317 | 470 | 951 | 00:36:59 | 222 | 221 | 464 |

**mWw,** median within words; **mBw,** median between words; **LT,** lower threshold**;UT,** upper threshold; **TD,** task duration;**TSs,** task segments

**Table 14.** Task, pause and respite values for Text C, Spanish group.

| Inf | text | mWw | mBw | LT | UT | TD | TSs | pauses | respites |
|---|---|---|---|---|---|---|---|---|---|
| ES01 | B | 0.248 | 0.36 | 496 | 1080 | 00:42:54 | 124 | 123 | 162 |
| ES02 | B | 0.267 | 0.476 | 534 | 1428 | 00:31:46 | 169 | 168 | 217 |
| ES03 | B | 0.233 | 0.317 | 466 | 951 | 00:34:59 | 221 | 220 | 467 |
| ES04 | B | 0.252 | 0.339 | 504 | 1017 | 00:38:50 | 190 | 189 | 489 |
| ES05 | B | 0.241 | 0.335 | 482 | 1005 | 00:48:25 | 148 | 147 | 413 |
| ES07 | B | 0.249 | 0.319 | 498 | 957 | 00:20:43 | 178 | 177 | 238 |
| ES08 | B | 0.269 | 0.448 | 538 | 1344 | 00:28:20 | 132 | 131 | 210 |
| ES09 | B | 0.242 | 0.398 | 484 | 1194 | 00:42:16 | 148 | 147 | 203 |
| ES10 | B | 0.246 | 0.395 | 492 | 1185 | 00:42:43 | 323 | 322 | 355 |
| ES11 | B | 0.274 | 0.529 | 548 | 1587 | 00:29:32 | 207 | 206 | 689 |
| ES12 | B | 0.249 | 0.552 | 498 | 1656 | 00:49:15 | 300 | 299 | 317 |
| ES13 | B | 0.243 | 0.371 | 486 | 1113 | 00:24:34 | 335 | 334 | 594 |
| ES14 | B | 0.275 | 0.361 | 550 | 1083 | 00:45:06 | 218 | 217 | 849 |
| ES15 | B | 0.258 | 0.37 | 516 | 1110 | 00:22:24 | 225 | 224 | 438 |
| ES17 | B | 0.275 | 0.627 | 550 | 1881 | 00:56:06 | 150 | 149 | 380 |
| ES18 | B | 0.244 | 0.342 | 488 | 1026 | 00:46:06 | 268 | 267 | 468 |
| ES19 | B | 0.249 | 0.426 | 498 | 1278 | 00:52:17 | 262 | 261 | 428 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ES20** | B | 0.262 | 0.589 | 524 | 1767 | 01:00:06 | 312 | 311 | 458 |
| **ES21** | B | 0.25 | 0.434 | 500 | 1302 | 00:36:17 | 173 | 191 | 315 |
| **ES22** | B | 0.251 | 0.362 | 502 | 1086 | 00:37:04 | 241 | 240 | 456 |
| **ES23** | B | 0.247 | 0.488 | 494 | 1464 | 00:58:47 | 463 | 462 | 481 |

**mWw,** median within words; **mBw,** median between words; **LT,** lower threshold**;UT,** upper threshold; **TD,** task duration;**TSs,** task segments

**Table 15.** Task, pause and respite values for Text B, Spanish group.

| Inf | text | mWw | mBw | LT | UT | TD | TSs | pauses | respites |
|---|---|---|---|---|---|---|---|---|---|
| **ES01** | C | 0.254 | 0.431 | 508 | 1293 | 00:52:20 | 157 | 156 | 148 |
| **ES02** | C | 0.275 | 0.532 | 550 | 1596 | 00:51:04 | 215 | 215 | 309 |
| **ES03** | C | 0.232 | 0.338 | 464 | 1014 | 00:47:51 | 285 | 284 | 609 |
| **ES05** | C | 0.242 | 0.341 | 484 | 1023 | 00:58:35 | 238 | 237 | 553 |
| **ES07** | C | 0.237 | 0.306 | 474 | 918 | 00:38:46 | 217 | 216 | 414 |
| **ES10** | C | 0.257 | 0.492 | 514 | 1476 | 01:01:04 | 243 | 242 | 339 |
| **ES11** | C | 0.277 | 0.463 | 554 | 1389 | 00:41:56 | 169 | 168 | 524 |
| **ES12** | C | 0.249 | 0.501 | 498 | 1503 | 00:57:04 | 351 | 350 | 448 |
| **ES15** | C | 0.253 | 0.444 | 506 | 1332 | 00:30:33 | 275 | 274 | 537 |
| **ES16** | C | 0.256 | 0.361 | 512 | 1083 | 00:43:59 | 170 | 175 | 317 |
| **ES17** | C | 0.263 | 0.61 | 526 | 1830 | 00:59:53 | 269 | 268 | 414 |
| **ES18** | C | 0.26 | 0.38 | 520 | 1140 | 00:59:56 | 266 | 265 | 517 |
| **ES19** | C | 0.27 | 0.504 | 540 | 1512 | 00:58:47 | 211 | 210 | 736 |
| **ES21** | C | 0.255 | 0.415 | 510 | 1245 | 00:44:46 | 222 | 221 | 363 |
| **ES22** | C | 0.248 | 0.354 | 496 | 1062 | 00:31:37 | 206 | 205 | 386 |

**mWw,** median within words; **mBw,** median between words; **LT,** lower threshold**;UT,** upper threshold; **TD,** task duration;**TSs,** task segments

**Table 16.** Task, pause and respite values for Text C, Spanish group.

## Excluded data

Table 17 sums up the translation sessions that were excluded from the analyses. For Text A, ES06, ES14 and ES23 were excluded because they did not finish the translation. ES18 opened Inputlog in the middle of the translation session (half of the data was lost as a result). ES16 data was corrupted. ES09 was considered an outlier: the translation process was only composed of ADD task segments, which makes us suspect the informant already translated the text using machine translation and just rewrite/corrected it. For Text B, ES06 and ES16 were excluded because they did not finish the translation. For Text C, ES06, ES13 and ES23 were excluded because they did not finish the translation. ES04 and ES09 translated a wrong text. ES14 and ES20 data was corrupted. ES08 was considered an outlier: few (and very long) task segments, few respites and also the translation process was only composed of ADD task segments (and two CHANGE), which makes us suspect the informant already translated the text using machine translation and just rewrite/corrected it.

| Inf | Text | mWw | mBw | LT | UP | task duration | TS | pauses | respites |
|---|---|---|---|---|---|---|---|---|---|
| ES06 | A | 0.256 | 0.386 | 512 | 1158 | 00:42:48 | 307 | 306 | 678 |
| ES09 | A | 0.259 | 0.46 | 518 | 1380 | 00:43:22 | 70 | 69 | 120 |
| ES14 | A | 0.287 | 0.401 | 574 | 1203 | 00:39:06 | 95 | 94 | 249 |
| ES16 | A | 0.256 | 0.384 | 512 | 1152 | 00:59:30 | 57 | 56 | 63 |
| ES18 | A | 0.25 | 0.381 | 500 | 1143 | 00:49:45 | 277 | 276 | 489 |
| ES23 | A | 0.256 | 0.502 | 512 | 1506 | 01:03:57 | 354 | 354 | 667 |
| ES06 | B | 0.252 | 0.376 | 504 | 1128 | 00:44:51 | 230 | 229 | 599 |
| ES16 | B | 0.252 | 0.352 | 504 | 1056 | 00:41:08 | 51 | 50 | 84 |
| ES04 | C | 0.257 | 0.492 | 514 | 1476 | 01:01:04 | 239 | 238 | 768 |
| ES06 | C | 0.248 | 0.436 | 496 | 1308 | 00:51:34 | 290 | 289 | 526 |
| ES08 | C | 0.278 | 0.497 | 556 | 1491 | 01:07:09 | 145 | 144 | 207 |
| ES09 | C | 0.265 | 0.48 | 530 | 1440 | 00:57:33 | 171 | 170 | 321 |
| ES13 | C | 0.239 | 0.452 | 478 | 1356 | 00:38:46 | 333 | 332 | 561 |
| ES14 | C | - | - | - | - | - | - | - | - |
| ES20 | C | - | - | - | - | - | - | - | - |
| ES23 | C | 0.26 | 0.489 | 520 | 1467 | 00:42:55 | 396 | 395 | 571 |

**mWw,** median within words; **mBw,** median between words; **LT,** lower threshold**;UT,** upper threshold; **TD,** task duration;**TSs,** task segments

**Table 17.** Translation sessions excluded from the analyses.

## 11. Data preparation

As established before, four hypotheses were investigated in this study by using fluency indicators and typing fluency. If the CNA hypothesis were true, it would translate into low fluency task segments when the participants had different renditions; high fluency task segments when all the participants had the same rendition; and high fluency task segments after longer and shorter previous pauses. We also analyzed whether there was a correlation between pauses and typing fluency. In order to carry out the analyses needed for the investigations, Inputlogs' General Analysis file and the Task Segment Framework were used.

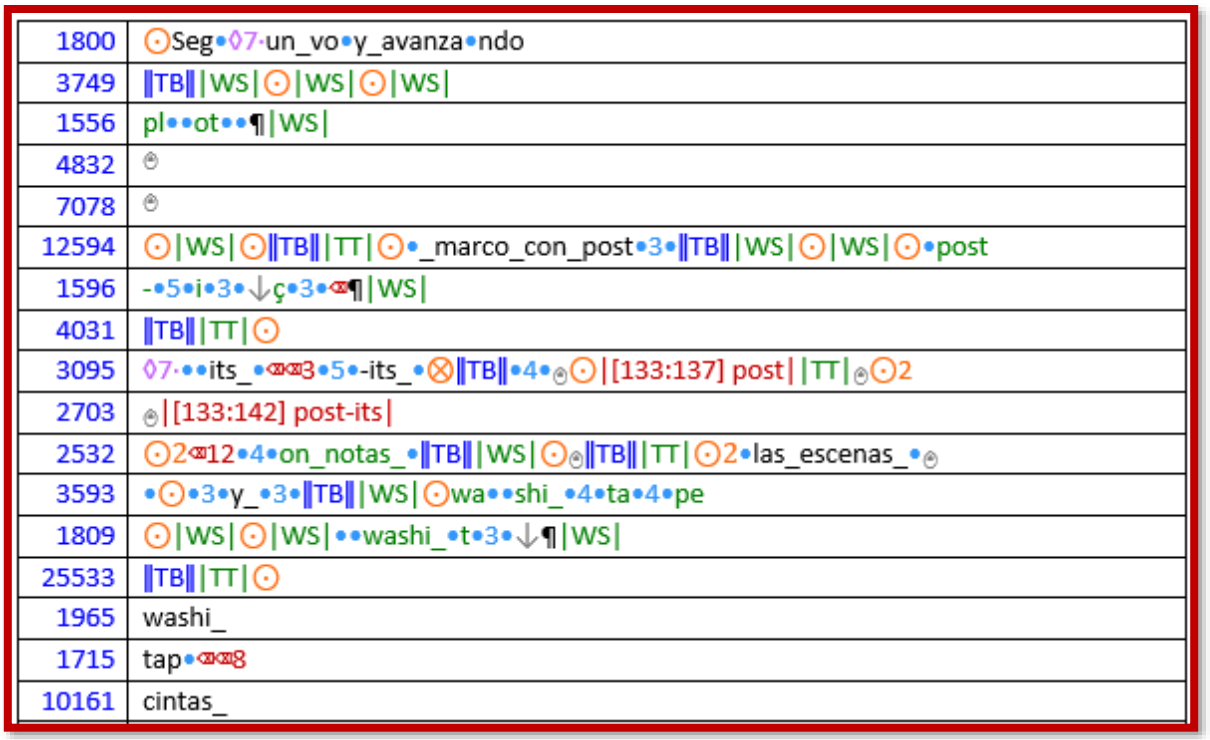
### 11.1. Inputlog files

Data logs were exported to Excel spreadsheets, which were then used to prepare each log file for the analysis along the lines laid out in the Task Segment Framework (see §4). The Inputlog's inbuilt general and pause analyses were used for the analysis. The pause analysis was used to calculate the thresholds to segment informants' behavioral flow. The general analysis was used to segment informants' translation session. Two files were obtained for each participant. The first file was a representation of the translation session divided into task segments (as seen in Figure 5) obtained with a program called Fácil, developed for us by Eros Zanchetta, IT engineer from the Department of Interpreting and Translation of the University of Bologna.

Fácil was developed in order to produce these files more quickly. We contributed in the developing of this tool by assisting him in the creation of the tool and by testing it. Currently Fácil is still in a beta version. Figure 5 shows the translation process of a chunk of text into Spanish. The left column shows the values of the previous pauses in ms. The right column shows the contents of the translation process, as keylogged. In this case, the participant translated the ST-chunk

*As I'm going along, I plot the scenes with post-its and washi tape*

Text in black is production (added text), text in green are text and actions entered elsewhere (mainly, web searches in search engines) and text in red are changes in the copy: selections or deletions (modified text). A guide and table to the symbols can be found in Appendix A.



| | |
|---|---|
| 1800 | ⊙Seg•◊7·un_vo•y_avanza•ndo |
| 3749 | ‖TB‖\|WS\|⊙\|WS\|⊙\|WS\| |
| 1556 | pl••ot••¶\|WS\| |
| 4832 | |
| 7078 | |
| 12594 | ⊙\|WS\|⊙‖TB‖\|TT\|⊙•_marco_con_post•3•‖TB‖\|WS\|⊙\|WS\|⊙•post |
| 1596 | -•5•i•3•↓ç•3•⌫¶\|WS\| |
| 4031 | ‖TB‖\|TT\|⊙ |
| 3095 | ◊7·••its_•⌫⌫3•5•-its_•⊗‖TB‖•4•⊙\|[133:137] post\|\|TT\|⊙2 |
| 2703 | \|[133:142] post-its\| |
| 2532 | ⊙2⌫12•4•on_notas_•‖TB‖\|WS\|⊙‖TB‖\|TT\|⊙2•las_escenas_• |
| 3593 | •⊙•3•y_•3•‖TB‖\|WS\|⊙wa••shi_•4•ta•4•pe |
| 1809 | ⊙\|WS\|⊙\|WS\|••washi_•t•3•↓¶\|WS\| |
| 25533 | ‖TB‖\|TT\|⊙ |
| 1965 | washi_ |
| 1715 | tap•⌫⌫8 |
| 10161 | cintas_ |

**Figure 5.** Representation of a translation session divided into task segments.

The second file was an Excel file based on Inputlog's general analysis in which we also had to divide the translation process into task segments. Later, this file was also used to calculate the typing speed of each task segment. Task segments in each file of each participant were then classified accordingly in order to identify all the subtasks in the translation process of the informants (see Table 18). Both files can be found in Appendix D. As mentioned in §4 The Task Segment Framework, a task segment can be classified into one (or a combination of) the following categories: ADD, SEARCH, CHANGE, HCI, MIX and FILLER. This step was particularly important, since the ADD task segments correspond to the production phase, which was the focus of our analysis.

| TS | pause | events | | |
|---|---|---|---|---|
| TS079 | 2723 | Me_encanta_la_natir 2uraleza_ | ADD | |
| TS080 | 2615 | ‖TB‖⊙\|WS\|rundoen 2wn¶••\|WS\| | SEARCH | |
| TS081 | 1718 | ⇳4\|TT\|• ,_pero_la_belleza_ de_los_lugares_abandonados_y_detr• •eriorados_es•3•_lo_que_ | ADD | |
| TS082 | 1953 | verdaderamente_me_llama_la_atenci◊7·o••n,_ y_creo_que_se_apr 3puede_apreciar_en_los_dos_librl•3• | ADD | |
| TS083 | 1609 | os.•_• ‖♪‖ | ADD+HCI | MIX |
| TS084 | 2743 | ‖♪→‖ | HCI | |
| TS085 | 2564 | ‖♪→‖ | HCI | |
| TS086 | 2596 | | FILLER | |
| TS087 | 5062 | ‖TB‖⊙\|WS\|\|WS\|cape_town•¶•••⊙\|TT\|•3•2 | SEARCH | |

**Table 18.** Classification of TSs into subtasks.

Then, the typing speed of each task segment was calculated using the information provided by Inputlog. The procedure was the following: first, the number of events and duration of each task segment was calculated. Since pauses are periods when no activity is recorded, they were subtracted from the duration of the task segment. Then, the duration of the task segment in seconds (instead of ms) was calculated[3]. After that, it was possible to calculate the typing speed of each task segment, expressed as events per seconds.

We had, however, to clean the data after calculating the typing speed. Two problems were faced related to Inputlog's General analysis. The first one is shown in Figure 6: the duration of some task segments was negative. This problem occurred when informants held down the left click button to select already written text.

| id | startTime | pauseTime | output | TASK SEG | EVENTS | TIME | TIME -LP TS | TIME SEC | SPEED |
|---|---|---|---|---|---|---|---|---|---|
| 2709 | 1459109 | 7312 | Movement | TS184 | 55 | 18216 | 15720 | 15,720 | 3,499 |
| 2764 | 1477325 | 2496 | e | TS185 | 2 | 45597 | 125 | 0,125 | 16,000 |
| 2766 | 1522922 | 45472 | Movement | TS186 | 2 | 4297 | 828 | 0,828 | 2,415 |
| 2768 | 1527219 | 3469 | Movement | TS187 | 1 | 0 | -3172 | -3,172 | -0,315 |
| 2769 | 1527219 | 3172 | 80:1699] sottigliezze e | TS188 | 8 | 10480 | 6250 | 6,250 | 1,280 |
| 2777 | 1537699 | 4230 | SPACE | TS189 | 3 | 32645 | 578 | 0,578 | 5,190 |
| 2780 | 1570344 | 32067 | Movement | TS190 | 1 | 2719 | 1500 | 1,500 | 0,667 |

**Figure 6.** Example of a task segment with negative typing speed (TS187).

Task segment 187 had a duration of 0 ms, which caused the TS to have a negative speed. The solution was to identify in the general analysis file at which point the left click was pressed. In this case, it started in TS186, which means that the pause before TS187 and TS188 was not really a pause, but it should be included inside

[3] To follow the distance/time convention to describe speed, typing speed was expressed as events per second instead of events per milisecond, because otherwise a higher value means slow typing speed, and viceversa.

the action time of the selection procedure. Thus, TS186, TS187 and TS188 were merged into one task segment, and the figures were recalculated (see Figure 7). After cleaning the data of all the participants, we also had to clean the representations of the translation sessions, since the number of TS changed.

| id | startTime | pauseTime | output | TASK SEG | EVENTS | TIME | TIME -LP TS | TIME SECS | SPEED |
|---|---|---|---|---|---|---|---|---|---|
| 2709 | 1459109 | 7312 | Movement | TS184 | 55 | 18216 | 15720 | 15,720 | 3,499 |
| 2764 | 1477325 | 2496 | e | TS185 | 2 | 45597 | 125 | 0,125 | 16,000 |
| 2766 | 1522922 | 45472 | Movement | TS186 | 11 | 14777 | 10547 | 10,547 | 1,043 |
| 2777 | 1537699 | 4230 | SPACE | TS187 | 3 | 32645 | 578 | 0,578 | 5,190 |
| 2780 | 1570344 | 32067 | Movement | TS188 | 1 | 2719 | 1500 | 1,500 | 0,667 |

**Figure 7.** Cleaned file.

The second problem faced was that sometimes task segments were composed of only one event (for instance, pressing only one key). These events were so fast that Inputlog recorded the duration of the event as zero, making the task segment duration as zero too after subtracting the previous pause. In Figure 8, TS033 and TS034 had a duration of zero ms, and subsequently a speed of zero.

| id | startTime | pauseTime | output | TASK SEG | EVENTS | TIME | TIME -LP TS | TIME SECS | SPEED |
|---|---|---|---|---|---|---|---|---|---|
| 619 | 247785 | 3426 | SPACE | TS031 | 23 | 6512 | 4696 | 4,696 | 4,898 |
| 642 | 254297 | 1816 | Movement | TS032 | 15 | 7460 | 5075 | 5,075 | 2,956 |
| 657 | 261757 | 2385 | e | TS033 | 1 | 3956 | 0 | 0,000 | 0,000 |
| 658 | 265713 | 3956 | SPACE | TS034 | 1 | 1760 | 0 | 0,000 | 0,000 |
| 659 | 267473 | 1760 | 2 | TS035 | 4 | 1510 | 395 | 0,395 | 10,127 |
| 663 | 268983 | 1115 | , | TS036 | 11 | 4731 | 3410 | 3,410 | 3,226 |

**Figure 8.** Task segments with a duration of 0 ms.

It was not possible to simply discard these task segments from the analysis because they were part of the translation process and many of them were part of the production phase, particularly important for H1 and H2. Neither was possible to perform the analysis without these values (that is, maintaining the 0 value), because they would have distorted the results. The solution was to calculate the median value without these zero-duration task segments, and then assign them the median value, since these zero-duration task segments were in fact very fast task segment. In this way we also prevented distorting the calculations when one text stretch was composed of more than one task segment.

After cleaning the representation files, the ADD task segments were identified in the typing speed file and imported into a separate Excel sheet. The average and median speed of the task segments was calculated in order to identify the fastest task segments. The fastest task segments were operationalized as the ones with a speed higher than the median speed. Average speed and median speed of the translation sessions are reported in Table 19.

| | text A | | text B | | text C | |
|---|---|---|---|---|---|---|
| inform. | average | **median** | average | **median** | average | **median** |
| **ES01** | 5.515 | **5.433** | 5.825 | **5.786** | 7.335 | **6.649** |
| **ES02** | 5.819 | **5.376** | 5.040 | **4.640** | 4.710 | **4.598** |
| **ES03** | 5.640 | **4.984** | 6.078 | **5.350** | 6.126 | **5.079** |
| **ES04** | 4.001 | **3.878** | 2.940 | **2.966** | - | **-** |
| **ES05** | 4.072 | **3.881** | 3.964 | **3.850** | 4.096 | **3.963** |
| **ES06** | - | **-** | - | **-** | - | **-** |
| **ES07** | 4.262 | **4.047** | 5.295 | **4.937** | 4.575 | **4.399** |
| **ES08** | 5.985 | **5.716** | 5.215 | **5.114** | - | **-** |
| **ES09** | - | **-** | 5.325 | **4.912** | - | **-** |
| **ES10** | 22.257 | **4.587** | 45.058 | **5.336** | 275.110 | **4.493** |
| **ES11** | 3.741 | **3.427** | 3.702 | **3.343** | 3.763 | **3.504** |
| **ES12** | 5.758 | **5.189** | 5.816 | **5.692** | 5.163 | **5.080** |
| **ES13** | 3.582 | **3.105** | 4.364 | **3.889** | - | **-** |
| **ES14** | - | **-** | 4.376 | **3.797** | - | **-** |
| **ES15** | 4.658 | **4.447** | 4.363 | **4.151** | 4.271 | **4.040** |
| **ES16** | - | **-** | - | **-** | 5.261 | **5.167** |
| **ES17** | 5.079 | **4.354** | 4.746 | **4.395** | 25.055 | **5.156** |
| **ES18** | - | **-** | 6.793 | **5.279** | 25.828 | **4.930** |
| **ES19** | 4.033 | **3.911** | 4.772 | **4.075** | 3.732 | **3.488** |
| **ES20** | 4.557 | **4.286** | 5.008 | **4.647** | - | **-** |
| **ES21** | 5.300 | **4.893** | 5.316 | **4.800** | 6.816 | **4.878** |
| **ES22** | 5.131 | **4.812** | 5.009 | **4.567** | 5.267 | **4.995** |
| **ES23** | - | **-** | 5.439 | **4.912** | - | **-** |
| **IT01** | 5.815 | **5.543** | 6.182 | **5.711** | 5.462 | **5.027** |
| **IT02** | 4.786 | **4.300** | 4.193 | **4.011** | 4.602 | **3.913** |
| **IT03** | 6.652 | **6.375** | 10.483 | **6.466** | 6.276 | **6.141** |
| **IT04** | 5.858 | **5.802** | 6.361 | **6.579** | 5.546 | **5.398** |
| **IT05** | 5.571 | **4.956** | 5.829 | **5.766** | 5.142 | **5.001** |
| **IT06** | 5.825 | **5.694** | 5.801 | **5.723** | 5.442 | **5.405** |

**Table 19.** Average and median speeds in all translation tasks

Longer and shorter previous pauses before ADD task segments were also identified using the interquartile range, that is, longer previous pauses were ones in quartile 3 and shorter previous pauses were the ones in quartile 1.

## 11.2. Translation products

The translation products of our informants were compared looking for different renditions and same renditions. The translation products can be found in Appendix D. We followed Campbell's (2000) suggestions and method to look for different and same renditions. Unlike Campbell, we considered that the minimum unit of analysis is the phrase (e.g., determinant+noun) instead of just a word. Target texts were divided into

short stretches, most of which were phrases. Then, they were compared in order to identify the similarities in the texts. After that, texts stretches were adjusted depending on the similarities and differences of the texts. After having identified the same and different renditions in all the target texts, we used AntConc (Anthony 2022) to verify that there were no errors in the data. Two analyses were performed for each hypothesis:

H1: different rendition by all informants, and different renditions by 20% of the informants

H2: same renditions by all informants, and same renditions by 80% of the informants

## 11.3. Data analysis

The texts stretches analyzed for H1 and H2 are presented below in Table 22 to 43. Tables for H1 show the source text that was translated differently by all informants, while tables for H2 show the target texts stretches that were translated in the same manner by all informants. Each chunk of text containing a different rendition by all participants (H1) or a single rendition by all participants (H2) received a code name before being analyzed. The code is composed by text (TT) and chunk number (C). The complete list of stretches analyzed can be found in Appendix C.

### 11.3.1. Text stretches analyzed

The following section presents the text stretches analyzed in Hypothesis 1 and Hypothesis 2. For H1, we marked the stretches in the ST in which participants had no coincidence with **bolded red** and the stretches with a coincidence below 20% in red. For H2, we marked the stretches in the ST in which all participants coincided with **bolded green** and the stretches with a coincidence above 80% in green. A [/] symbol is used to indicate that two text stretches belong to different units to be analyzed. A text stretch in brackets indicates that that stretch is not part of the analytical unit surrounding it. A complete list of the stretches analyzed and their corresponding codes can be found in Appendix C. Table 20 shows the text stretches analyzed of Text A for H1 and H2 of the Spanish group. For H1, Text A had no stretches with no coincidences among the participants, and 6 stretches with less than 20% of coincidence. For H2, Text A had 18 stretches in which all participants coincided, and 64 stretches above 80% of coincidences.

**Text A - Spanish group**

| H1 | H2 |
|---|---|
| Suspecting vampirism, the villagers exhumed Paole's body. They found it intact—even the nails had grown. Fresh blood covered the inside of the coffin. The villagers thus "drove a stake through his heart, whereby he gave an audible groan and bled copiously." The bodies of other villagers, thought to have been also transformed into vampires, were disinterred and likewise maimed in an attempt to "kill" them for good. | Suspecting vampirism, the villagers exhumed Paole's body. They found it intact—even the nails **had grown**. Fresh blood covered the inside [/] of the coffin. The villagers thus "drove a stake through his heart, whereby he gave an audible groan and bled copiously." The bodies of other villagers, thought to have been also transformed **into vampires**, were disinterred and likewise maimed in an attempt to "kill" them for good. |
| Hair and nails. | Hair and nails. |

| | |
|---|---|
| The incorruptibility of a corpse was thought to be evidence that a dead person was a vampire. Calmet noted that some bodies, after several months or even years in the grave, were found with "the blood in a liquid state, the flesh entire, the limbs flexible and pliable."<br>The observation was accurate, but science rather than the supernatural can explain such postmortem phenomena. In large part, the belief in vampirism grew out of a lack of knowledge about the natural processes of decomposition after death, which can, under certain conditions, be delayed for a long period of time.<br><br>A body can remain well preserved through two natural processes; one of them, saponification, occurs when the body is buried in a cold, damp environment, as is common in eastern Europe. During the saponification process, the body's fatty acids turn into a waxy, soap-like compound that covers the corpse and prevents putrefaction. A saponified body also retains a certain flexibility, as described in Calmet's work.<br>Accounts in Calmet's Dissertation also noted that vampires' hair and fingernails continued to lengthen even after death. Certain postmortem changes may have given the illusion of continued growth. After death, the skin dehydrates, causing it to retract from the hair follicles. This may make the hair, especially stubble on the chin, look longer. The same is true of nails, as the skin around them retracts and makes more of the nail bed visible.<br><br>Blood of the vampire.<br><br>Bloodstains on an unearthed corpse was also a sign that someone had become a vampire. As Calmet explained, "[Vampires] suck the blood of living men or animals in such abundance that sometimes it flows from them at the nose, and sometimes the corpse swims in its own blood oozed out in its coffin."<br>Again, medical science can provide an explanation. The length of time that blood remains liquid depends on environmental conditions. In cold temperatures the blood can stay fluid for at least three to four days. If bodies were unearthed during that period on suspicion of vampirism, blood could still be found in their veins. Stories of corpses being stained with blood or "swimming" in blood (the latter likely an exaggeration) may have been derived from postmortem hemorrhages.<br>A blow to the body during transfer to its resting place can result in a trauma sufficient to make blood appear to flow from the nose or mouth. | The incorruptibility of a corpse was thought to be evidence that a dead person was **a vampire**. Calmet noted that some bodies, after several months or even years in the grave, were found with "the blood in a liquid state, the flesh entire, the limbs flexible and pliable."<br>The observation was accurate, but **science** rather than the supernatural can explain such postmortem phenomena. In large part, the belief in vampirism grew out of a lack of knowledge about the natural processes [/] of decomposition after death, which can, under certain conditions, be delayed for a long period of time.<br>A body can remain well preserved through two natural processes; [/] one of them**,** [/] saponification**,** [/] occurs when [/] the body is buried in a cold, damp environment, as is common in eastern Europe. During **the saponification process**, the body's [/] fatty acids turn into a waxy, soap-like compound that covers the corpse and prevents putrefaction**. A saponified body** also retains a certain flexibility, as described in Calmet's work.<br><br>Accounts in **Calmet's** Dissertation also noted that vampires' [/] hair [/] and fingernails continued to lengthen even after death. Certain postmortem changes may have given the illusion of continued growth. After death, **the skin** dehydrates, causing it to retract from the hair follicles. This may make the hair, especially stubble on the chin, look longer. **The same** is true of **nails**, as **the skin** around them retracts and makes more of the nail bed visible.<br><br>Blood of the vampire.<br><br>**Blood**stains on an unearthed corpse was also a sign that someone had become a vampire. As Calmet explained, "[**Vampires**] suck the blood of living men or animals in such abundance that sometimes it flows from them at the nose, and sometimes the corpse swims in its own blood oozed out in its coffin."<br>Again, medical science can provide an explanation. The length of time that blood remains liquid depends on environmental conditions. In cold temperatures **the blood** can stay fluid for at least three to **four days**. If bodies were unearthed during that period on suspicion of vampirism, blood could still be found in their veins. [/] Stories of corpses being stained with blood or "swimming" in blood (the latter likely an exaggeration) may have been derived from postmortem hemorrhages.<br>**A blow** to the body during transfer to its resting place can result in a trauma sufficient to make blood appear to flow from **the nose** or **mouth**. |

**Table 20.** Stretches analyzed for H1 and H2 in Text A, Spanish group.

Table 21 shows the text stretches analyzed of Text B for H1 and H2 of the Spanish group. For H1, Text B had no stretches with no coincidences among the participants, and 7 stretches with less than 20% of coincidence. For H2, Text A had 6 stretches in which all participants coincided, and 33 stretches above 80% of coincidences.

**Text B - Spanish group**

| H1 | H2 |
|---|---|
| How do you organise yourself, as a writer, to keep track of the world you're writing about? | How do you organise yourself**,** as a writer, to keep track of the world you're writing about? |
| As I'm going along, I plot the scenes with post-its and washi tape in an enormous, bound sketchbook. This way I can visualise where everything is in relation to each other. I also divide a page in quarters and decide which events need happen in which quarter of the novel, and whether it's the early or later part of the quarter. I read on Kindle a lot and 25%, 50% and 75% feel like natural markers to me. Of course it's not exact, but dividing by quarters rather than a three act narrative works better for me. | As I'm going along, I plot the scenes with post-its and washi tape in an enormous, bound sketchbook. This way I can visualise where everything is in relation to each other. I also divide a page in quarters and decide which events need happen in which quarter of the novel, and whether it's the early or later part of the quarter. I read on Kindle a lot and 25%, 50% and 75% feel like natural markers to me. Of course it's not exact, but dividing by quarters rather than a three act narrative works better for me. |
| Your writing overflows with descriptions of the natural world. How much of an influence is landscape for you? | Your writing overflows with descriptions of the natural world. How much of an influence is landscape for you? |
| I do a lot of creative thinking while walking, and my neighbourhood is very inspiring with trees and fields and a lake, and this is how Kilshamble was formed. Writing is a dialogue with the world around me. While I don't have to be in a place to write it, I do have to have a good sense of it. | I do a lot of creative thinking while walking, and my neighbourhood is very inspiring with trees and fields and a lake, and this is how Kilshamble was formed. Writing is a dialogue / with the world around me. While I don't have to be in a place to write it, I do have to have a good sense of it. |
| Following on from the previous question, what landscapes have inspired you? | Following on from the previous question, / what landscapes have inspired you? |
| I love nature, but the beauty of rundown and abandoned places really appeals to me and I think this is there in both books. I am also inspired by Cape Town, my home city which is naturally extraordinarily beautiful but has an uncomfortable mix of privilege and poverty. | I love **nature**, but the beauty of rundown and abandoned places really appeals to me and I think this is there in both books. I am also inspired by Cape Town, my home city which is naturally extraordinarily beautiful but has an uncomfortable mix of privilege and poverty. |
| Where is your favourite place to write? | Where is your favourite place to write? |
| My study, with the door open because I'm alone at home, and The Witcher 3 soundtrack blasting from another room. A tray with tea and my homemade almond sugar free biscuits. | My study, with **the door open** because I'm alone **at home**, and The Witcher 3 **soundtrack** blasting from another room. / A tray / with tea and my homemade almond **sugar free** biscuits. |
| For you, what makes a great story? | For you, what makes a great story? |
| I love nuance and texture in a story, and I also like riveting plot. It's a difficult balance, because too much nuance interferes with plot, and too much plot doesn't always lend itself to texture. But books that veer towards this balance are my favourite. | I love nuance and texture in a story, and I also like riveting plot. It's a difficult balance, because too much nuance interferes with plot, and too much plot doesn't always lend itself to texture. But books that veer towards this balance are my favourite. |
| Best bit of writing advice you've ever heard? | Best [bit of writing] advice you've ever heard? |
| To be honest, when I see Twitter threads with writing advice they freeze me up. People like and value such different things. The best advice? Find what works for you, whether it's content or style or practice. Writing is not easy, and sticking at it is even harder. Listen to what works for others, evaluate, and then choose your own path. | To be honest, when I see Twitter threads with writing advice they freeze me up. People like and value such different things. The best advice? Find what works for you, whether it's content or style or practice. Writing is not easy, and sticking at it is even harder. Listen to what works for others, evaluate, and then choose your own path. |

**Table 21.** Stretches analyzed for H1 and H2 in Text B, Spanish group.

Table 22 shows the text stretches analyzed of Text C for H1 and H2 of the Spanish group. For H1, Text C had 2 stretches with no coincidences among the participants, and 17 stretches with less than 20% of coincidences. For H2, Text A had 18 stretches in which all participants coincided, and 39 stretches above 80% of coincidences.

**Text C - Spanish group**

| H1 | H2 |
|---|---|
| Administering the Dose<br>To administer the dose, patients should be instructed to perform the following steps: | Administering **the Dose**<br>To administer the dose, **patients** should be instructed to perform the following steps: |
| • Blow the nose.<br>• Remove the cap from the dispenser.<br>• Place the right index finger on the pump of the actuator and while in front of a mirror, slowly advance the tip of the actuator into the left nostril upwards until their finger on the pump reaches the base of the nose.<br>• Tilt the actuator so that the opening on the tip of the actuator is in contact with the lateral wall of the nostril to ensure that the gel is applied to the nasal wall.<br>• Slowly depress the pump until it stops.<br>• Remove the actuator from the nose while wiping the tip along the inside of the lateral nostril wall to fully transfer the gel.<br>• Using your left index finger, repeat the steps outlined in bullets 3 through 6 for the right nostril.<br>• Use a clean, dry tissue to wipe the tip of the actuator.<br>• Replace the cap on the dispenser.<br>• Press on the nostrils at a point just below the bridge of the nose and lightly massage.<br>• Refrain from blowing the nose or sniffing for 1 hour after administration. | • Blow **the nose**.<br>• Remove the cap from the dispenser.<br>• Place the right index finger on the pump of the actuator and while in front of a mirror, slowly advance the tip of the actuator into the left nostril upwards **until their finger** on the pump reaches the base / of the nose.<br>• Tilt the actuator so that the opening on the tip of the actuator is in contact / with the lateral wall of the nostril to ensure that the gel is applied to the nasal wall.<br>• Slowly depress the pump until it stops.<br>• Remove the actuator **from the nose** while wiping the tip along the inside of the lateral nostril wall to fully transfer the gel.<br>• Using your left index finger, repeat the steps outlined in bullets 3 through 6 for the right nostril.<br>• Use a clean, dry tissue to wipe / **the tip** of the actuator.<br>• Replace the cap on the dispenser.<br>• Press on the nostrils at a point just below the bridge of the nose and lightly massage.<br>• Refrain from blowing **the nose** or sniffing for 1 hour after administration. |
| The dispenser should be replaced when the top of the piston inside the dispenser reaches the arrow at the top of the inside label. The inside label may be found by unwrapping the outer flap from around the container.<br>Use with Nasally Administered Drugs Other Than Sympathomimetic Decongestants<br>The drug interaction potential between Natesto and nasally administered drugs other than sympathomimetic decongestants is unknown. Therefore, Natesto is not recommended for use with nasally administered drugs other than sympathomimetic decongestants (e.g., oxymetazoline).<br>Temporary Discontinuation of Use for Severe Rhinitis<br>If the patient experiences an episode of severe rhinitis, temporarily discontinue Natesto therapy pending resolution of the severe rhinitis symptoms. If the severe rhinitis symptoms | The dispenser should be replaced when the top of the piston inside the dispenser reaches the arrow at the top of the inside label. The inside label may be found by unwrapping the outer flap from around the container.<br>Use with Nasally Administered Drugs Other Than Sympathomimetic Decongestants<br>The drug interaction potential between Natesto and nasally administered drugs other than sympathomimetic decongestants is unknown. Therefore, Natesto is not recommended for use with nasally administered drugs other than sympathomimetic decongestants (e.g., oxymetazoline).<br>Temporary Discontinuation of Use for Severe Rhinitis<br>**If the patient** experiences **an episode** of severe rhinitis, temporarily discontinue Natesto therapy pending resolution of the severe rhinitis symptoms. If the severe rhinitis symptoms |

| | |
|---|---|
| persist, an alternative testosterone replacement therapy is recommended. | persist, an alternative testosterone replacement therapy is recommended. |
| DOSAGE FORMS AND STRENGTHS<br>Natesto is a slightly yellow gel for intranasal use and is available in a dispenser with a metered dose pump. **One pump actuation** delivers 5.5 mg of testosterone. | DOSAGE FORMS AND STRENGTHS<br>**Natesto is a** [slightly yellow] **gel** for intranasal use and is available in a dispenser with a metered dose pump. One pump actuation delivers 5.5 mg of testosterone. |
| CONTRAINDICATIONS<br>Natesto is contraindicated in men with carcinoma of the breast **or known or suspected** carcinoma of the prostate. Natesto is contraindicated in women who are or who may become pregnant, or who are breastfeeding. Natesto may cause fetal harm when administered to a pregnant woman. Natesto may cause serious adverse reactions in nursing infants. Exposure of a fetus or nursing infant to androgens may result in varying degrees of virilization. If a pregnant woman is exposed to Natesto, she should be apprised of the potential hazard to the fetus. | CONTRAINDICATIONS<br>Natesto is contraindicated in men with carcinoma of the breast or known or suspected carcinoma of the prostate. Natesto is contraindicated in women who are or who may become pregnant, or who are breastfeeding. Natesto may cause fetal harm when administered to a pregnant woman. Natesto may cause serious adverse reactions in nursing infants. Exposure of a fetus or nursing infant to androgens may result in varying degrees of virilization. If a pregnant woman is exposed to Natesto, she should be apprised of the potential hazard to the fetus. |

**Table 22.** Stretches analyzed for H1 and H2 in Text C, Spanish group.

Table 23 shows the text stretches analyzed of Text A for H1 and H2 of the Italian group. For H1, Text A had 19 stretches with no coincidences among the participants, and 26 stretches with less than 20% of coincidence. For H2, Text A had 30 stretches in which all participants coincided, and 68 stretches above 80% of coincidences.

**Text A - Italian group**

| H1 | H2 |
|---|---|
| Suspecting vampirism, the villagers exhumed Paole's body. They found it intact—even the nails had grown. Fresh blood covered the inside of the coffin. The villagers thus "**drove a stake** through his heart, **whereby he gave an audible groan** and bled copiously." The bodies of other villagers, thought to have been also transformed into vampires, were disinterred and likewise maimed in an attempt to "kill" them for good. | Suspecting **vampirism**, the villagers **exhumed Paole's body**. They found it intact—**even** [the nails] **had grown**. Fresh blood covered **the inside of the coffin**. The villagers thus "drove a stake through his heart, whereby he gave an audible groan and bled copiously." **The bodies** of other villagers, thought to have been also transformed into vampires, were disinterred and likewise maimed in an attempt **to "kill" them** for good. |
| Hair and nails. | Hair and nails. |
| The incorruptibility of a corpse was thought **to be evidence** that a dead person was a vampire. Calmet noted that some bodies, after several months or even years in the grave, were found with "the blood in a liquid state, the flesh entire, the limbs flexible and pliable."<br>The observation was accurate, but science rather than the supernatural **can explain** such postmortem phenomena. In large part, the belief in vampirism **grew out of a lack** of knowledge **about the natural processes** of decomposition after death, which can, under certain conditions, be delayed for a long period of time.<br>A body can remain well preserved through two natural processes; one of them, saponification, occurs when the body is buried in a cold, damp environment, **as is common** in eastern Europe. During the saponification process, the body's fatty acids turn into a waxy, soap-like compound that covers | The incorruptibility of a corpse was thought to be evidence that a dead person was a vampire. Calmet noted that some bodies, after several months or even years in the grave, were found with "the blood in **a liquid state**, the flesh entire, the limbs flexible and pliable."<br>The observation was accurate, but science rather than the supernatural can explain such postmortem phenomena. In large part, **the belief** in vampirism grew out of a lack of knowledge about the natural processes of decomposition **after death**, which can, under certain conditions, be delayed for a long period of time.<br>**A body** can remain well preserved through two natural processes; one of them, **saponification**, occurs when the body is buried in **a cold, damp environment**, as is common in eastern Europe. **During the saponification process**, **the** [body's] **fatty acids / turn into** a waxy, soap-like compound |

| | |
|---|---|
| the corpse and prevents putrefaction. A saponified body also retains a certain flexibility, as described in Calmet's work. | that covers the corpse and prevents **putrefaction**. **/ A saponified body** also retains a certain flexibility, as described **in Calmet's work**. |
| **Accounts in** [Calmet's] **Dissertation** also noted that vampires' hair and fingernails continued to lengthen even after death. Certain postmortem changes may have given the illusion **of continued growth**. After death, the skin dehydrates, causing it to retract from the hair follicles. **This may make** the hair, especially stubble on the chin, look longer. The same is true of nails, as the skin around them retracts and makes more of the nail bed visible. | Accounts in **Calmet's** Dissertation also noted that **vampires'** hair **and fingernails** continued to lengthen even after death. Certain postmortem changes may have given the illusion of continued growth. **After death**, **/ the skin dehydrates**, causing it to retract from the hair follicles. This may make the hair, especially stubble on the chin, look **longer**. The same is true of **nails**, as **the skin** around them retracts and makes more of the nail bed visible. |
| Blood of the vampire. | Blood of **the vampire**. |
| Bloodstains on an unearthed corpse was **also a sign** that someone had become a vampire. As Calmet explained, "[Vampires] suck the blood of living men or animals **in such abundance** [/] **that sometimes it flows from them** at the nose, and sometimes the corpse swims in its own blood **oozed out** in its coffin."<br>Again, medical science can provide an explanation. The length of time that blood remains liquid depends on environmental conditions. In cold temperatures the blood can stay fluid for at least three to four days. If bodies were unearthed **during that period** on suspicion of vampirism, blood **could still be found** in their veins. Stories of corpses being stained with blood **or "swimming"** in blood (the latter likely an exaggeration) may have been derived from postmortem hemorrhages. | **Blood**stains on an unearthed corpse was also a sign that someone had become a vampire. As Calmet explained, "[**Vampires**] suck the blood of living men or animals in such abundance that sometimes it flows from them at the nose, and sometimes the corpse swims in its own blood oozed out in its coffin."<br>Again, **/** medical science **/** can provide **/ an explanation**. The length of time that blood remains liquid depends on environmental conditions. In cold temperatures **the blood** can stay fluid for at least **three to four days**. **/ If bodies** were unearthed during that period on suspicion of vampirism, blood could still be found in their veins. Stories of corpses being **stained with blood** or "swimming" in blood (the latter likely an exaggeration) may have been derived from postmortem hemorrhages. |
| A blow **to the body** during transfer to its resting place can result in a trauma sufficient to make blood appear to flow from the nose or mouth. | A blow to the body during transfer to its resting place can result in a trauma sufficient to make blood appear to flow from the nose **or mouth**. |

**Table 23.** Stretches analyzed for H1 and H2 in Text A, Italian group.

Table 24 shows the text stretches analyzed of Text B for H1 and H2 of the Italian group. For H1, Text B had 21 stretches with no coincidences among the participants, and 27 stretches with less than 20% of coincidences. For H2, Text A had 12 stretches in which all participants coincided, and 36 stretches above 80% of coincidences.

**Text B - Italian group**

| H1 | H2 |
|---|---|
| How do you organise yourself, as a writer, to keep track of the world you're writing about? | How do you organise yourself, as a writer, to keep track **/** of the world you're writing about? |
| **As I'm going along**, I plot the scenes with post-its and washi tape in **an enormous, bound sketchbook**. This way I can visualise **where everything is in relation to each other**. I also divide a page in quarters and decide which events need happen in which quarter of the novel, and whether **it's the early** [or later] **part** of the quarter. I read on Kindle a lot and 25%, 50% and 75% feel **like natural markers** to me. Of course **it's** | As I'm going along, I plot **the scenes** with post-its and washi tape in an enormous, bound sketchbook. **This way** I can visualise where everything is in relation to each other. I also divide a page in quarters and decide which events need happen in which quarter of **the novel**, and whether it's the early or later part of the quarter. I read on Kindle a lot and 25%, 50% and 75% feel like natural markers to me. Of course it's |

| | |
|---|---|
| not exact, but dividing by quarters rather than a three act narrative works better for me. | not exact, but dividing by quarters rather than a three act narrative works better for me. |
| Your writing overflows with descriptions of the natural world. How much of an influence is landscape for you? | Your writing overflows with descriptions of the natural world. How much of an influence is landscape for you? |
| I do a lot of creative thinking while walking, and my neighbourhood is very inspiring with trees and fields and a lake, and this is how Kilshamble was formed. Writing is a dialogue with the world around me. While I don't have to be in a place to write it, I do have to have a good sense of it. | I do a lot of creative thinking while walking, and my neighbourhood is very inspiring with trees and fields and a lake, and this is how Kilshamble was formed. Writing is a dialogue with the world around me. While I don't have to be in a place to write it, I do have to have a good sense of it. |
| Following on from the previous question, what landscapes have inspired you? | Following on from the previous question, what landscapes have inspired you? |
| I love nature, but the beauty of rundown and abandoned places really appeals to me and I think this is there in both books. I am also inspired by Cape Town, my home city which is naturally extraordinarily beautiful but has an uncomfortable mix of privilege and poverty. | I love nature, but the beauty of rundown and abandoned places really appeals to me and I think this is there in both books. I am also inspired by Cape Town, my home city which is naturally extraordinarily beautiful but has an uncomfortable mix of privilege and poverty. |
| Where is your favourite place to write? | Where is your favourite / place to write? |
| My study, with the door open because I'm alone at home, and The Witcher 3 soundtrack blasting from another room. A tray with tea and my homemade almond sugar free biscuits. | My study, with the door open because I'm alone at home, and The Witcher 3 soundtrack blasting from another room. A tray with tea and [my homemade / almond / sugar free /] biscuits. |
| For you, what makes a great story? | For you, what makes a [great] story? |
| I love nuance and texture in a story, and I also like riveting plot. It's a difficult balance, because too much nuance interferes with plot, and too much plot doesn't always lend itself to texture. But books that veer towards this balance are my favourite. | I love nuance and texture in a story, and I also like riveting plot. It's a difficult balance, because too much nuance interferes with plot, and too much plot doesn't always lend itself to texture. But books that veer towards this balance are my favourite. |
| Best bit of writing advice you've ever heard? | Best bit of [writing] advice you've ever heard? |
| To be honest,[/] when I see [Twitter] threads with writing advice they freeze me up. People like and value such different things. The best advice? Find what works for you, whether it's content or style or practice. Writing is not easy, and sticking at it is even harder. Listen to what works for others, evaluate, and then choose your own path. | To be honest, when I see Twitter threads with writing advice they freeze me up. People like and value such different things. The best advice? Find what works for you, whether it's content or style or practice. Writing is not easy, and sticking at it is even harder. Listen to what works for others, evaluate, and then choose your own path. |

Table 24. Stretches analyzed for H1 and H2 in Text B, Italian group.

Table 25 shows the text stretches analyzed of Text C for H1 and H2 of the Italian group. For H1, Text C had 10 stretches with no coincidences among the participants, and 18 stretches with less than 20% of coincidences. For H2, Text C had 13 stretches in which all participants coincided, and 47 stretches above 80% of coincidences.

**Text C - Italian group**

| H1 | H2 |
|---|---|
| Administering the Dose | Administering the Dose |

| | |
|---|---|
| To administer the dose, patients **should be instructed to perform** the following steps: | To administer the dose, patients should be instructed to perform the following steps: |
| • Blow the nose.<br>• Remove the cap from the dispenser.<br>• Place the right index finger on the pump of the actuator and while in front of a mirror, slowly advance the tip of the actuator into the left nostril upwards until their finger on the pump reaches the base of the nose.<br>• Tilt the actuator **so that** the opening on the tip of the actuator is in contact with the lateral wall of the nostril to ensure that the gel is applied to the nasal wall.<br>• Slowly depress the pump until it stops.<br>• Remove the actuator from the nose while wiping the tip **along the inside of the lateral nostril wall to fully transfer** the gel.<br>• Using your left index finger, repeat the steps outlined in bullets 3 through 6 for the right nostril.<br>• Use a clean, dry tissue to wipe the tip of the actuator.<br>• Replace the cap on the dispenser.<br>• Press on the nostrils **at a point just below** the bridge of the nose and lightly massage.<br>• Refrain from blowing the nose or sniffing for 1 hour after administration. | • Blow the nose.<br>• **Remove the cap** from the dispenser.<br>• Place the right index finger on the pump of the actuator and while in front of a mirror, slowly advance the tip / of the actuator / into the left nostril upwards until **their finger** on the pump reaches **the base of the nose**.<br>• **Tilt the actuator** so that the opening on the tip of the actuator is in contact / with the lateral wall of the nostril to ensure that the gel is applied to the nasal wall.<br>• **Slowly depress** the pump until it stops.<br>• **Remove the actuator from the nose** while wiping the tip along the inside of the lateral nostril wall to fully transfer the gel.<br>• Using your left index finger, repeat the steps outlined in bullets 3 through 6 for the right nostril.<br>• Use a clean, dry tissue to wipe / the tip / of the actuator.<br>• Replace the cap on the dispenser.<br>• Press on the nostrils at a point just below the bridge of the nose and lightly massage.<br>• Refrain from blowing the nose or sniffing for 1 hour after administration. |
| The dispenser should be replaced when the top of the piston inside the dispenser reaches the arrow at the top of the inside label. The inside label **may be found by unwrapping the outer flap from around the container**.<br>Use with Nasally Administered Drugs Other Than Sympathomimetic Decongestants<br>The drug interaction potential between Natesto and nasally administered drugs other than sympathomimetic decongestants is unknown. Therefore, **Natesto is not recommended for use** with nasally administered drugs other than sympathomimetic decongestants (e.g., oxymetazoline).<br>Temporary Discontinuation of Use for Severe Rhinitis<br>If the patient experiences an episode of severe rhinitis, temporarily discontinue Natesto therapy pending resolution of the severe rhinitis symptoms. If the severe rhinitis symptoms persist, an alternative testosterone replacement therapy **is recommended**. | The dispenser should be replaced when the top of the piston inside the dispenser reaches the arrow at the top of the inside label. The inside label may be found by unwrapping the outer flap from around the container.<br>Use with Nasally Administered Drugs Other Than Sympathomimetic Decongestants<br>The drug interaction potential between Natesto and nasally administered drugs other than sympathomimetic decongestants is unknown. Therefore, Natesto is not recommended for use with nasally administered drugs other than sympathomimetic decongestants (e.g., oxymetazoline).<br>Temporary Discontinuation of Use for Severe Rhinitis<br>**If the patient** experiences an episode of severe rhinitis, temporarily discontinue Natesto therapy pending resolution of the severe rhinitis **symptoms.** If [the severe rhinitis] symptoms persist, an alternative testosterone replacement therapy is recommended. |
| DOSAGE FORMS AND STRENGTHS<br>Natesto is **a slightly yellow** gel for intranasal use and is available in a dispenser with a metered dose pump. One pump actuation delivers 5.5 mg of testosterone. | DOSAGE FORMS AND STRENGTHS<br>Natesto is a [slightly yellow] gel **for intranasal use** and is available in a dispenser with a metered dose pump. One pump actuation delivers **5.5 mg of testosterone**. |
| CONTRAINDICATIONS<br>Natesto is contraindicated in men with carcinoma of the breast or known or suspected carcinoma of the prostate. Natesto is contraindicated in women who are or who may become pregnant, or who **are breastfeeding**. Natesto may cause fetal harm when administered to a pregnant woman. | CONTRAINDICATIONS<br>Natesto is contraindicated in men **with carcinoma** of the breast or known **or suspected** carcinoma of the prostate. Natesto is contraindicated in women who are or who may become pregnant, or who are breastfeeding. Natesto may cause fetal harm **when administered** to a pregnant woman. |

| | |
|---|---|
| Natesto may cause serious adverse reactions in nursing infants. Exposure of a fetus or **nursing infant** to androgens may result in varying degrees of virilization. If a pregnant woman is exposed to Natesto, she should be apprised of the potential hazard to the fetus. | Natesto may cause serious adverse reactions in nursing infants. **Exposure** of a fetus or nursing infant to androgens may result in varying degrees of virilization. If a [pregnant] woman is exposed to Natesto, she should be apprised of the potential hazard to the fetus. |

**Table 25.** Stretches analyzed for H1 and H2 in Text C, Italian group.

## 11. 4. Behavioral fluency

As mentioned in §5 Hypotheses, the fluency indicators used to determine the level of fluency of the task segments were the following:

- Text span in one task segment
- Task segment only for production (mono TS)
- No respites in the task segment
- No typos/deletions in the task segment
- Typing speed faster than the median

Each of these indicators covers one of the key features of fluency identified by writing research: revision behavior (task segment only for production, no typos/deletion in the task segment), pausing behavior (no respites in the task segment) and production rate (typing speed faster than the median). We also added text span in one task segment for the product-based hypotheses, since the division of a text into several task segments indicates attentional changes.

Each chunk was analyzed by using these fluency indicators (see Appendix D). Each fluency indicator was expressed as having one of two possible values: yes or no. For H1 and H2, each chunk was assigned with a fluency level that can range from fully disfluent (0) to fully fluent (5). Figure 9 shows an example of the fluency levels of 11 task segments.

| CHUNK | TS | 1 TS | NO RESPITES | NO TYPOS/DELETIONS | MONO TS | SPEED HIGHER | | LVL |
|---|---|---|---|---|---|---|---|---|
| TT02C01 | TS010 | Y | N | Y | Y | Y | | 4 |
| TT02C02 | TS012 | Y | N | Y | Y | N | | 3 |
| TT02C03 | TS018-TS019 | N | N | Y | Y | Y | | 3 |
| TT02C04 | TS024 | Y | N | N | Y | Y | | 3 |
| TT02C05 | TS029 | Y | N | N | Y | N | | 2 |
| TT02C06 | TS029 | Y | N | N | Y | N | | 2 |
| TT02C08 | TS032 | Y | N | Y | Y | Y | | 4 |
| TT02C09 | TS032 | Y | N | Y | Y | Y | | 4 |
| TT02C10 | TS032 | Y | N | Y | Y | Y | | 4 |
| TT02C11 | TS040 | Y | N | N | N | N | | 1 |

**Figure 9.** Calculation of the fluency levels for H1 and H2.

ADD task segments with a longer and shorter previous pauses were identified for H3 and H4 using the interquartile range, the upper and lower 25%. Then, the task segments were analyzed using the same fluency indicators as in H1 and H2, except for TEXT SPAN IN ONE TASK SEGMENT. For H3 and H4, fluency levels can

range from very low fluency (0) to very high fluency (4). Figure 10 shows the fluency levels of 8 task segments for H3 and H4.

| TASK SEGMENT | NO RESPITES | NO TYPOS/DELETIONS | MONO TS | SPEED HIGHER | | LVL |
|---|---|---|---|---|---|---|
| TS005 | Y | Y | Y | Y | | 4 |
| TS012 | Y | Y | Y | N | | 3 |
| TS054 | Y | Y | Y | N | | 3 |
| TS056 | Y | Y | Y | Y | | 4 |
| TS057 | Y | N | Y | N | | 2 |
| TS069 | Y | Y | Y | N | | 3 |
| TS070 | Y | Y | Y | Y | | 4 |
| TS073 | Y | N | Y | Y | | 3 |

**Figure 10.** Calculation of the fluency levels for R2.

The indicator TASK SPAN IN ONE TASK SEGMENT was discarded because all the task segments in H3 fulfill this indicator. The reason behind this difference between H1 and H2 versus H3 and H4 is that H1 and H2 are product-based hypotheses (the analysis starts by identifying the renditions in the products and then moves into the task segments that make up each chunk) and the empirical analysis in H3 and H4 are process-based hypotheses (the analysis starts from the task segments). Thereafter, the fluency levels were grouped into three categories. For hypotheses 1 and 2: fluent (level 5 and 4), mid-fluent (level 3 and 2) disfluent (level 1 and 0). For hypotheses 3 and 4: fluent (level 4 and 3), mid-fluent (level 2) and disfluent (level 1 and 0).

## 11.5. Questionnaire data analysis

To supplement the product and process analyses, data collected from questionnaires was analyzed. Questionnaires provided information about informant's impression on the translation tasks, regarding self-perceived difficulty, enjoyment and satisfaction with the task. It also provided information on which features of texts informants find most difficult.

## 11.6. Statistical data analysis

The statistical tests for both research questions were conducted with Jamovi 2.2.5 (The Jamovi Project 2021) and one test (a multinomial logistic regression) was performed with IBM SPSS Statistics version 25 (2017). Graphs were also produced in Jamovi. The specific tests for each research questions are provided in the Results and discussion section.

# RESULTS

We will now discuss the results and their relationship with the hypotheses, also group by group, in different sections. In closing, we will lay out a supplementary analysis from the post-translation questionnaire.

## 1. Product-based hypotheses

### 1.1. Hypothesis 1: Totally different translations (no coincidences)

What happens when *no* translator chooses the same translation for the same text stretch? Hypothesis 1 (H1) predicted that there will be no positive correlation between a different number of renditions by all participants and high difficulty, operationalized in terms of behavioral fluency. Table 26 shows the results of the three translation tasks for the Italian group. Each text stretch analyzed for each text and participant was classified into a category (fluent, mid-fluent or disfluent).

| | text A | | | text B | | | text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **IT01** | 3 | 11 | 5 | 6 | 15 | 0 | 0 | 5 | 5 |
| **IT02** | 2 | 10 | 7 | 1 | 6 | 14 | 1 | 6 | 3 |
| **IT03** | 4 | 11 | 4 | 7 | 9 | 5 | 1 | 7 | 2 |
| **IT04** | 3 | 12 | 4 | 6 | 11 | 4 | 5 | 3 | 2 |
| **IT05** | 1 | 10 | 8 | 7 | 10 | 4 | 2 | 4 | 4 |
| **IT06** | 2 | 11 | 6 | 4 | 9 | 8 | 2 | 4 | 4 |
| **total** | 15 | 65 | 34 | 31 | 60 | 35 | 11 | 29 | 20 |
| **%** | 13.2 | 57.0 | 29.8 | 24.6 | 47.6 | 27.8 | 18.3 | 48.3 | 33.3 |
| **mean** | 2.500 | 10.833 | 5.667 | 5.167 | 10.000 | 6.000 | 1.833 | 4.833 | 3.333 |
| **median** | 2.5 | 11.0 | 5.5 | 6.0 | 9.5 | 4.5 | 1.5 | 4.5 | 3.5 |
| **sd** | 1.049 | 0.753 | 1.633 | 2.317 | 2.966 | 4.858 | 1.722 | 1.472 | 1.211 |

**Table 26.** Results H1 (no coincidences), Italian group.

In all translation tasks, most TSs with no coincidences were of medium fluency: In Text A, 57.0%; in Text B, 47.6%; and in Text C, 48.3%. Fluent TSs were the least prevalent in all the translation tasks (13.2, 24.6, and 18.3%, respectively). In Text B, fluent and disfluent TSs had similar results (24.6 and 27.8%, respectively). Again, disfluent TSs were roughly 30% of all instances (29.8, 27.8, and 33.3%). A chi-square test of independence to examine the relationship between fluency levels and texts were all participants had different translations for a given stretch showed that there was no significant relationship between the two variables, $X^2$ (4, $N$ = 300) = 5.73, $p$ = .220. The effect size, Cramer's V, was weak, 0.0977.

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **ES01** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| **ES02** | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 | 0 |
| **ES03** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **ES04** | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - |
| **ES05** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| **ES06** | - | - | - | - | - | - | - | - | - |
| **ES07** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **ES08** | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - |
| **ES09** | - | - | - | 0 | 0 | 0 | - | - | - |
| **ES10** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **ES11** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **ES12** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 0 |
| **ES13** | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - |
| **ES14** | - | - | - | 0 | 0 | 0 | - | - | - |
| **ES15** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| **ES16** | - | - | - | - | - | - | 0 | 2 | 0 |
| **ES17** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **ES18** | - | - | - | 0 | 0 | 0 | 0 | 0 | 2 |
| **ES19** | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 |
| **ES20** | 0 | 0 | 0 | 0 | 0 | 0 | - | - | - |
| **ES21** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| **ES22** | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 0 | 1 |
| **ES23** | - | - | - | 0 | 0 | 0 | - | - | - |
| **TOTAL** | 0 | 0 | 0 | 0 | 0 | 0 | 4 | 12 | 14 |
| % | 0 | 0 | 0 | 0 | 0 | 0 | 13.3 | 40.0 | 46.7 |
| MEAN | 0 | 0 | 0 | 0 | 0 | 0 | 0.267 | 0.800 | 0.933 |
| MEDIAN | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 1 |
| SD | 0 | 0 | 0 | 0 | 0 | 0 | 0.594 | 0.862 | 0.799 |

**Table 27.** Results H1 (no coincidences), Spanish group.

Table 27 shows the general results of the Spanish informants for the three translation tasks for H1, when no translator coincided with any other one. In the Spanish group, both in Text A and Text B there were no stretches with no coincidences among the group. Only in Text C there were 2 cases, which show that most TSs were of low fluency (46.7%), followed closely by Mid-fluency TSs (40.0%). Finally, 13.3% of the TS were fluent. Although this was the only case where the results differ from the other analyses, it should be taken into account with a pinch of salt, due to the limited amount of data. No statistical test was performed for this condition, since there was too little data in order to perform a test of association.

## 1.2. Hypothesis 1: Mostly different translations (less than 20% of coincidences)

Let us now try a weak(er) version of hypothesis 1. What happens when *most* translators choose a different translation for the same text stretch? If H1 is wrong and the CNA hypothesis is right, we should find a larger number of low fluency segments. Given the characteristics of the smallest group (the Italian), it was decided to use quintiles in order to identify when translations were mostly different, that is to say, translations with less than 20% of coincidence. Table 28 reports the results of the Italian informants for the three translation tasks for H1.

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | dis-fluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | dis-fluent |
| **IT01** | 5 | 15 | 6 | 9 | 17 | 1 | 1 | 10 | 7 |
| **IT02** | 3 | 14 | 9 | 1 | 10 | 16 | 1 | 10 | 7 |
| **IT03** | 7 | 15 | 4 | 10 | 11 | 6 | 5 | 11 | 2 |
| **IT04** | 5 | 15 | 6 | 10 | 12 | 5 | 6 | 7 | 5 |
| **IT05** | 3 | 13 | 10 | 7 | 12 | 8 | 4 | 5 | 9 |
| **IT06** | 3 | 15 | 8 | 7 | 12 | 8 | 3 | 9 | 6 |
| **TOTAL** | 26 | 87 | 43 | 44 | 74 | 44 | 20 | 52 | 36 |
| % | 16.7 | 55.8 | 27.6 | 34.9 | 58.7 | 34.9 | 18.5 | 48.1 | 33.3 |
| MEAN | 4.333 | 14.500 | 7.167 | 7.333 | 12.333 | 7.333 | 3.333 | 8.667 | 6.000 |
| MEDIAN | 4 | 15 | 7 | 8 | 12 | 7 | 3,5 | 9,5 | 6,5 |
| SD | 1.633 | 0.837 | 2.229 | 3.386 | 2.422 | 4.967 | 2.066 | 2.251 | 2.366 |

**Table 28.** Results H1 (<20%), Italian group.

In all three translation tasks, most TSs with only 20% of coincidence or below were not disfluent, but of medium fluency. The translation of the first text yielded the highest percentage of Mid-fluency TSs (57.5%), though Mid-fluency TSs s took almost half of the instances in Text B and Text C (47.6 and 48.3%, respectively). High fluency TSs were the least prevalent in all three texts (13.3, 24.6 and 18.3%). However, low fluency TSs corresponded roughly to one third of the cases in all translation tasks (29.2, 27.8 and 33.3%). In the case of Text B, there were as many highly fluent TSs as low-fluency TSs . The median values confirm that most TSs were of medium fluency. The standard deviation also shows us that there is a higher deviation within the data in Text B. A chi-square test of independence on the relationship between fluency levels and texts were most participants had different translations for a given stretch showed that there was no significant relationship between the two variables, $X^2$ (4, $N$ = 426) = 7.33, $p$ = .120. The effect size, Cramer's V, was weak, 0.0927.

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **ES01** | 1 | 5 | 0 | 2 | 3 | 2 | 5 | 9 | 3 |
| **ES02** | 2 | 4 | 0 | 2 | 3 | 2 | 4 | 10 | 3 |
| **ES03** | 0 | 1 | 5 | 0 | 3 | 4 | 2 | 9 | 6 |
| **ES04** | 0 | 2 | 4 | 1 | 3 | 3 | - | - | - |
| **ES05** | 1 | 2 | 3 | 0 | 1 | 6 | 0 | 10 | 7 |
| **ES06** | - | - | - | - | - | - | - | - | - |
| **ES07** | 0 | 4 | 2 | 1 | 3 | 3 | 2 | 9 | 6 |
| **ES08** | 0 | 6 | 0 | 1 | 4 | 2 | - | - | - |
| **ES09** | - | - | - | 1 | 4 | 2 | - | - | - |
| **ES10** | 1 | 4 | 1 | 0 | 3 | 4 | 2 | 10 | 5 |
| **ES11** | 1 | 3 | 2 | 1 | 4 | 2 | 1 | 10 | 6 |
| **ES12** | 0 | 4 | 2 | 0 | 6 | 1 | 3 | 7 | 7 |
| **ES13** | 1 | 3 | 2 | 0 | 3 | 4 | - | - | - |
| **ES14** | - | - | - | 0 | 5 | 2 | - | - | - |
| **ES15** | 0 | 4 | 2 | 0 | 4 | 3 | 3 | 7 | 7 |
| **ES16** | - | - | - | - | - | - | 2 | 11 | 4 |
| **ES17** | 2 | 4 | 0 | 1 | 3 | 3 | 1 | 9 | 7 |
| **ES18** | - | - | - | 0 | 5 | 2 | 0 | 10 | 7 |
| **ES19** | 1 | 0 | 5 | 0 | 6 | 1 | 1 | 10 | 6 |
| **ES20** | 2 | 2 | 2 | 1 | 3 | 3 | - | - | - |
| **ES21** | 3 | 3 | 0 | 1 | 5 | 1 | 5 | 7 | 5 |
| **ES22** | 0 | 4 | 2 | 1 | 3 | 3 | 4 | 6 | 7 |
| **ES23** | - | - | - | 0 | 5 | 2 | - | - | - |
| **TOTAL** | 15 | 55 | 32 | 13 | 79 | 55 | 35 | 134 | 86 |
| % | 14.7 | 53.9 | 31.4 | 8.8 | 53.7 | 37.4 | 13.7 | 52.5 | 33.7 |
| MEAN | 0.882 | 3.235 | 1.882 | 0.617 | 3.762 | 2.619 | 2.333 | 8.933 | 5.733 |
| MEDIAN | 1 | 4 | 2 | 1 | 3 | 2 | 2 | 9 | 6 |
| SD | 0.928 | 1.480 | 1.654 | 0.669 | 1.221 | 1.203 | 1.633 | 1.486 | 1.438 |

**Table 29.** Results H1 (<20%), Spanish group.

Table 29 shows the general results of the Spanish informants in the three translation tasks for H1. In all translation tasks, most TSs with only 20% of coincidence or below were not disfluent, but of mid fluency: In Text A, 53.9%; in Text B, 53.7%; and in Text C, 52.5%. Fluent TSs were the least prevalent in all translation tasks (14.7, 8.8, and 13.7%, respectively). Disfluent TS amounted roughly to one third of the cases in all translation tasks (31.4, 37.4, and 33.7%). A chi-square test of independence on the relationship between fluency levels and texts were most participants had different translations for a given stretch showed that there was no significant relationship between the two variables, $X^2$ (4, $N$ = 504) = 2.86, $p$ = .582. The effect size, Cramer's V, was weak, 0.0532.

## 1.3. Hypothesis 2: Fluency when translations are the same (100% coincidences)

Will, in contrast, behaviorally fluent TSs coincide with those were *all* translators choose the same rendition? Hypothesis 2 posited that there will be no correlation between a single rendition by all translators and low difficulty. Table 30 shows the results of the Italian group in the three translation tasks for H2.

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | dis-fluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **IT01** | 10 | 18 | 2 | 6 | 8 | 1 | 3 | 7 | 2 |
| **IT02** | 3 | 24 | 3 | 2 | 9 | 4 | 0 | 6 | 6 |
| **IT03** | 6 | 24 | 0 | 8 | 4 | 3 | 9 | 2 | 1 |
| **IT04** | 13 | 12 | 5 | 4 | 10 | 1 | 4 | 7 | 1 |
| **IT05** | 6 | 21 | 3 | 8 | 3 | 4 | 4 | 7 | 1 |
| **IT06** | 10 | 16 | 4 | 3 | 9 | 3 | 3 | 6 | 3 |
| **TOTAL** | 48 | 115 | 17 | 31 | 43 | 16 | 23 | 35 | 14 |
| % | 26.7 | 63.9 | 9.4 | 34.4 | 47.8 | 17.8 | 31.9 | 48.6 | 16.4 |
| MEAN | 8.000 | 19.167 | 4.500 | 5.167 | 7.167 | 2.667 | 3.833 | 5.833 | 2.333 |
| MEDIAN | 8 | 19.5 | 3 | 5 | 8.5 | 3 | 3.5 | 6.5 | 1.5 |
| SD | 3.633 | 4.750 | 5.320 | 2.563 | 2.927 | 1.366 | 2.927 | 1.941 | 1.966 |

**Table 30.** Results H2 (100%), Italian group.

In all three translation tasks, most TSs with 100% coincidence in Italian participants were of medium fluency: 63.9% in Text A; 47.8% in Text B; and 48.6% in Text C. There were very few disfluent TSs in Text A (9.4%), Text B (17.8%) and Text C (16.4%). Fluent TS represented roughly 30% of all instances in the three translation tasks (26.7, 34.4, and 31.9%, respectively). A chi-square test of independence on the relationship between fluency levels and texts were all participants had the same translation for a given stretch showed that there was indeed a relationship between the two variables, $X^2$ (4, $N$ = 342) = 10.3, $p$ = .036. However, the effect size for this finding, Cramer's V, was weak, 0.123.

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | dis-fluent | fluent | mid-fluent | dis-fluent |
| **ES01** | 9 | 8 | 1 | 1 | 4 | 1 | 6 | 4 | 0 |
| **ES02** | 8 | 8 | 2 | 2 | 4 | 0 | 5 | 5 | 0 |
| **ES03** | 3 | 12 | 3 | 1 | 4 | 1 | 3 | 3 | 4 |
| **ES04** | 8 | 7 | 3 | 1 | 4 | 1 | - | - | - |
| **ES05** | 5 | 11 | 2 | 4 | 2 | 0 | 6 | 3 | 1 |
| **ES06** | - | - | - | - | - | - | - | - | - |
| **ES07** | 5 | 13 | 0 | 2 | 3 | 1 | 3 | 5 | 2 |
| **ES08** | 3 | 14 | 1 | 1 | 5 | 0 | - | - | - |
| **ES09** | - | - | - | 3 | 3 | 0 | - | - | - |
| **ES10** | 3 | 14 | 1 | 4 | 2 | 0 | 4 | 5 | 1 |
| **ES11** | 3 | 13 | 2 | 1 | 3 | 2 | 3 | 5 | 2 |
| **ES12** | 7 | 10 | 1 | 2 | 4 | 0 | 3 | 7 | 0 |
| **ES13** | 4 | 11 | 3 | 1 | 3 | 2 | - | - | - |
| **ES14** | - | - | - | 3 | 3 | 0 | - | - | - |
| **ES15** | 5 | 12 | 1 | 2 | 4 | 0 | 3 | 7 | 0 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ES16** | - | - | - | - | - | - | 1 | 8 | 1 |
| **ES17** | 9 | 7 | 2 | 3 | 3 | 0 | 3 | 7 | 0 |
| **ES18** | - | - | - | 1 | 3 | 2 | 3 | 7 | 0 |
| **ES19** | 6 | 11 | 1 | 4 | 2 | 0 | 1 | 6 | 3 |
| **ES20** | 5 | 7 | 6 | 2 | 3 | 1 | - | - | - |
| **ES21** | 5 | 12 | 1 | 2 | 4 | 0 | 1 | 9 | 0 |
| **ES22** | 7 | 9 | 2 | 4 | 2 | 0 | 3 | 7 | 0 |
| **ES23** | - | - | - | 2 | 4 | 0 | - | - | - |
| **TOTAL** | 95 | 179 | 32 | 46 | 69 | 11 | 48 | 88 | 14 |
| % | 31.0 | 58.5 | 10.5 | 36.5 | 54.8 | 8.7 | 32.0 | 58.7 | 9.3 |
| MEAN | 5,588 | 10,529 | 1,882 | 2,190 | 3,286 | 0,524 | 3,200 | 5,867 | 0,933 |
| MEDIAN | 5 | 11 | 2 | 2 | 3 | 0 | 3 | 6 | 0 |
| SD | 2,093 | 2,452 | 1,364 | 1,123 | 0,845 | 0,750 | 1,568 | 1,767 | 1,280 |

**Table 31.** Results H2 (100%), Spanish group.

Table 31 shows the general results of the Spanish informants in the three translation tasks for H2.In all translation tasks, most TSs by Spanish informants with total coincidence were also of medium fluency. Mid-fluent TSs accounted for 58.5% in Text A; 54.8% in Text B; and 58.7% in Text C. There were very few dis-fluent TSs in all three texts (Text A, 9.4%; Text B, 54.8%; and Text C, 58.7%). Fluent TSs represented once again roughly one third of all instances in all translation tasks (31.0, 36.5, and 32.0%, respectively). A chi-square test of independence on the relationship between fluency levels and texts were all participants had the same translation for a given stretch yielded no relationship between the two variables, $X^2$ (4, $N$ = 582) = 1.40, $p$ = .845. The effect size for this finding, Cramer's V, was weak, 0.0346.

## 1.4. Hypothesis 2: Fluency when most, not all, translations are the same (above 80% of coincidences)

Will, at least, fluent TSs coincide with those where not all, but just four out of five translators chose the same rendition? This section will examine this weak version of hypothesis 2. If the CNA hypothesis holds true for H2, the analysis should yield a larger number of fluent TSs. Again, an quintiles were used to identify when most translations were the same, that is, above 80% of coincidences. Table 32 reports the results of 80% coincidence in the Italian participants at the three translation tasks for H2. Most TSs were of medium fluency (62.1, 51.8, and 51%, respectively). Mid- fluency TSs accounted for 62.1% in Text A; 51.8%, in Text B; and 51% in Text C. There were very few disfluent TSs in all translation tasks (Text A, 11.7%; Text B, 15.6%; and Text C, 16.9%). Yet fluent TSs amounted roughly to one third of the cases in all translation tasks (26.1, 32.7, and 32.1%, respectively). A chi-square test of independence examined the relation between fluency levels and texts were most participants had the same translation for a given stretch and yielded a statistically significant relationship between the two variables, $X^2$ (4, $N$ = 823) = 10.1, $p$ = .040. However, the effect size for this finding, Cramer's V, was weak, 0.0781.

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **IT01** | 20 | 41 | 5 | 11 | 22 | 2 | 10 | 28 | 5 |
| **IT02** | 7 | 51 | 7 | 6 | 22 | 6 | 2 | 26 | 13 |
| **IT03** | 19 | 38 | 4 | 18 | 15 | 3 | 29 | 14 | 3 |
| **IT04** | 20 | 32 | 10 | 11 | 21 | 3 | 20 | 20 | 5 |
| **IT05** | 12 | 39 | 8 | 12 | 11 | 6 | 10 | 18 | 10 |
| **IT06** | 20 | 32 | 10 | 7 | 12 | 11 | 9 | 21 | 6 |
| **TOTAL** | 98 | 233 | 44 | 65 | 103 | 31 | 80 | 127 | 42 |
| % | 26.1 | 62.1 | 11.7 | 32.7 | 51.8 | 15.6 | 32.1 | 51.0 | 16.9 |
| MEAN | 16.333 | 38.833 | 7.333 | 10.833 | 17.167 | 5.167 | 13.333 | 21.167 | 7.000 |
| MEDIAN | 19.5 | 38.5 | 7.5 | 11 | 18 | 4.5 | 10 | 20.5 | 5.5 |
| SD | 5.538 | 7.026 | 2.503 | 4.262 | 5.115 | 3.312 | 9.585 | 5.154 | 3.742 |

**Table 32.** Results H2 (>80%), Italian group.

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **ES01** | 26 | 31 | 4 | 8 | 20 | 4 | 19 | 19 | 1 |
| **ES02** | 21 | 31 | 5 | 10 | 21 | 1 | 17 | 15 | 3 |
| **ES03** | 10 | 27 | 17 | 6 | 21 | 5 | 10 | 15 | 8 |
| **ES04** | 11 | 33 | 10 | 6 | 19 | 2 | - | - | - |
| **ES05** | 21 | 28 | 17 | 6 | 19 | 2 | 14 | 20 | 2 |
| **ES06** | - | - | - | - | - | - | - | - | - |
| **ES07** | 17 | 39 | 3 | 6 | 22 | 3 | 12 | 18 | 5 |
| **ES08** | 7 | 47 | 6 | 2 | 26 | 1 | - | - | - |
| **ES09** | - | - | - | 11 | 20 | 0 | - | - | - |
| **ES10** | 16 | 35 | 12 | 17 | 13 | 1 | 12 | 18 | 5 |
| **ES11** | 15 | 38 | 4 | 5 | 21 | 5 | 12 | 18 | 3 |
| **ES12** | 23 | 35 | 5 | 12 | 17 | 3 | 9 | 20 | 2 |
| **ES13** | 12 | 31 | 12 | 3 | 13 | 10 | - | - | - |
| **ES14** | - | - | - | 4 | 21 | 5 | - | - | - |
| **ES15** | 16 | 37 | 6 | 9 | 15 | 3 | 9 | 24 | 5 |
| **ES16** | - | - | - | - | - | - | 9 | 21 | 5 |
| **ES17** | 22 | 33 | 6 | 7 | 19 | 1 | 10 | 23 | 3 |
| **ES18** | - | - | - | 5 | 21 | 4 | 10 | 23 | 3 |
| **ES19** | 12 | 39 | 10 | 13 | 18 | 0 | 6 | 25 | 8 |
| **ES20** | 20 | 23 | 17 | 12 | 13 | 7 | - | - | - |
| **ES21** | 16 | 39 | 7 | 4 | 15 | 4 | 8 | 19 | 3 |
| **ES22** | 18 | 38 | 3 | 14 | 11 | 3 | 13 | 23 | 2 |
| **ES23** | - | - | - | 5 | 22 | 3 | - | - | - |
| **TOTAL** | 283 | 584 | 144 | 165 | 387 | 67 | 170 | 301 | 58 |
| % | 28.0 | 57.8 | 14.2 | 26.7 | 62.5 | 10.8 | 32.1 | 56.9 | 11.0 |
| MEAN | 16.647 | 34.353 | 8.471 | 7.857 | 18.429 | 3.190 | 11.333 | 20.067 | 3.867 |
| MEDIAN | 16 | 35 | 6 | 6 | 19 | 3 | 10 | 20 | 3 |
| SD | 5.147 | 5.700 | 4.951 | 4.028 | 3.815 | 2..100 | 3.416 | 3.081 | 2.100 |

**Table 33.** Results H2 (>80%), Spanish group.

Table 33 reports the results of the Spanish participants for the weak version of H2 in the three translation tasks. Once again, most TSs were of medium fluency (57.9, 62.5, and 56.9%, respectively). Disfluent TSs accounted for 14%, in Text A; 10.8%, in Text B; and 11%, in Text C. The share of fluent TSs was less than one third in all the translation tasks (28.1, 26.7, and 32.1%, respectively). A chi-square test of independence examined the relation between fluency levels and texts were most participants had the same translation for a given stretch and found a relationship between the two variables, $X^2$ (4, $N$ = 2159) = 10.1, $p$ = .039. However, the effect size for this finding, Cramer's V, was weak, 0.0468.

### 1.5. Hypothesis 1 and hypothesis 2, both groups together

Finally, two chi-square tests of independence were performed to examine the relation between the fluency levels and the two conditions presented in H1 and H2 (no coincidences or 100% coincidence), but grouping the data from both groups. The test for H1 found no relationship between the two variables, $X^2$ (10, $N$ = 322) = 11.5, $p$ = .317. The test for H2 also found no relationship between the two variables, $X^2$ (10, $N$ = 924) = 10.1, $p$ = .430.

## 2. Process-based hypotheses

Hypotheses 3 and 4 address the idea that pauses above a certain pre-defined threshold are indicators of difficulty as it is commonly assumed that pauses are indicators of problem solving. Research lines following this idea presuppose that the longer the pause, the greater the difficulty (Muñoz & Olalla-Soler 2022). Thus, pauses were classified into longer prior pauses and shorter prior pauses in order to determine whether the idea that the longer the pause, the greater the difficulty is true. Table 34 and 36 displays the results of the Italian participants in all translation tasks for H3. Table 34 shows the results for TS with longer prior pauses (corresponding to the upper quartile) and Table 36 shows the results for TS with shorter prior pauses (corresponding to the lower quartile).

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | dis-fluent |
| **IT01** | 20 | 7 | 8 | 14 | 9 | 2 | 9 | 10 | 5 |
| **IT02** | 14 | 7 | 12 | 11 | 5 | 13 | 8 | 8 | 10 |
| **IT03** | 25 | 10 | 6 | 24 | 2 | 4 | 23 | 11 | 5 |
| **IT04** | 21 | 3 | 10 | 27 | 5 | 1 | 21 | 10 | 5 |
| **IT05** | 14 | 6 | 8 | 14 | 12 | 7 | 15 | 5 | 12 |
| **IT06** | 15 | 7 | 9 | 9 | 5 | 6 | 15 | 3 | 8 |
| **TOTAL** | 109 | 40 | 53 | 99 | 38 | 33 | 91 | 47 | 45 |
| % | 54.0 | 19.8 | 26.2 | 58.2 | 22.4 | 19.4 | 49.7 | 25.7 | 24.6 |
| MEAN | 18.167 | 6.667 | 8.833 | 16.5 | 6.333 | 5.5 | 15.167 | 7.833 | 7.5 |
| MEDIAN | 17.5 | 7 | 8.5 | 14 | 5 | 5 | 15 | 9 | 6.5 |
| SD | 4.535 | 2.251 | 2.041 | 7.287 | 3.559 | 4.324 | 6.080 | 3.189 | 3.017 |

**Table 34.** TS after longer prior pauses, Italian group.

In all three texts, most TSs were fluent (54, 58.2, and 49.7%, respectively). Mid-fluency TSs amounted roughly to one fifth of the instances (19.8, 22.4, and 25.7%), while the shares of disfluent TSs were 26.2% in Text A; 19.4% in Text B and 24.6% in Text C.

Further analyses were performed to explore these hypotheses. Since data was not distributed normally, it was log transformed in order to decrease skew in the distribution. A Pearson's correlation coefficient was computed to assess the relationship between the prior pause and the typing speed (H4). There was no correlation between the two variables, r = .032, p = .457. A scatterplot (Figure 11) suggests there is no association between the prior pause and the typing speed.

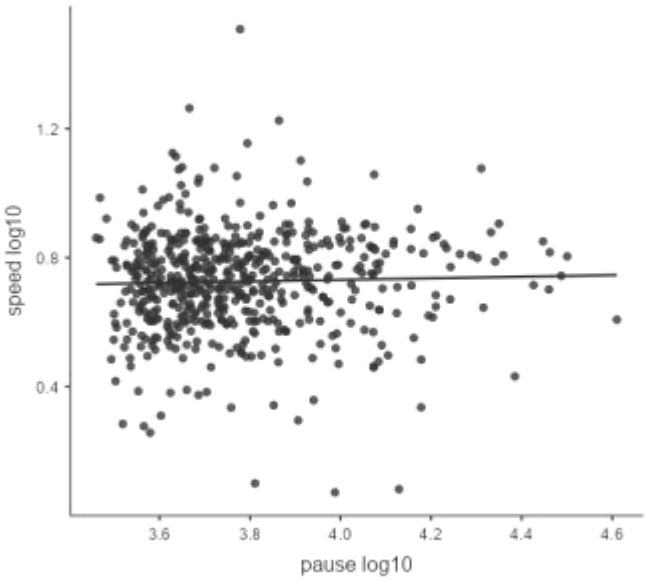



**Figure 11.** Scatterplot. Speed vs pause after longer pauses, Italian group.

A linear regression was performed to predict typing speed based on the prior pause. Table 35 shows the descriptives for the analysis. The results indicated that the prior pause explained 2.32% of the variation in the speed (R2 = .0232). The model shows that the prior pause was not significant to explain the speed (p = .775)

Descriptives

| | pause log10 | speed log10 |
|---|---|---|
| N | 557 | 556 |
| Missing | 0 | 1 |
| Mean | 3.78 | 0.726 |
| Median | 3.73 | 0.733 |
| Standard deviation | 0.203 | 0.156 |
| Minimum | 3.46 | 0.0719 |
| Maximum | 4.61 | 1.51 |

**Table 35.** Descriptives. Linear regression. Longer prior pauses, Italian group.

The texts were not significant either (B - A, p = 0.356; C - A, p = 0.786). The interaction between text and pause was also non significant either (pause* B - A, p = 0.359; pause*C - A, p = 0.664). Therefore, there is no effect in the dependent variable.

Model assumptions were checked. Cook's distance showed no outliers (max. value = 0.0652). Autocorrelation showed the values are independent (DW = 1.54, p < .001). Collinearity showed problems on text and pause*text interaction (pause VIF = 1.57, text VIF = 18.79, pause*text VIF = 18.82). However, since the model indicated that text is non significant, it has no effect on the results. Finally, residuals showed a normal distribution and homoscedasticity was present. To sum up, there is visible effect of the pause on the speed, meaning that prior pause and typing speed are independent. There is also no noticeable effect of texts on the speed.

A linear regression to predict the prior pause based on behavioral fluency indicated (H3) that behavioral fluency explained 1.9% of the variation in the prior pause (R2 = .0190). Fluency was non significant (disfluent - fluent, p = .137; mid-fluency - fluent, p = .877). The model also showed that the interaction between text and fluency was also non significant (text* disfluent-fluent, p = .794; text* mid-fluency-fluent; p = .999). There is no effect in the dependent variable.

Models assumptions were checked. Cook's distance showed no outliers (max. value = 0.0392). Autocorrelation showed that the values are independent (DW = 0.399, p < .001). Collinearity was normal (fluency VIF = 2.57; text VIF = 1.39; text*fluency VIF 2.67). Residuals showed a normal distribution and homoscedasticity was present.

| | Text A | | | Text B | | | Text C | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **IT01** | 27 | 8 | 0 | 16 | 8 | 1 | 12 | 5 | 7 |
| **IT02** | 13 | 7 | 13 | 8 | 9 | 12 | 11 | 5 | 10 |
| **IT03** | 30 | 9 | 2 | 22 | 4 | 4 | 23 | 9 | 7 |
| **IT04** | 14 | 13 | 7 | 24 | 4 | 5 | 20 | 7 | 10 |
| **IT05** | 9 | 10 | 9 | 17 | 5 | 11 | 14 | 9 | 9 |
| **IT06** | 10 | 9 | 12 | 9 | 5 | 8 | 7 | 11 | 9 |
| **TOTAL** | 103 (%) | 56 (%) | 43 (%) | 96 (%) | 35 (%) | 41 (%) | 87 (%) | 46 (%) | 52 (%) |
| % | 51.0 | 27.7 | 21.3 | 55.8 | 20.3 | 23.8 | 47.0 | 24.9 | 28.1 |
| MEAN | 17.167 | 9.333 | 7.167 | 16 | 5.833 | 6.833 | 14.5 | 7.667 | 8.667 |
| MEDIAN | 13.5 | 9 | 8 | 16.5 | 5 | 6.5 | 13 | 8 | 9 |
| SD | 9.020 | 2.066 | 5.269 | 6.542 | 2.137 | 4.262 | 5.958 | 2.422 | 1.366 |

**Table 36.** Descriptives. Linear regression. Longer prior pauses, Italian group.

In all three texts, most TSs were fluent. Fluent TS accounted for 51% in Text A, 55.8 in Text B and 47% in Text C. Mid-fluency TS corresponded roughly to one quarter of the data (27.7, 20.3 and 24.9%) and disfluent TSs in Text A, Text B and Text C accounted for a similar proportion of the data (21.3, 20.3 and 28.1%, respectively).

Further analyses were performed to test these hypotheses. Since data was not distributed normally, it was log transformed in order to decrease skew in the distribution. There was one data point identified as an outlier, since its value was higher than two times the standard deviation. The value of this outlier was changed by the median value of the dataset. A Pearson's correlation coefficient to assess the relationship between the prior pause and the typing speed (H4) showed a very weak negative correlation between the two variables, $r = -0.183$, $p < .001$. A scatterplot (Figure 12) also suggests the effect size is very small.

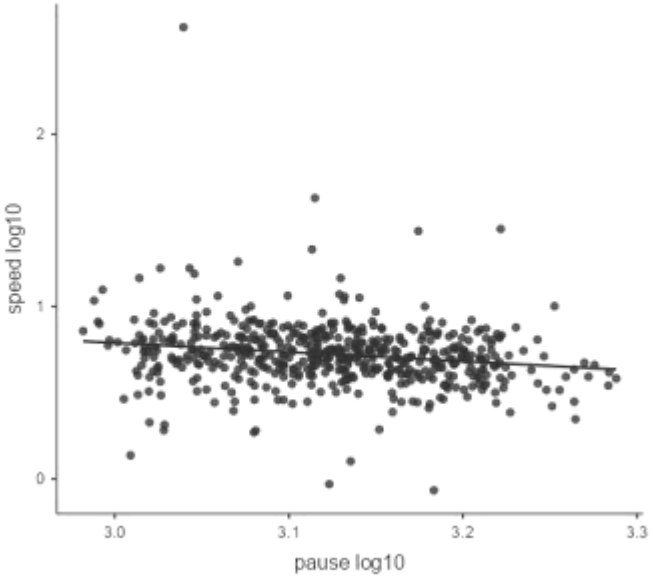



**Figure 12.** Scatterplot. Speed vs pause after shorter pauses, Italian group.

A linear regression to predict typing speed based on the prior pause indicates that the pause explains 4.75% of the variation in the speed (R2 = .0475). Table 37 shows the descriptives for the analysis.

Descriptives

| | pause log10 | speed log10 |
|---|---|---|
| N | 559 | 559 |
| Missing | 0 | 0 |
| Mean | 3.12 | 0.722 |
| Median | 3.13 | 0.715 |
| Standard deviation | 0.0642 | 0.187 |
| Minimum | 2.98 | -0.0669 |
| Maximum | 3.29 | 2.62 |

**Table 37.** Descriptives. Linear regression. Shorter prior pauses, Italian group.

The model showed that the prior pause was non significant (p = .333). The effect of the prior pause in Text B - A was significant for the speed (p = .006). Participants speed increased 2.6891 ms for each ms increased by the pause. This result is significant, but the effect is very small. The effect of the prior pause in Text C - A was non significant (p = .903). The interaction between pause and text as a predictor of speed was significant in pause* B - A (p = .007). The effect of the pause in Text B compared to Text A decreased in 0.8507 ms for each ms increased by the pause. This result is significant, but the effect is very small. The interaction between text and pause did not affect the speed in pause * C - A (p = .886). Therefore, the pause itself has no effect on speed but, when taking into account the effect of the pause comparing Text B with Text A, it slows downs the speed in 0.8509, that is, four times the average. This result is significant, but small. Generally, the pause does not have any effect on the speed.

Model assumptions were checked. Cook's distance showed no outliers (max. value = 0.232). Autocorrelation showed the values are independent (DW = 1.87, p = .1). Collinearity showed problems on text and pause*text interaction (pause VIF = 1.78, text VIF = 50.79, pause*text VIF = 50.90). This means that the estimation of the effect is likely to be smaller for the texts and for the interaction between pause and texts. Finally, residuals showed a normal distribution and homoscedasticity was present. The model meets the assumptions and indicates that typing speed and prior pause are independent. There is also no noticeable effect of the text on speed.

A linear regression to predict the prior pause based on behavioral fluency (H3). Table X shows the descriptives for the analysis indicated that the pause explained 6.22% of the variation in the speed (R2 = .0622). The model showed that fluency was non significant (disfluent - fluent, p = .373; mid fluency - fluent, p = .899). Text was significant (p <.001). The interaction between fluency and text was non significant (text*

disfluent - fluent, p = .994; text* mid fluency - fluent, p = .819). Therefore, behavioral fluency and the prior pause are independent.

Model assumptions were checked. Cook's distances showed no outliers (max. value = .0172). Auto-correlation showed that the values are independent (DW = 1.02, p <.001). Collinearity was normal (fluency VIF = 2.58; text VIF = 1.43; text*fluency VIF = 2.68). Residuals showed a normal distribution and homo-scedasticity was present.

Table 38 and 40 reports the general results of the three translation tasks for H3, corresponding to the group of Spain. Table 38 shows the general results for TS with longer prior pauses and Table 40 shows the general results for TS with shorter prior pauses.

| | **Text A** | | | **Text B** | | | **Text C** | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | dis-fluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **ES01** | 13 | 14 | 7 | 11 | 4 | 5 | 141 | 8 | 7 |
| **ES02** | 19 | 16 | 8 | 16 | 6 | 8 | 27 | 5 | 8 |
| **ES03** | 11 | 7 | 16 | 12 | 12 | 11 | 16 | 7 | 18 |
| **ES04** | 16 | 9 | 8 | 8 | 3 | 9 | - | - | - |
| **ES05** | 17 | 9 | 11 | 10 | 11 | 5 | 16 | 10 | 9 |
| **ES06** | - | - | - | - | - | - | - | - | - |
| **ES07** | 18 | 7 | 11 | 21 | 4 | 6 | 23 | 9 | 10 |
| **ES08** | 13 | 9 | 11 | 4 | 14 | 6 | - | - | - |
| **ES09** | - | - | - | 12 | 3 | 13 | - | - | - |
| **ES10** | 22 | 10 | 8 | 19 | 7 | 12 | 17 | 12 | 4 |
| **ES11** | 18 | 6 | 10 | 7 | 14 | 10 | 8 | 14 | 11 |
| **ES12** | 20 | 6 | 10 | 13 | 3 | 8 | 15 | 7 | 10 |
| **ES13** | 12 | 7 | 18 | 17 | 11 | 12 | - | - | - |
| **ES14** | - | - | - | 8 | 10 | 8 | - | - | - |
| **ES15** | 20 | 11 | 14 | 10 | 11 | 8 | 18 | 9 | 12 |
| **ES16** | - | - | - | - | - | - | 17 | 3 | 10 |
| **ES17** | 18 | 5 | 11 | 14 | 5 | 10 | 17 | 6 | 13 |
| **ES18** | - | - | - | 7 | 10 | 15 | 13 | 9 | 11 |
| **ES19** | 16 | 12 | 18 | 11 | 8 | 16 | 15 | 10 | 13 |
| **ES20** | 21 | 5 | 19 | 16 | 4 | 12 | - | - | - |
| **ES21** | 12 | 6 | 16 | 12 | 6 | 5 | 15 | 10 | 16 |
| **ES22** | 16 | 13 | 11 | 19 | 3 | 14 | 19 | 9 | 10 |
| **ES23** | - | - | - | 18 | 13 | 7 | - | - | - |
| **TOTAL** | 282 | 152 | 207 | 265 | 162 | 200 | 377 | 128 | 162 |
| % | 44.0 | 23.7 | 32.3 | 42.3 | 25.8 | 31.9 | 56.5 | 19.2 | 24.3 |
| MEAN | 16.588 | 8.941 | 12.176 | 12.619 | 7.714 | 9.524 | 25.133 | 8.533 | 10.8 |
| MEDIAN | 17 | 9 | 11 | 12 | 7 | 9 | 17 | 9 | 10 |
| SD | 3.392 | 3.307 | 3.893 | 4.610 | 3.951 | 3.371 | 32.333 | 2.722 | 3.427 |

**Table 38.** TS after longer prior pauses, Spanish group.

In all three texts, most TSs were fluent. Fluent TS accounted for 44% in Text A, 42.3 in Text B and 56.5 in Text C. Mid-fluency TSs corresponded roughly to one fifth of the data (23.7, 25.8 and 19.2%, respectively)

and disfluent TSs accounted for almost one third of the data (Text A, 32.3; Text B, 31.9; and Text C, 24.3%, respectively).

Further analyses were performed to test these hypotheses. Since data was not normally distributed, it was log transformed in order to decrease skew in the distribution. A Pearson's correlation coefficient was computed to assess the relationship between the prior pause and the typing speed. There was a very weak negative correlation between the two variables, r = -0.060, p = .011. A scatterplot (Figure 13) also suggests there is no relation between the variables.

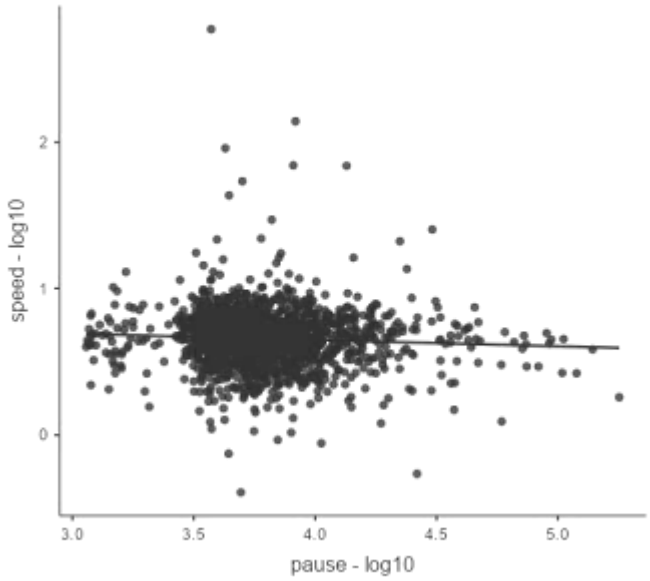



**Figure 13.** Scatterplot. Speed vs pause after longer pauses, Spanish group.

A linear regression to predict typing speed based on the prior pause (H4) indicated the pause explained 0.47% of the variation in the speed (R2 = .00475). Table 39 shows the descriptives for the analysis.

Descriptives

| | pause - log10 | speed - log10 |
|---|---|---|
| N | 1811 | 1811 |
| Missing | 0 | 0 |
| Mean | 3.79 | 0.658 |
| Median | 3.75 | 0.666 |
| SD | 0.270 | 0.193 |
| Minimum | 3.06 | -0.392 |
| Maximum | 5.25 | 2.77 |

**Table 39.** Descriptives. Linear regression. Longer prior pauses, Spanish group.

The model showed that the prior pause was non significant to explain the speed (p = .164). The texts were also non significant (B - A, p = 930; C - A, p = .886). The interaction between pause and texts as a predictor of speed was also non significant (pause* B - A, p = .956; pause* C - A, p = .842). Therefore, there is no visible effect in the dependent variable.

Model assumptions were checked. Cook's distance showed no outliers (max. value = 0.096). Autocorrelation showed that the values are independent (DW = 1.73, p < .001). Collinearity showed problems on text and pause*text interaction (pause VIF = 1.87, text VIF = 14.53, pause*text VIF = 14.47). Nevertheless, since the model indicated that text is non significant, it has no effect on the results. Finally, residuals showed a normal distribution and homoscedasticity was present. The models meets the assumptions and indicates that there is no relationship between the typing speed and the prior pause. Moreover, there is no effect of the texts on typing speed.

A linear regression to predict fluency level based on the prior pause (H3) indicated that the pause explained 0.15% of the variation in the speed (R2 = .00158). The model showed that prior pause and behavioral fluency are independent. The interaction between pause and behavioral fluency was also non significant (disfluent - fluent, p =.666; mid fluency - fluent, p = .969, mid-fluency - fluent, p = .831). Therefore, there is no visible effect in the dependent variable.

Model assumptions were checked. Cook's distance showed no outliers (max. value = 0.105). Autocorrelation showed the values are independent (DW = 0.297, p < .001). Collinearity was between normal ranges (VIF = 1.00). Residuals showed a normal distribution and homoscedasticity was present. The models meets the assumptions, so there is no relationship between the prior pause and behavioral fluency.

| | **Text A** | | | **Text B** | | | **Text C** | | |
|---|---|---|---|---|---|---|---|---|---|
| | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent | fluent | mid-fluent | disfluent |
| **ES01** | 18 | 13 | 3 | 9 | 7 | 4 | 18 | 6 | 5 |
| **ES02** | 22 | 9 | 12 | 11 | 9 | 10 | 17 | 11 | 12 |
| **ES03** | 9 | 4 | 21 | 7 | 7 | 21 | 13 | 6 | 22 |
| **ES04** | 7 | 11 | 15 | 7 | 5 | 11 | - | - | - |
| **ES05** | 8 | 13 | 16 | 13 | 8 | 5 | 15 | 7 | 13 |
| **ES06** | - | - | - | - | - | - | - | - | - |
| **ES07** | 16 | 11 | 9 | 14 | 7 | 10 | 17 | 13 | 12 |
| **ES08** | 15 | 5 | 13 | 8 | 9 | 7 | - | - | - |
| **ES09** | - | - | - | 20 | 6 | 2 | - | - | - |
| **ES10** | 18 | 12 | 10 | 27 | 5 | 6 | 14 | 11 | 8 |
| **ES11** | 17 | 7 | 10 | 11 | 14 | 6 | 15 | 9 | 9 |
| **ES12** | 19 | 7 | 10 | 11 | 8 | 5 | 16 | 7 | 9 |
| **ES13** | 11 | 11 | 15 | 11 | 12 | 17 | - | - | - |
| **ES14** | - | - | - | 7 | 7 | 12 | - | - | - |
| **ES15** | 20 | 7 | 18 | 14 | 10 | 5 | - | - | - |
| **ES16** | - | - | - | - | - | - | 16 | 9 | 5 |
| **ES17** | 12 | 8 | 14 | 14 | 5 | 10 | 15 | 6 | 15 |
| **ES18** | - | - | - | 10 | 10 | 12 | 15 | 6 | 12 |
| **ES19** | 19 | 8 | 19 | 20 | 9 | 6 | 11 | 9 | 18 |
| **ES20** | 17 | 11 | 17 | 19 | 7 | 6 | - | - | - |
| **ES21** | 13 | 8 | 13 | 12 | 6 | 5 | 15 | 9 | 17 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| **ES22** | 20 | 11 | 9 | 16 | 8 | 12 | 20 | 8 | 10 |
| **ES23** | - | - | - | 12 | 12 | 14 | - | - | - |
| **TOTAL** | 261 | 156 | 224 | 273 | 171 | 186 | 217 | 117 | 167 |
| % | 40.7 | 24.3 | 34.9 | 43.3 | 27.1 | 29.5 | 43.3 | 23.4 | 33.3 |
| MEAN | 15.353 | 9.176 | 13.176 | 13 | 8.143 | 8.857 | 15.5 | 8.357 | 11.929 |
| MEDIAN | 17 | 9 | 13 | 12 | 8 | 7 | 15 | 8,5 | 12 |
| SD | 4,568 | 2,698 | 4,461 | 5,089 | 2,435 | 4,715 | 2,175 | 2,205 | 4,859 |

**Table 40.** TS after shorter prior pauses, Spanish group.

In all three texts, most TSs were fluent. Fluent TS accounted for 40.7 in Text A, 43.3 in Text B and 43.3% in Text C. Mid-fluency TSs corresponded roughly to one quarter of the data (24.3, 27.1 and 23.4%, respectively) and disfluent TSs accounted for roughly one third of the data (Text A, 34.9%; Text B, 29.5% and Text C, 33.3%).

Further analyses were performed to test these hypotheses. Since data was not normally distributed, it was log transformed in order to decrease skew in the distribution. A Pearson's correlation coefficient was computed to assess the relationship between the prior pause and the typing speed (H4). There was a very weak negative correlation between the two variables, r = -0.048, p = .041. A scatterplot (Figure 14) also suggests there is no relation between the variables.

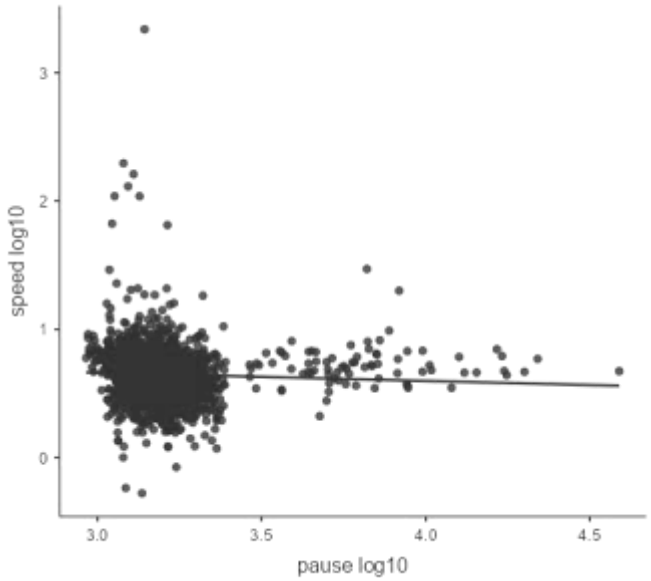



**Figure 14**. Scatterplot. Speed vs pause after shorter pauses, Spanish group.

A linear regression to predict typing speed based on the prior pause indicated the pause explained 0.42% of the variation in the speed (R2 = .00418). Table 41 shows the descriptives for the analysis.

Descriptives

| | speed log10 | pause log10 |
|---|---|---|
| N | 1809 | 1811 |
| Missing | 2 | 0 |
| Mean | 3.20 | 0.648 |
| Median | 3.18 | 0.650 |
| SD | 0.159 | 0.211 |
| Minimum | 2.97 | -0.278 |
| Maximum | 4.59 | 3.34 |

**Table 41**. Descriptives. Linear regression. Shorter prior pauses, Spanish group.

The model showed that the prior pause was significant to explain the speed ($p < .001$). Participant speed decreased 0.6413 ms for each ms increased by the pause. The effect, however, is very small. When comparing Text B to Text A the result was also significant ($p = < .001$). Here, participant speed decreases 2.1761 ms for each ms increased by the pause. Again, the effect is small. Text C - A was non significant ($p = .729$). The interaction between pause and text as a predictor of speed was significant for pause* B - A ($p = < .001$). The effect of the pause in Text B, compared to Text A, increases the speed in 0.6865 ms for each ms increased by the pause. Once again, the effect is very small. Compared to Text A, in Text C there is no interaction between the text and pause in the speed ($p = .707$). To sum up, there is no visible effect in the dependent variable.

Model assumptions were checked. Cook's distance showed no outliers (max. value = 0.0599). Autocorrelation showed the values are independent ($DW = 1.65$, $p < .001$). Collinearity showed problems on text and pause*text interaction (pause VIF = 3.67, text VIF = 31.91, pause*text VIF = 32.20). This means that the estimation of the effect is likely to be smaller for the texts and for the interaction between pause and text. Finally, residuals showed a normal distribution and homoscedasticity was present. The model meets the assumptions and indicates that typing speed and prior pause are independent. Generally, there is no noticeable effect of the text on speed, meaning that texts do not influence typing speed.

A linear regression to predict fluency level based on the prior pause (H3) indicated that the pause explained 0.17% of the variation in the speed ($R2 = .00175$). Behavioral fluency was non significant (disfluent - fluent, $p = .350$; mid fluency - fluent, $p = .382$) and also the text was non significant ($p = .365$). The model showed that the interaction between Behavioral fluency and text to predict the prior pause was also non significant (text* disfluent - fluent; $p = .591$; text* mid fluency - fluent, $p = .708$).Therefore, there is no visible effect on the dependent variable.

Model assumptions were checked. Cook's distance showed no outliers (max. value = 0.0285). Autocorrelation showed the values are independent ($DW = 0.279$, $p < .001$). Collinearity was normal (fluency

VIF = 1.00; text VIF = 1.55; text*fluency VIF = 2.73). Residuals showed a normal distribution and homoscedasticity was present. The model meets the assumptions and indicates that the prior pause and behavioral fluency are independent.

## 3. Supplementary analysis

In the post-task questionnaire (see Appendix B), there were several questions related to difficulty, organized in an 8-point Likert scale. Participants had to rate how difficult the translation was for each text and which feature of the text they found more difficult in a scale from 1 (very easy) to 8 (very difficult). They also had to rate their satisfaction with their TTs and the enjoyment of the task from 1 to 8. Table 42 shows the general results, divided by groups.

| | group | difficulty | satisfaction | enjoyment | lack knowledge | ST writing | specific words | long sentences |
|---|---|---|---|---|---|---|---|---|
| N | es | 66 | 66 | 66 | 66 | 66 | 66 | 66 |
| | it | 18 | 18 | 18 | 18 | 18 | 18 | 18 |
| Missing | es | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | it | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Mean | es | 5.62 | 5.50 | 5.35 | 4.71 | 4.94 | 5.47 | 5.00 |
| | it | 5.11 | 5.50 | 6.11 | 3.67 | 3.44 | 5.11 | 3.22 |
| Median | es | 6.00 | 6.00 | 6.00 | 4.50 | 5.00 | 5.50 | 5.00 |
| | it | 5.00 | 6.00 | 7.00 | 3.00 | 3.50 | 5.50 | 3.00 |
| Standard deviation | es | 1.51 | 1.47 | 2.06 | 2.15 | 2.04 | 1.74 | 1.65 |
| | it | 1.75 | 1.42 | 1.81 | 2.40 | 1.79 | 1.97 | 1.35 |
| Minimum | es | 2 | 1 | 1 | 1 | 1 | 1 | 2 |
| | it | 3 | 3 | 2 | 1 | 1 | 2 | 2 |
| Maximum | es | 8 | 8 | 8 | 8 | 8 | 8 | 8 |
| | it | 8 | 7 | 8 | 8 | 6 | 8 | 6 |

**Table 42.** General results of the post-task questionnaire

The Italian group (N = 6) rated Text A with an average of 4.2 (min. 3, max. 6, SD 1.2). Text B was also rated 4.2 (mix. 3, max. 6, SD 1.3). Text C was rated 7 (min. 6, max. 8, SD 0.8). Even though Text C was regarded as the most difficult text, two participants chose Text B as the most difficult, while four participants chose Text B as the most difficult. On the other hand, five participants answered that Text A was the easiest one, while one replied it was Text B.

Participants were also asked whether they were satisfied with their translation products. Their TTs were rated 6.3 (min. 6, max. 7, SD 0.5) for Text A, 7 (min. 3, max. 7, SD 1.5) for Text B and 4.5 (mix. 3, max.

7, SD 1.5) for Text C. Their enjoyment of the translation task was rated 7.3 (mix. 7, max. 8, SD 0.5) for Text A, 6.3 (min. 4, max. 8, SD 1.4) for Text B and 4.7 (min. 2, max. 8, SD 2.2) for Text C.

Participants were asked for several aspects of the translation that may represent a difficulty for them. Lack of background knowledge obtained 1.5 (min. 1, max. 2, SD 0.5) in Text A; 3 (mix. 1, max. 5, SD 1.4) in Text B and 6.5 (min. 5, max. 8, SD 1.2) in Text C. The writing of the ST obtained 2.7 in Text A, 2.2 in Text B and 5.5 in Text C. Specific words obtained 4 in Text A, 4.5 in Text B and 6.8 in Text C. Long sentences obtained 2.7 in Text A, 2.5 in Text B and 4.5 in Text C. Finally, most participants stated that the basic translation unit they focused was the sentence (3; 50%) while two mentioned the phrase (33.3%) and one above sentence (16.6%).

In the Spanish group, 22 out of 23 students answered the post-task questionnaire. They rated Text A with an average of 4.6 (min. 2, max. 6, SD 1.3). Text B was rated 5.5 (min. 3, max. 7, SD 1.4). Text C was rated 6.8 (min. 5, max. 8, SD 0.9). When asked which text was the easiest one, fifteen participants chose Text A; five, Text B; and two, Text C. When asked which text was the most difficult one, sixteen participants said Text C and six participants chose Text B.

Regarding the satisfaction with their translations, their TTs were rated 5.9 (min. 3, max. 8, SD 1.2) for Text A, 5.5 (min. 3, max. 7, SD 1.4) for Text B, and 5 (min. 5, max. 8, SD 0.9) for Text C. Their enjoyment of the translation tasks was rated 6.9 (min. 5, max. 8, SD 1.1) for Text A, 5.2 (min. 1, max. 8, SD 1.7) for Text B, and 4 (min. 1, max. 7, SD 2.1) for Text C.

Regarding the different aspects that may represent a difficulty for them, lack of background knowledge obtained 3.4 (min. 1, max. 8, SD 1.7) for Text A, 3.9 (min. 1, max. 6, SD 1.7) for Text B and 6.8 (min. 4, max. 8, SD 1.3) for Text C. The writing of the ST obtained 4 (min. 1, max. 8, SD 1.7) for Text A, 5.4 (min. 2, max. 8, SD 2.1) for Text B, and 5.4 (min. 2, max. 8, SD 1.7) for Text C. Specific words obtained 4.4 (min. 3, max. 6, SD 1.1) for Text A, 5 (min. 1, max. 8, SD 1.7) for Text B, and 7 (min. 4, max. 8, SD 1.2) for Text C. Long sentences obtained 4.4 (min. 3, max. 7, SD 1.3) for Text A, 4.9 (min. 2, max. 7, SD 1.6) for Text B and 5.7 (min. 2, max. 8, SD 1.8) for Text C. Finally, most participants stated that the basic translation unit they focused was the sentence (15, 68.1%). Four participants mentioned the phrase (18.1%), two the text (9.0% ) and one above sentence (4.5%).

A multinomial logistic regression was performed to create a model of the relationship between perceived difficulty and the covariates satisfaction, enjoyment, lack of knowledge, ST writing, specific words and long sentences with text and group as factors. The fit between the model containing only the intercept and data improved with the addition of the predictor variables $X^2$ (9, $N$ = 84) = 80.277, $p$ = < .001., McFaddens' $R^2$ = .269, p = < .001. As shown in Table 43, significant unique contributions were made only by long sentences (p = .008), meaning that a one-point increase in the perception of long sentences as the cause of difficulty increases 1.634 times the perception of difficulty.

| | Esti-mate | Std. Error | Wald | df | Sig. | Odds ratio | 95% Confidence Interval | |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | Lower Bound | Upper Bound |
| satisfaction | 0.136 | 0.221 | 0.379 | 1 | 0.538 | 1.1457 | -0.298 | 0.570 |
| enjoyment | -0.304 | 0.197 | 2.377 | 1 | 0.123 | 0.7379 | -0.691 | 0.082 |
| lackknowledge | 0.293 | 0.196 | 2.238 | 1 | 0.135 | 1.3404 | -0.091 | 0.677 |
| STwriting | 0.022 | 0.163 | 0.018 | 1 | 0.894 | 1.0222 | -0.297 | 0.341 |
| specificwords | 0.248 | 0.185 | 1.799 | 1 | 0.180 | 1.2815 | -0.115 | 0.611 |
| longsentences | 0.491 | 0.188 | 6.817 | 1 | 0.009 | 1.6340 | 0.122 | 0.860 |
| [group=ES] | -.747 | 0.591 | 1.594 | 1 | 0.207 | 0.4738 | -1.906 | 0.412 |
| [group=IT] | 0[a] | . | . | 0 | . | - | . | . |
| [text=A] | -1.603 | 0.897 | 3.194 | 1 | 0.074 | 0.2013 | -3.361 | 0.155 |
| [text=B] | -1.285 | 0.762 | 2.846 | 1 | 0.092 | 0.2767 | -2.778 | 0.208 |
| [text=C] | 0[a] | . | . | 0 | . | - | . | . |

a. This parameter is set to zero because it is redundant.

**Table 43**. Parameters estimates of the post-task questionnaire.

# DISCUSSION

## Summary of findings

The aim of this study was to investigate whether the CNA hypothesis was correct by determining whether it can measure difficulty. CNA hypothesis' underlying assumption is that the number of renderings for a given stretch is a good indicator of difficulty. However, data showed no evidence in favor of the CNA hypothesis. In fact, there emerged a very different picture from what the CNA hypothesis posed. In the next sections, results are interpreted with reference to the literature.

## 1. Hypothesis 1: There is no positive correlation between a different number of renditions by all participants and a high level of difficulty of a text excerpt

The first hypothesis examined the relationship between relatively large numbers of renditions and high difficulty. If the CNA hypothesis were true, we should find mostly behaviorally disfluent TSs, since they are deemed to be indicators of difficulty. Before, we did not take into account the cases of zero coincidence in the Spanish subsample because there were only two cases, in only one text. The analysis yielded a higher proportion of mid-fluent TSs in both subsamples, followed by disfluent, and then fluent TSs. In all texts, groups, and conditions behavioral fluency tended to be medium, not low, when offering different renditions for a given ST stretch. Although most TSs were mid-fluent, there was some variation in the fluency of these TSs, meaning that translators experienced different levels of difficulty when translating those stretches. The statistical analysis showed no correlation between the behavioral disfluency and large(r) numbers of renditions by all participants in any of the three texts. This evidence confirms that there is no positive relationship between the number of renditions and ST difficulty.

## 2. Hypothesis 2: There is no positive correlation between a single rendition by all participants and a low level of difficulty of a text excerpt

The second hypothesis focused on the opposite pole, the relationship between a single rendition and low difficulty. If the CNA hypothesis were true, the logs should show mostly fluent TSs, since they are related to less difficulty. The analysis showed a higher proportion of mid-fluent TSs in both groups, followed by fluent and disfluent TSs. Translators' fluency when offering the same rendition for a given ST stretch tended to be medium, not low, in all texts. Although most TSs were mid-fluent, there was some variation in their fluency, meaning that, as in H1, translators experienced different levels of difficulty when translating those stretches. The statistical analysis yielded no correlation between optimal behavioral fluency and instances of a single rendition by all participants in all three texts. This evidence confirms that there is no positive relationship between a single rendition by all participants and low ST difficulty.

## 3. Summary for H1 and H2

In summary, constantly, one out of two subjects had mid-fluent behaviors, whether they all or most of them chose the same translation, but also when whether all or most of them chose a different translation. Furthermore, there was no correlation between the levels of behavioral fluency—computed as the existence or the absence in the TSs of different kinds of fluency phenomena—and number of options, both for H1 and H2. This evidence leads us to conclude that the CNA hypothesis is not able to measure difficulty. Nevertheless, in H1 there were larger shares of disfluent TSs than of fluent TSs and in H2 there were higher proportions of fluent TSs than disfluent TSs. Although this observation did not reach statistical significance, it may have given researchers a sense of intuition regarding a potential correlation between the number of options and difficulty.

## 4. Hypothesis 3 and Hypothesis 4: There is no positive correlation between pauses and behavioral fluency; There is no positive correlation between pauses and typing speed

The third and fourth hypotheses addressed the assumption that pauses are an indicator of difficulty. Whereas we found no relationship between the number of options and difficulty, we might still assume that pauses are indicators of difficulty. Traditional translation process research tends to be in line with the CNA hypothesis, as they often assumes that pause length is an indicator of difficulty, so that the longer the pause, the higher the difficulty. The rationale would be the increasingly contested assumption that translators use pauses to only or mainly solve problems—that is, that the process of choosing among translation options occurs (only) during a pause. If that was the case, we could have expected to find only fluent task segments after a *pause,* understood as in the TSF, what TPR researchers would call *long(er) [prior] pauses*. We should have also found less fluent task segments in shorter previous pauses compared to longer previous pauses. The analysis showed that fluent TSs were more frequent both after shorter and longer pauses (that is, after *shorter long prior pauses* and *longer long prior pauses*) in both subsamples, ranging between 40–58% of the TSs. Both groups had almost 1/4 of mid-fluent TSs. As for disfluent TSs, in the Spanish group they were nearly one third, while in the Italian group they only reached one fourth. However, the statistical analysis showed no correlation between pauses and behavioral fluency of the TSs. Furthermore, there was also no correlation between pauses and typing speed. Thus, the length of a pause is independent of the typing speed and fluency of the TS following that pause. As in the case of H1 and H2, there was a statistically non-significant tendency that might have fostered intuitions, but in this case, there was a lot more variation, especially in the Spanish group. And the fact that there were many disfluent TSs after longer and shorter previous pauses, means that they experienced difficulties, probably during the production phase. The picture that emerges after this discussion is that this constitutive assumption of the CNA is very simplistic, at best. The translation process seems to have many interrelated processes, and not all of them take place at the same

time. It seems that the ideas underpinning the CNA are too narrowly focused on working memory, but fail to consider its interaction with the long-term memory, since decisions taken, prior solutions, influence what comes next.

The assumption that the longer the pause, the greater the difficulty arises mainly from two sources. First, it was formulated in Butterworth's pause paradigm (1980, 156): "The more the delays [...] the more cognitive operations are required by the output" . This assumption was later criticized and reformulated by Schilperoord (2002), who suggested that longer pauses reflect cognitive processes that are relatively more effortful compared to those reflected by shorter pauses. However, TS fluency levels were quite varied within one and the same solution, which suggests that subjects experienced different levels of difficulty for the same ST stretch. Hale & Campbell (2002) proposed to distinguish between *options* and *alternatives,* and in so doing they acknowledged that the number of options available to an individual does not equal the number of renditions in the sample, but a number of researchers have ignored this important twist in their framework. On the other hand, Ketola (2016) argues that an inherent limitation of product-based studies investigating the cognitive processing during translation is that they are not able to access the reasons behind the translation solutions. She states that is safe to ask "how much we may really infer of a translator's cognitive processing simply by examining the results of this processing" (93). O'Brien (2006a, 166) also addresses this problem when she underscores that the number of options will vary depending on the number of the participants of the study. Finally, the number of options may also vary depending on how the text is chunked and the choices made in prior task segments.

## 5. Questionnaire

Text C, the instructive text about a medicine, was perceived to be the most difficult one and also deemed the most difficult text to translate by most informants in both groups. Nevertheless, in both groups some participants perceived Text B to be the most difficult one. Interestingly, no evidence of this was found in the logs: the behavioral fluency levels were similar in all three texts. This suggests that there might be a difference between perceived vs actual difficulty. We will retake this thread below, in the section *Difficulty and laboriousness.* The only indicator they seem to unequivocally hint that Text C was the most difficult one to translate is that many students did not finish their translations. The Spanish group bestowed a score of *translation difficulty* for Text B higher than that of the Italian group (5.5 vs. 4.2). *Enjoyment* seemed to correlate to *ease of translation* and therefore it negatively correlated to *translation difficulty*. However, the statistical analysis yielded a non-significant correlation between difficulty and enjoyment. *Translation difficulty* only correlated to *lack of knowledge about the subject* they were translating.

In the open questions of the questionnaires, participants were able to point out which parts of the texts were the most difficult for them. They could point out words, phrases, sentences, whatever they wanted. This question was added to see whether the informants found the same parts of the texts difficult. However, there were not many coincidences among informants in the Spanish group. 6 out of 22 participants pointed out that a difficult word to translate was "actuator", and 5 out of 20 found the following stretches particularly difficult:

Dissertations Upon the Apparitions of Angels, Daemons, and Ghosts, and Concerning the Vampires of Hungary, Bohemia, Moravia, and Silesia, was published in 1746.

Primary hypogonadism (congenital or acquired): testicular failure due to conditions such as cryptorchidism, bilateral torsion, orchitis, vanishing testis syndrome, orchiectomy, Klinefelter's syndrome, chemotherapy, or toxic damage from alcohol or heavy metals. These men usually have low serum testosterone concentrations and gonadotropins (follicle-stimulating hormone [FSH], luteinizing hormone [LH]) above the normal range.

In the Italian group, 3 out of 6 participants mentioned stretches containing the phrase *resolve the disconnect* in Text A, while they mentioned *nuance and texture in a story* in Text B. Finally, in Text C, 5 out of 6 informants mentioned stretches containing *pump* and 3 out of 6, stretches containing *actuator.* Let us here remind the reader that the Spanish group was four times larger than the Italian group, so this might explain this difference. Finally, informants' responses were divided into two parts of each text (1 and 2), to see whether they found more difficult stretches during the first (shared) or the second (on their own) translation sessions (see Table 44).

| | Italy | | Spain | | Total | |
|---|---|---|---|---|---|---|
| Text | Part 1 | Part 2 | Part 1 | Part 2 | Part 1 | Part 2 |
| A | 10 | 4 | 20 | 10 | 30 | 14 |
| B | 12 | 4 | 16 | 14 | 28 | 18 |
| C | 13 | 8 | 16 | 9 | 29 | 17 |

**Table 44**. Difficult stretches in Parts 1 or 2 of the texts, as reported by the participants.

Informants tended to find more difficult text stretches from the first translation session that corresponds to the first part of the texts. This was the case in all three texts and in both groups. This interesting and unexpected finding is in line with Muñoz & Martín (2018) suggestion that the orientational phase in the translation process goes well beyond the first keypress, in contrast to previous contention by Jakobsen (2002). Due to the way in which the texts were divided for the translation tasks, we can only be sure that the orientational phase may happen in the first 400-500 words of a text, so further research should be done in this line.

## 6. Further discussion

The CNA hypothesis posited that the more translation options a group of translations display for the same ST stretches, the higher the difficulty of those text stretches for each translator in the sample and perhaps beyond, and vice versa. This hypothesis is crucially based on the assumption that all translation options in the texts were equally available for translators at the time of creating or choosing their own rendering. In other words, the CNA assumes a correlation between many options and difficulty because translators take time to decide between these options, and a single option by all translators will be easier because translators

did not have to choose or even decide about it. The evidence in this project suggests that the idea that the sum of translation options found in the TTs (and only those?) are always available to all members of a sample is too simplistic, at best.

The data in this research project showed a completely different picture. The difficulty when translating text stretches corresponding to many and few translation options was not as the CNA hypothesis had predicted. Both when facing large palettes of renderings and when coinciding in a single one translators displayed a tendency to engage in mid-fluent behavior. Furthermore, some translators experienced different levels of difficulty when facing ST stretches with both few and many translation options. That is, there is also variation in the difficulty levels experienced by translators, highlighting the importance of local circumstances and individual differences when facing the task. The fact that most TSs were mid-fluent depicts an activity where its very nature and the coordination of several alternating subtasks entails moderate cognitive demands that the approach through behavioral fluency make quite plain. Instances of fluent TSs possibly coincide with which Jakobsen (2005) called *instances of peak performance.*

We also explored the idea that different renditions are available in principle to all the subjects and that larger processing efforts are required from each individual to make a choice from larger numbers of renditions. The CNA is a product-based theory, but several processual applications drawing from it assume that version choices occur during long pauses. Despite the task segments after longer and shorter pauses were mostly fluent, there was no correlation between pauses and behavioral fluency. Interestingly, the proportion among the different fluency levels in R2 was more evenly matched than in H1 and H2, especially in the Spanish group, highlighting individual differences when facing the task and in the strategic allocation of resources when at task.

The analysis also showed no link between pause length and typing speed, nor between pause length and behavioral fluency. We need to conclude that pauses are not only related to solving problems or to selecting options. There thus corroborate that there must be other processes going on during a pause as several authors had already stated (Foulin 1995, Schilperoord 2002 Englund Dimitrova 2005; Dragsted & Hansen 2008; Olive, Alves & Castro 2009; Angelone 2010; Dragsted 2012; Kumpulainen 2015; Kruger 2016, Angelone & Marín 2022, Muñoz & Apfelthaler 2022). The informants had problems while typing the text, which suggests that problem-solving and decision-making activities also take place during writing.

Traditionally, pauses were assumed to flag cognitive effort in mentally taxing processes, and different thresholds were used for that. However, "a pause may signify both problem-free and problematic processing" (Kumpulainen 2015, 48) and many long pauses are devoted to activities that require cognitive resources assigned to typing, which suggests that (long) pauses tend to be intentional and thus are technically not part of typing (Muñoz & Olalla-Soler 2022, 13). On the other hand, Lacruz & Muñoz (2014) and Lacruz & Shreve (2014) point out that clusters of pauses (respites in the TSF) as short as 500 ms may hint at higher cognitive efforts.

Furthermore, choice networks depend on the translation products, which means that they will vary depending on the number of participants in the study. O'Brien (2006a, 116) mentioned that when working with CNA if the group is small, then other renditions are possible. Also, it is possible for one hundred translators to produce one hundred different renditions of the same source sentence. Our data showed that, in

fact, when you have more participants, more renditions of the same segments are possible. In addition, we also observed that the more participants you have in a group, the more they tend to coincide in their translations. That was the reason why the Spanish group in H1 had almost no cases without coincidences. This may be because translation is a constrained activity: the number of ways to express something is finite, especially because translators are constrained by the ST. CNA does not take into account previous choices made by the translator: while constructing a translation, the translator has to fit in every new stretch into the text already built.

To summarize our results, the CNA hypothesis was not able to measure difficulty, so it should not be used in this regard. Under the light of our results, the CNA hypothesis was built as a mystifying notion based on some statistically insignificant tendencies, but it proves to be unable to describe the difficulty of a text, or stretches thereof. It is an empirical question worthy of trying whether it can be applied in translator training as a way to foster metacognitive awareness.

# CONCLUSIONS

This dissertation explored CNA's main hypothesis that the more translation options (a group of) translators have to render a given source text stretch, the higher the difficulty of that text stretch will be. The study was designed to be as much ecologically valid as possible and involved keylogging three translation tasks to analyze whether the CNA was able to measure difficulty. The results indicate that there was no correlation between both different renditions and a single rendition by all translators and difficulty, operationalized in terms of behavioral fluency. Additionally, no correlation was found between pauses and the two variables behavioral fluency and typing speed. Based on these findings and the theoretical discussion, we conclude that CNA is not a reliable measure of text difficulty.

In the following section, we present additional evidence that emerged from the data that challenges key elements of the CNA while also drawing connections to current literature.

## 1. Text and difficulty

### 1.1. *Text as product*

Ketola (2016) argued that an inherent limitation of all product-based studies investigating cognitive processing during translation is that they are not able to access the reasons behind the translation solutions. Here, H1 and H2 found no relationship between difficulty and the number of options. Furthermore, there was a lot of variation in TS behavioral fluency levels for the same stretches of the ST. This suggests that source texts might not be good indicators of translation difficulty, but just indicators of potential complexity (Hvelplund 2011), which may or not result in difficulties for a given translator.

In my data, many ST stretches were translated in the same manner by all translators. However, some of these renderings were uneventfully typed in on the first try while other participants arrived at the very same renderings after revising their first draft, as seen in Table 45. Translators translated the word *hair* in the stretch "*that vampires' hair and fingernails continued to*" in the same way, but their processes were very different. Based on CNA's product approach, those translations would have been deemed equally easy, but that was not the case.

| Sub | TS# | pause | TS content |
|---|---|---|---|
| **IT01** | TS125 | 2064 | il•_fatto_che_•4•i_capelli_e_le_un••ghie•_dei_c•v☒ 2vampiri_ |
| | | | continuavano_a_☒ d_allungarsi_•anche_dopo_la_morte._ |
| | TS235 | 1547 | ◌•4•\|[1800:1808] capelli\|••p\|[1800:1808] p\|eli_◌⇳2••⊙••◌• |
| | | | \|[528:535] Capelli\|P\|[528:535] P\|eli⇳3•4•◌ |
| **IT02** | TS118 | 1801 | →2•☒ ☒ re••0•4•☒ •4•→••_che_•4•i_capellie_2☒ 3_e_le_l☒ unghie_ |
| | | | dei_vampiri_con•tinuavano_a_crescere_anche_dopo_la_morte._ |
| | TS144 | 1531 | ◌2\|[499:506] Capelli\|P\|[499:506] P\|eli,_capelli•3•◌ |
| **IT03** | TS134 | 3778 | i_capelli_e_le_unghie_dei_vampiri_continuavano_a_crescere_ |
| | | | p•☒ anche_dopo_la_morte.•_ |
| | TS174 | 2313 | ⊙2\|[2003:2011] peluria\|b\|[2003:2011] b\|arba•◌_◌⊙2 |
| | | | \|[1968:1976] capelli\|p\|[1968:1976] p\|eli••_•⇳⊙2 |
| | | | \|[492:500] Capelli\|P\|[492:500] P\|eli••_ |
| **IT05** | TS190 | 3884 | i_capelli_e_le_unh☒ f☒ ghie_delle_mani_•3•dei_c☒ vampiri_continuassero_ |
| | | | ad_allungars•☒ 2☒ 9_crs☒ escere_anche_in_seguio☒ to_ |
| | | | alla_morte_dell•'indii☒ viduo._ |
| | TS206 | 3110 | ⇳•⊙2\|[1679:1687] capelli\|p\|[1679:1687] p\|eli_•◌ |
| **IT06** | TS131 | 1501 | s\|[1726:1728] s\|ottolinea_anche_come_le_••☒ ☒ 2u_c☒ 4_i_capelli_e_ |
| | | | le_unghie_del☒ i••_vampiri_•3•conti•nuassero_a_crescere•_ |
| | TS158 | 1170 | Ⓒ + ←4 Ⓒ +Ⓢ Ⓒ +Ⓢ+→\|[1747:1755] capelli\|p |
| | | | \|[1747:1755] p\|eli_••↓3•↓•Ⓐ +‖↹‖Ⓐ +→\|ST\|Ⓐ +‖↹‖ |
| | | | \|TT\|•peli,_soprattutto_la_barbetta_sul_mento•3• |
| | | | Ⓒ +← Ⓒ+←5•_più_lunghi Ⓒ+→6•._ |

**Table 45**. Translation of *hair* by the Italian participants.

All Italian translators opted first for *capelli,* but then all but one changed it for *peli*. That is, most translators changed their minds after translating it—maybe after reading the next sentence or better understanding what was meant. The reason for these changes in translating *hair* may be that Italian distinguishes human head hair *(capelli)* from body hair *(peli).* The product, however, the only data CNA draws on, shows something a straightforward coincidence while the process shows that it was not.

Furthermore, the quality of the products can be used as an indirect indicator of translators' expertise. Experts, so the general assumption is, are capable to produce results that are better than those by laypeople, and often do so with lower efforts (or with lower efforts in automated tasks that lead them to reinvest freed resources into other aspects of the task, leading to that superior performance). However, the effort invested is not necessarily related to quality. For instance, many novice translators will not exert more efforts because

they do not identify a problem experts have and think their renderings are fine. Conversely, the translation of an expert and a student can be of the same quality, but for one of them it was more difficult to reach that result. Technically, given enough time, a monkey might type what for us would be a perfect translation of *Hamlet* (cf. Borel 1913), indistinguishable from that of an outstanding expert. What the monkey theorem points, in this situation, is that translation products and their features are not reliable indicators of the translation process nor of the difficulties (and laboriousness) experienced by the humans who performed them.

## 1.2. *Text segmentation*

Text segmentation in the CNA is problematic because Campbell and Hale never stipulated clearly how to segment the text. They only mentioned a couple of rules and left it to the research needs, for they claimed their approach was atheoretical (Campbell 2000a, 38). Yet when creating the choice networks, the same data may yield very different results depending on how you chunk the text flow, posing serious issues on generalizability, reproducibility and replicability of CNA studies. This problem was mentioned by O'Brien (2006a) and Pavlović (2007).

This dissertation used the phrase as the minimal unit of analysis for creating the networks, because single word networks would make the CNA collapse into the mental lexicon (Muñoz, personal communication). I also decided to favor the number of renditions over segment length. That is, in cases where a part of a chunk with an x number of coincidences could be split into minor chunks with higher numbers of agreement or variation, the higher numbers of coincidences or different renditions were favored over a scarcer coincidence over a longer text stretch. Examples 1–3 illustrate the complexity of creating the choice networks. Since the aim is only to exemplify the problems, only examples of the smaller Italian group are discussed in this point.

(1) ST **After death, the skin dehydrates**

| | | |
|---|---|---|
| A | *Dopo la morte* (6/6) | *la pelle si disidrata* (6/6) |
| B | *Dopo la morte, la pelle si disidrata* (5/6) | *Dopo la morte, infatti, la pelle si disidrata (1/5)* |

(2) ST **and my homemade almond sugar free biscuits**

| | | | | |
|---|---|---|---|---|
| A | *e i miei biscotti* (5/6) | *fatti in casa* (6/6) | *alle mandorle* (5/6) | *senza zucchero* (6/6) |
| B | *e i miei biscotti* (5/6) | *alle mandorle senza zucchero* (4/6) | | *fatti in casa* (6/6) |

(3) ST **vampires' hair and fingernails**

| | | | |
|---|---|---|---|
| A | *i peli* (5/6) | *e le unghie* (6/6) | *dei vampiri* (6/6) |
| B | *i peli e le unghie* (5/6) | | *dei vampiri* (6/6) |
| B | i peli (5/6) | *e le unghie dei vampiri* (5/6) | |

Example 1 is very straightforward. The text stretch was segmented in two ways. Option A results into two segments with a coincidence of 100%. Option B yields a longer segment with a coincidence higher than 80%,

but not 100%. Although both segmentations appear to be nearly identical, they were segmented in this fashion because one participant decided to add an *infatti* (in fact) between *dopo la morte* and *la pelle si disidrata*. Thus, the first option was chosen because it met our criteria.

Example 2 also shows two different ways to segment the text stretch. Option A yields four segments with a coincidence between 100% and above 80%. Option B results into three segments, leaving the longer segment as a divergent rendering, and therefore out of the analysis. The reason why option A had more segments with higher coincidences was that translators played with the order of the segments. They all started with *e i miei biscotti*—except for one that used *e i miei biscottini*—and then diverged in the order of the segments. Option 1 was chosen for our analysis because it met our criteria to produce more units for the analysis.

Example 3 shows three diverse ways to segment the text stretch. Option A divided it into three segments with a coincidence between 100 and above 80%. Options B and C divided it into two segments with a coincidence between 100 and above 80% but segmenting it differently. In this case Option A was chosen since it met our criteria. Other researchers might have decided differently, but we cannot know, since the rules to break down the text flow are seldom mentioned.

Examples 1–3 illustrate cases where small identical stretches may be split or combined in different ways and orders but, when is a translation the same as another one? Only when it is identical in lexical choice, morphology, word order? CNA and CNA-based approaches seem to contend that only equal translations are same translations. This can be seen when they are creating choice networks or quantifying translation choices, since only the options that are word-by-word the same are regarded as same translation. However, this is far from clear.

(4) ST **Place the right finger** [...]

| | |
|---|---|
| *Posizionare l'indice destro* [...] | IT01, IT03, IT05 |
| *Posizionare il dito indice destro* [...] | IT02, IT04 |
| *Posizionare il dito indice della mano destra* [...] | IT06 |

Example 4 shows the Italian translations of the stretch *Place the right finger* [...]: These translations are not only referentially the same. Their variation do not seem to add any supplementary meaning, nuance or value, so that it would be difficult to see them as anything but one and the same translation. Since there are many ways to express the same, several formulations may be equally acceptable as the translation of a text.

The Spanish group provides an interesting additional example (5). When translating the expression *[...] a long period of time [...]*

(5) ST **[...] a long period of time**

| | | | |
|---|---|---|---|
| A | *un largo periodo* | + | *de tiempo* |
| B | *un periodo largo* | + | *de tiempo* |
| C | *un gran periodo* | + | *de tiempo* |
| D | *un periodo* | + | *de tiempo largo* |

Most informants translated this stretch as *un largo periodo + de tiempo,* although there were other alternatives such as *un periodo largo + de tiempo, un gran periodo + de tiempo* or *un periodo + de tiempo largo.* In the end, just the stretch *de tiempo* classified to be part of the analysis. According to the CNA hypothesis, this should have been an easy translation because most of the participants choose to translate it as *de tiempo*. However, translating *period of time* as *periodo de tiempo* in Spanish is redundant, because the notion of time is much more strongly embedded in *periodo* that it is in its English typical equivalent (see table 44) and professionals typically translate the stretch as just *un largo periodo*.

1: the completion of a cycle, a series of events, or a single action : *conclusion*
2 a 1: an utterance from one full stop to another : *sentence*
2: a well-proportioned sentence of several clauses
3: *periodic sentence*
b: a musical structure or melodic section usually composed of two or more contrasting or complementary phrases and ending with a cadence
3 a: the full pause with which the utterance of a sentence closes
b: *end, stop*
4: obsolete *goal, purpose*
5 a 1: a point . used to mark the end (as of a declarative sentence or an abbreviation)
5 2—used interjectionally to emphasize the finality of the preceding statement I don't remember—period
b: a rhythmical unit in Greek verse composed of a series of two or more cola
6 a: a portion of time determined by some recurring phenomenon
b 1: the interval of time required for a cyclic motion or phenomenon to complete a cycle and begin to repeat itself
2: a number *k* that does not change the value of a *periodic* function *f* when added to the independent variable especially : the smallest such number
c: a single cyclic occurrence of menstruation
7 a: a chronological division: *stage*
b: a division of geologic time longer than an epoch and included in an era
c: a stage of culture having a definable place in time and space
8 a: one of the divisions of the academic day
b: one of the divisions of the playing time of a game

1. m. Tiempo que algo tarda en volver al estado o posición que tenía al principio.
2. m. Espacio de tiempo que incluye toda la duración de algo.
3. m. Menstruo de las mujeres y de las hembras de ciertos animales.
4. m. Ciclo de tiempo. Período juliano, de Metón.
5. m. Fís. Tiempo que tarda un fenómeno periódico en recorrer todas sus fases, como el que emplea un péndulo en su movimiento de vaivén, la Tierra en su movimiento alrededor del Sol, etc.
6. m. Gram. Estructura oracional, generalmente bimembre, formada por una oración principal y una subordinada. U. más refiriéndose a las construcciones condicionales y concesivas.
7. m. Mat. Cifra o grupo de cifras que se repiten indefinidamente, después del cociente entero, en las divisiones inexactas.
8. m. Med. Tiempo que duran ciertos fenómenos que se observan en el curso de las enfermedades.

**Table 46**. Entries for period and período in the Merriam Webster's and the Diccionario de la Real Academia

This also raises the following question regarding the CNA application: if one translator in the sample mistranslates a stretch, will it be assumed that all the translators in the sample contemplated using the mistranslation when faced with the need of mentally choosing between the options as found in the TTs? If they are supposed not to have done it, does this mistranslation still count as an option? Indeed, what happens when most translators mistranslate a segment? Example 6 and 7 shows the most common translation options among participants of the Spanish and the Italian group for the stretch *An alternative testosterone replacement therapy* [...].

(6) ST **An alternative testosterone replacement therapy [...]**
A *una terapia de reemplazo de testosterona alternativa*
B *una terapia alternativa de reemplazo de testosterona*

Most Spanish participants (7; 46%) opted to translate that stretch as in Option A and only 2 (13%) opted for Option B. The rest of the participants opted for something in between A and B such as *una terapia alternativa de reemplazamiento de testosterona* or *una terapia sustitutiva de testosterona alternativa*. If we analyze it stretch by stretch, 10 participants (67%) opted for *de testosterona alternativa*. This is a mistranslation, since alternative is modifying *therapy* and not *testosterone*. However, most Spanish participants chose a mistranslation.

(7) ST **An alternative testosterone replacement therapy [...]**
A *una terapia sostitutiva con testosterone alternativa*
B *una terapia sostitutiva di testosterone.*
C *una terapia della sostituzione del testosterone differente.*

The situation is similar for the Italian group. Four participants (67%) opted for Option A, one for option B and one for Option C. In this case, all participant mistranslated this text stretch. We can certainly affirm that this was a problematic text stretch, but according to CNA, it should not have been particularly difficult to translate since most translators chose the same translation.

## 2. Behavioral fluency: Time and difficulty

### 2.1. *Pauses*

Translation process research traditionally associated *long pauses* (variously defined) with problems, intrinsic ST difficulty, and higher cognitive efforts. Hypothesis 3 and 4 showed that the idea that *the longer the pause, the higher the difficulty* is not correct. Behavioral fluency tended to be high both after long and short pauses and the statistical analyses yielded no relationship between pauses and typing speed and other indicators of behavioral fluency, hinting that pauses are indicators of mostly other processes that are not related to difficulty, as a host of authors remarked for decades (e.g., Englund Dimitrova 2005; Dragsted & Hansen 2008; Olive, Alves & Castro 2009; Angelone 2010; Dragsted 2012; Kumpulainen 2015; Kruger 2016). Though eyetracking is needed to determine accurately these processes, in the TSF pauses just point the stretches

where translators recruit back the cognitive resources they devoted to typing to devote them to several subtasks and combinations thereof, such as reading long stretches of text, planning, assessing, monitoring and, of course, solving problems and making decisions about the translation task. Furthermore, pauses may also work as a strategy or mechanism to regulate cognitive effort. Angelone & Marín (2022), for instance, suggest that pauses longer than 10 seconds may also indicate instances of cognitive suspension, breaks used as a refreshing mechanism by translators when performance has waned or runs the risk of doing so.

It stands to reason that typists will know (even if intuitively) what they are going to type before they do. Since many times it seems obvious that they run out of what to say, that is, that they brought their prior microplan to completion, many pauses occur when a translator reads a ST stretch and then plans what to do next. Pauses may thus sometimes be an indicator of problem-solving behavior, but they are at least equally as likely to be an indicator many other processes such as planning, reading, revising and decision-making behaviors (Muñoz & Olalla-Soler 2022). In any case, in my data many text excerpts within task segments broke off smoothly before finishing a phrase—an unnatural place to stop—or even abruptly, before a word was typed to its end, hinting that difficult stretches were experienced by translators while typing, i.e., that translators also notice or realize and solve problems when translating and not only during pauses.

Thus, interpretation of pauses should be totally different (cf. Muñoz & Apfelthaler 2022). Pauses are an active part of the translation process where several unregistered activities may take place, an activity, but we still do not know which ones. We will probably not know by using keylogging alone, which underscores the importance of combining different measurements in our research. However, keylogging has been underused and probably misused, in that texts were too short, informant too few, and phenomena worthy of were severely narrowed down and not always selected on the basis of explicit criteria.

## 2.2. *Respites*

CTIS research traditionally associated pauses with difficulty. In contrast, Lacruz & Shreve (2014) suggested that clusters of pauses down to 500 ms long may hint at higher cognitive efforts. The Task Segment Framework contends that respites (•) are better indicators of production difficulties, for they flag attentional changes and disturbances in the writing flow. Even though this was not the goal of this project, data shows that typos and deletions are often accompanied by respites. Table 47 shows the first two deletions of participants ES01, ES02, ES03 and ES04, and the first two deletion of participants IT01, IT02, IT03 and IT04.

| **Sub** | TS# | Pause | TS contents |
|---|---|---|---|
| **ES01** | TS007 | 2859 | e••xhumaron_el_ci⌧uerpo_ |
| | TS011 | 4012 | ,_incluso_las_uñas_•h•3•abian_⌧4◊7·ian_crecido•. |
| **ES02** | TS004 | 5015 | ⓁAⓁl_sospecha_⌧r_so_bre⌧ 4bre_•vampirismo••,_•3•l•os_vecinos_del_pueblo_•3•e•xhumaron_ |
| | TS006 | 2891 | ⓁLⓁlo_⌧3o_encontra•ron_intacto |

| | | | |
|---|---|---|---|
| **ES03** | TS002 | 2625 | ◌ ••Ⓒ⇳Ⓒ24⇳Ⓒ112⇳•3•◌⇳••◌•4•⊙ⓁSⓁosp•echandoq☒_que_eran☒ ••_l☒algo_relativo_☒34ⓁSⓁ☒•Ⓛ |
| | TS004 | 2848 | ◊7·on_empe•zo☒18os_algo☒2deanos_ eme☒pezaron_a_sospechar_qe_☒ 2ue_eran_sucesos_☒_relacionados_con_el_vampo•☒irismo,_por_lo_qu_e ☒2e_exhumaron_el_cuerpo_de_ⓁPⓁaole_Ⓛ☒._ |
| **ES04** | TS006 | 1784 | ._••lo_•☒☒2ⓁLⓁo_n☒enc•3•2⊙\|OW\| |
| | TS008 | 1736 | ontrarn•☒on_•5•intacto |
| **IT01** | TS003 | 5765 | Con_il_sospetto_di_vampiriso☒mo,_ |
| | TS006 | 2350 | _•e_•4•persino_le_unghi_☒e_••si_erano_allungate._ |
| **IT02** | TS001 | Start | \|TT\|⊙•4•◌•4⇳◌•6⇳⊙•4•Sospettando_si_trattasse_di_vampirismo•,_i☒ gli_abitantid☒_del_vi••lla•gg•3•io_esumarono_il_corpo_di_Paole•._ Lo_tro- van☒rono_inta•tto |
| | TS003 | 1594 | 2⊙‖TB‖2[–]•3•an••\|TT\|⊙anche_le_unghie_erano_crescitue☒4ute☒ 3iute.•4•_ |
| **IT03** | TS010 | 3367 | L'interno_della_•bara_era_coe☒perto_da_sangue_ |
| | TS051 | 2135 | _•pareva_essere_la_pro•va_che_una_persona_morta_fosse_un_ ba☒2vampito☒2ro.•3•_ |
| **IT04** | TS004 | 1933 | Ⓛ••CⓁon_il_sospe••tto_di☒2si_☒3che_si_tra☒26ⓁSⓁs☒osps••☒•et- tando_che_si_trattasse_di_un_caso_di_vampirismo,_•i |
| | TS005 | 4576 | ☒2‖TB‖⊙\|WS\|2⊙wordreference¶\|WS\| |
| | TS013 | 1100 | ‖TB‖⊙\|TT\|◌‖TB‖⊙\|ST\|◌‖TB‖\|TT\|⊙☒•,_gli_abitanti_del |

**Table 47**. Respites and deletions in participants ES01 to ES04 and IT01 to IT04.

In line with Lacruz & Shreve's (2014) observation and with the tenets of the TSF, in most cases, deletions and typos are surrounded by respites. Thus, behavioral fluency, which is not necessarily linguistic, seems to be a more adequate framework to study difficulty and the translation process. Traditional approaches in CTIS are overly influenced by the study of language, which is fundamental, but does not exhaust the possibilities and needs for the study of translation. In translation—as in many forms of human communication, for that matter— many semiotic codes are simultaneously involved. Translator interact directly or indirectly with many parties during the translation process, and all those interactions affect the way the translator behaves and produces the text.

## 3. CNA's options and expertise

In Campbell and Hale's CNA hypothesis, the translator's control and steering of her own cognitive resources (in a way, her free will) is out of the picture. However, translation routines become entrenched with increasing repetition and, once entrenched, these routines are activated more quickly and with less effort, and are therefore more likely to be repeated.

The ease or difficulty to translate certain ST stretches seems to be highly individual, though frequency, repetition and saliency, together with implicit social norms, personal preference and corrective feeedback, certainly contribute to the ways translations are processed and would explain why translators tend to translate certain stretches in the same manner, particularly multi-word chunks. This is in line with the construct of default translation (Halverson 2019, 188), understood as a particular phase of translation production where translators demonstrate stretches of uninterrupted production that are easy and fast. Default translation seems to offer a much better account for the variation in TS fluency in our data, as it adds other sources for facilitatory effects other than physical resemblance in both shape and order (literal translation, as in Schaffer & Carl 2014). Spotting default translations is also easy, since they are assumed to come in behaviorally fluent task segments. Pickering & Garrot (2004, 218) state that entrenchment, as a repetition-conditioned cognitive process, can only become effective if the traces of processing events "survive", making deliberate translation practice a key process to consolidate these entrenched routines. It is probably more likely to find more similar translation renderings in advanced translation students than in novices and professionals alike, since advanced translation students conform more homogeneous groups, thanks to years-long similar task exposure, conditioning, and corrective feedback (De Rooze 2003) proned to choose similar translations.

Default translation is, however, a part of something bigger. Some translators arrive at certain solutions with difficulty, while those solutions are the default translation for others. Learning to translate is a process of socialization in the field of public communications, which requires reading and expression experience oriented to the community, the addressees of the translation. Translations are done a particular way because the translator thought it was the best way to reformulate for a particular addressee or group of addressees. Translators' entrenched routines take into account how people express themselves and understand others, making those routines feedbacked experience. Communicating is adaptive and contextual.

## 4. Difficulty and effort

### 4.1. *Primacy of mid-fluent task segments in H1 and H2*

People generally try to avoid high cognitive efforts when possible (Kurzban 2016). However, the informants in this study tended systematically to have a higher share of mid-fluent task segments both when they coincided with many other translators in the sample and when they chose an original solution. This is quite new: mid-fluency might actually be a constant through the task, with instances of fluent and disfluent TSs interspersed and alternating through the translation. This could mean that there is a basic, intermediate level of cognitive effort when translating, which alternates with instances of greater and lesser effort. That is, so-called *automatic translation* in the Monitor Model (Tirkkonen-Condit 2005) would not be always effortless.

Rather, both problem solving (here associated to behaviorally disfluent task segments) and instances of peak performance (as one of the possible results of maximal fluency) would appear to be exceptional cases.

The prevalence of mid-fluent task segments could be due to the cognitive demands of translation tasks, which are generally assumed to be inherently high. In this view, translators try to maintain their cognitive resources not to a minimum, but at an appropriate level to successfully bring the task to completion—that is, translators try to keep cognitive effort constant at an intermediate, manageable level when at task. This probably leads to cost-benefit analyses aimed at optimizing cognitive resource allocation (Kurzban et al. 2013; Shenhav et al. 2017; Kool & Botvinick 2018). Under this light, cost-benefit analysis is very similar to Levý's minimax strategy, that is, translators resolve for the possible path that promises a maximum effect with a minimum effort.

Some frameworks in cognitive translation & interpreting studies seem to envision the minimax strategy as aimed at always seeking the lowest effort possible in all circumstances. Often, they assume that translation is a problem-solving activity combined with a decision-making activity of consciously choosing between a palette of solutions at hand, very often facilitated or even primed by their shapes. However, cognitive effort plays a decisive role when trying to obtain rewards, thus making the process important of weighting effort against gains and benefits of other less effortful alternatives (Kool & Botvinick 2014). Recent studies show that there seem to be limits to effort avoidance (Wu et al. 2022) and that people can learn to positively value effort and demanding tasks in the absence of extrinsic reward (Clay et al. 2022).

The minimax strategy can also be understood in terms of *human* efficiency and effectiveness. A minimax strategy for the translation process might not be seeking zero effort, but the level at which the translator is comfortable and better able to successfully carry out the task to its end. Thus, it may be related to expertise. As experience accumulates, translators learn how to regulate and organize their behaviors more efficiently, thanks to accumulated practice and the entrenchment of accepted translation solutions. This understanding of the minimax strategy, which takes into account that behavioral repertoires develop over time, that translators accumulate relevant, feedbacked solutions, and that translators learn how to interact more efficiently with tools and their working environment is a possible explanation of our findings, and a more realistic way to approach to the translation process in that it does assume that translators do have memory of prior failures and successful renderings. Indeed, within the TSF the proportion of fluent vs disfluent TSs has been suggested as an indicator of expertise in translators.[4] More research should be done in this regard, especially with experts, since students are still developing their behavioral repertoire.

### 4.2. *Difficulty and laboriousness*

The results from the questionnaire showed that translators found Text C to be the most difficult of all three. However, no evidence was found in the behavioral data confirming that for them it was actually more difficult to translate it. We would like to contend that when translators assess the difficulty of a text, they may

[4] Muñoz. Unpublished keynote in Beijing, 2017: *Tracking down attention and metacognition in the translation process.*

be referring to two different things or combinations thereof. Namely, they may be referring (1) to the estimation of their capacity to carry out the task with their available cognitive resources and skills (knowledge, routines expertise, etc.); or (2) to the quantity of work/time required to be invested to carry out a task that they feel able to carry out with their available cognitive resources. In other words, the literature on translation difficulty may have conflated the self-assessment on one's own capacities to perform a task (difficulty proper) and the quantity of effort and time needed to invest in a task they are certain they can do (laboriousness). For instance, translating a simple chemistry text may entail finding the appropriate terms, which are often both quite univocal and easy to find. If we are not familiar with the sources and the terminology, we will take longer. Perhaps as long as translating a much shorter famous poem where rhythm and rhyme are important. The chemical text would be laborious. The poem would be difficult proper. Yet they would probably yield similar objective indicators and the informants may not have been aware of such distinction.

This distinction runs vaguely in parallel to distinction between translation problem and difficulty (Nord 1997, 59-67). In her view, translation problems are person-independent and objective, while translation difficulties are subjective and individual. This distinction does not fit in our views, for there can be no such thing as translation's transcendental problems (see Muñoz & Olalla-Soler 2022, 6-9), but Nord seems to have grasped this difference between difficult and work-intensive/time-consuming. More research is needed into this difference between difficulty and laboriousness.

### 4.3. *Caveats and further research*

The first and most obvious consequence of this study is that the CNA hypothesis should no longer be used to measure difficulty. The idea that the quantity of translation options is an indicator of difficulty should be discarded. This impacts some frameworks in CTIS that still assume that difficulty can be measured by analyzing different and similar translations of the same ST (e.g., translation entropy, Carl & Schaeffer 2017, or Vanroy et al. 2019). This study shows that CNA cannot measure difficulty, and that difficulty is individual and unstable, transitory phenomenon. The reader should be reminded, anyway, there the study had several caveats, out of which two are particularly important.

The first caveat of the study is related to the way behavioral fluency levels were measured. Currently we still do not know the weights of each parameter—typing speed, typos, respites, mono task segment—and if they are due the same causes. So we just noted them down as to the existence of such parameters. Hence, a task segment with a fluency level of 5 does not mean the it has a degree of fluency 5, but rather that it has all 5 considered fluency indicators. This approach was good enough to distinguish fluent from mid-fluent and disfluent task segments, but more work needs to be done in this respect. Mid fluency, in this first attempt, is anything that is not totally fluent or totally disfluent, but there is probably a large terrain to map to determine the relationship between this behavioral fluency criteria.

Another caveat of this work is related to the sample of the study. We had 29 participants, but there were two groups, very different in terms of experience (one group was of MA students while the other of BA students) and number (6 vs 23). Of course, having the same quantity of participants in the groups is desirable, but the goal here was not to compare groups but rather to check whether the same phenomena existed

in both of them. It would have been better to include a group of professional translators in the study, since their behaviors may be different from translation students, but, again, this project's aim was to study phenomena across subjects with different profiles, not to compare ill-defined groups such as those of professionals, or students. In the case of professionals, professional routines are more likely to be entrenched than in students thanks to their accumulated experience, and hence they might have been less informative. This creates new research avenues by enabling comparisons between groups with varying characteristics following a setup such as the one presented in this dissertation. The present study used the task segment framework and behavioral fluency to investigate the CNA hypothesis. We classified TSs into fluent, mid-fluent and disfluent, and most TSs in H1 and H2 were mid-fluent. It would be interesting to examine in more detail the nature of mid-fluent TSs, since right now we only know that they are something in between disfluent and fluent TSs. It would be also of interest to investigate the proportion of fluent vs disfluent TSs, as it has been suggested they might be an indicator of expertise in translators within the TSF.

Jensen (2009) distinguished between text difficulty and text complexity. Comparing the results of the post-task questionnaire to the behavioral fluency levels, we discovered that there might be a difference between perceived difficulty vs actual difficulty when translators are assessing the difficulty of a text, that is to say, the self-assessment of our own capacities to perform a task (difficulty proper) vs the quantity of effort needed to invest in a task they are certain they can do (laboriousness). It would worthwhile to further research into this difference as it may have pedagogical and research implications

Jakobsen (2002) posited that the orientational phase in the translation process ends with the first keypress. Muñoz & Martín (2018) suggested that the orientational phase goes well beyond the first keypress. We found that most participants found more difficult stretches in the first translation session compared to the second translation session, which would suggest that the first part of the texts (approx. 400 words) served as an orientational phase. It would be interesting to determine the approximate duration of the orientational phase as it may have consequences related to the text length used for research purposes.

Finally, it would be interesting to investigate the didactical applications of the CNA as a way to present translation variation to students in order to foster metacognitive activities in the classroom. However, constructing choice networks is a very time-consuming process, which may be detrimental for its application in a translation class.

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# APPENDIX A. NOTATION CODES OF THE TSF

### Text

regular TT text, black

text typed elsewhere, green (e.g., on a search engine) (RGB= 0, 128, 0)

text added on TT but not RMP (right-most point), dark blue (e.g., pasted) (RGB= 0, 0, 255)

text deleted on TT but not RMP, red (RGB= 200, 0, 0)

### Behavioral codes

mouse clicks and scrolls, orange (RGB= 255, 100, 0)

cursor movements, grey (RGB = 128, 128, 128)

supporting keypresses (modifier keys, dead keys), purple (RGB= 200, 100, 255)

HCI, PC and app management and use, dark blue

change of active app (of focus)

changes in text produced thus far

respites (RGB= 50, 150, 250)

### typing (all texts colors possible)

| | | |
|---|---|---|
| _ | 23bd | space |
| ¶ | 00b6 | return |

## mouse actions

⇳ scroll

⊙ LEFT click

⊜ double click

⊗ RIGHT click

⊖ MIDDLE click

⊛ X Click (special clicks)

## mouse & cursor movements

mouse movement

↑ up

↓ down

→ right

← left

⇥ end of line

⇤ beginning of line

⇆ prior

⇉ next

⇈ PageUp

⇊ PageDown

## text typing support (modifier and dead keys on TT)

| | |
|---|---|
| | left control |
| ▪ | right control |
| | left alt |
| ▪ | right alt |
| | left shift (uppercase) |
| ▪ | right shift (uppercase) |
| | caps lock |
| | num pad lock |
| | italics |
| | bold |
| ␣ | no separation space |
| ⍟ | symbol code |
| ⏎ | insert symbol |
| ◊7· | OEM_7 (here, accent) |
| LCTRL + ◊102· | OEM_102 (here, quotation marks) |
| ◊***· | The most common OEMs are 1, 2, 3, 7. Replace the asterisks with the appropriate number. Careful! OEMs are used for different things in different keyboard layouts |
| ⌘ | Windows key |

## HCI (PC and app management)

‖TB‖ taskbar active

‖↹‖ tab

‖j‖ justify

‖j‖ justify

‖a‖ select all

‖e‖ escape

‖vm‖ volume mute

‖vu‖

‖vd‖

‖↻‖ repeate

‖pc‖ computer or app adjustment

‖F1‖ F1 key (usually on desktop computers)

‖F2‖ F2 key (and so on)

## change of active app (of focus)

|ST| source text active

≡TT≡ target text active

≡DS≡ different screen active

≡OS≡ other sources (DropBox, external hard drive)

≡3T≡ third texts (any other)

≡WP≡ word processor adjustments etc

≡WB≡ web browser, but no action

≡AP≡ use or other application

≡FE≡ file explorer and navigation

≡NS≡ new web browser screen

**changes in text produced thus far**

✓ auto-correction

delete to the left

⌦ delete right on spot

find all (English)

find all (Spanish)

undo

paste

copy

cut

⇔##:... highlight in segment ##

⇔##:...>ø highlight and delete in segment ##

⇔##:...>... highlight and replace in segment ##

>ST##:... go back to task segment ## and enter ...

insert

## 2.8. respites

- 2202 LT to 200 ms respite
- •• 201 ms to 400 ms respite
- •3• 401 ms to 600 ms respite
- •4• 201 ms to 800 ms respite
- •5• 801 to 1000 ms respite, and so on

# APPENDIX B. MATERIALS

As a translation student, you have been invited to participate in this research project carried out by César González (cesarandres.gonzale2@unibo.it), a PhD student at the MC2 Lab of the University of Bologna, Italy, about translation. Please read this guide through its end before you start.

Your contribution consists of translating 3 texts, each of them 800-1000 words long.

You need to do it in six one-hour sessions, in three consecutive weeks.

Each text will be split into two halves.

You cannot work on two different texts on the same week.

You may do the second half of one text in the same day, provided there are at least three hours between both sessions.

You cannot let more than three days go between the translation of the first half, and the translation of the second half of one text.

You do NOT need to finish the text, translate at your regular pace. If you do not finish translating the first part in, say, 65-70 minutes, don't worry, just leave it. In the second sessions, just start with the second half of the text.

In sum, you will have to translate each text in two one-hour sessions. After you translate the texts, you will be given a questionnaire to fill out.

| | **Week 1 (day 1)** | **Week 2 (day 8)** | **Week 3 (day 15)** |
|---|---|---|---|
| Translate | text 1, first half | text 2, first half | text 3, first half |
| Take a long break* | | | |
| Translate | text 1, second half | text 2, second half | text 3, second half |
| Fill out | questionnaire 1 | questionnaire 2 | questionnaire 3 |

* For instance, you can translate the first half in the morning and the second one, in the evening

You will need to install a program and put it on during all sessions, for the whole session.

The program is Inputlog, a research keylogger. Please note that keyloggers are usually spy programs and many antiviruses will identify Inputlog as such and block it. If you have some problems when installing it, make sure that it is entered as an exception in antivirus and firewall programs.

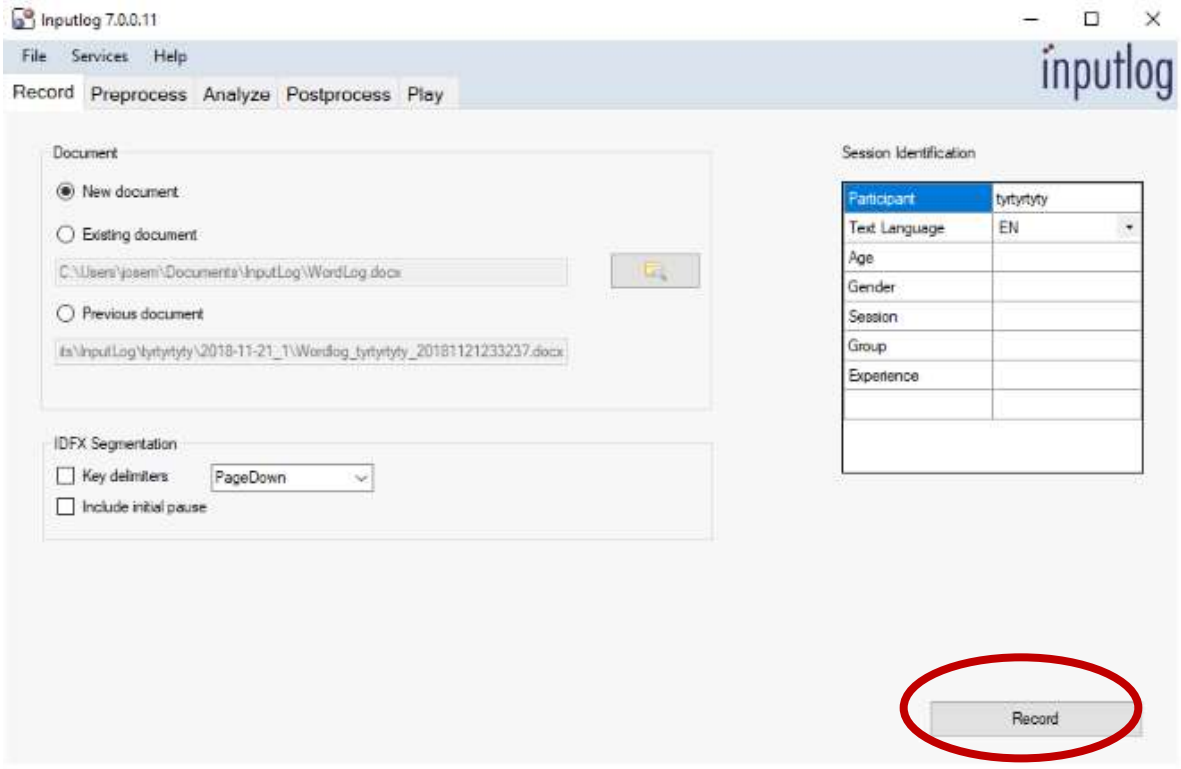
Inputlog is NOT a spy program. It will not do anything you do not know or do not want. However, Inputlog will record everything you type on your keyboard, and every click and scroll in your mouse. Please refrain from accessing sensitive websites (e.g., banks, university access, etc). If you forget, do not worry. Let us know and we will make sure that it is erased and no one will ever access your data, passwords and the like. But you will probably feel more comfortable avoiding to access security places. Apart from that, just behave the way you always do.

# HOW TO USE INPUTLOG

### How to use Inputlog

Inputlog runs in the background, out of sight. You must have an icon to start it, probably in the desktop and/or on the system tray.

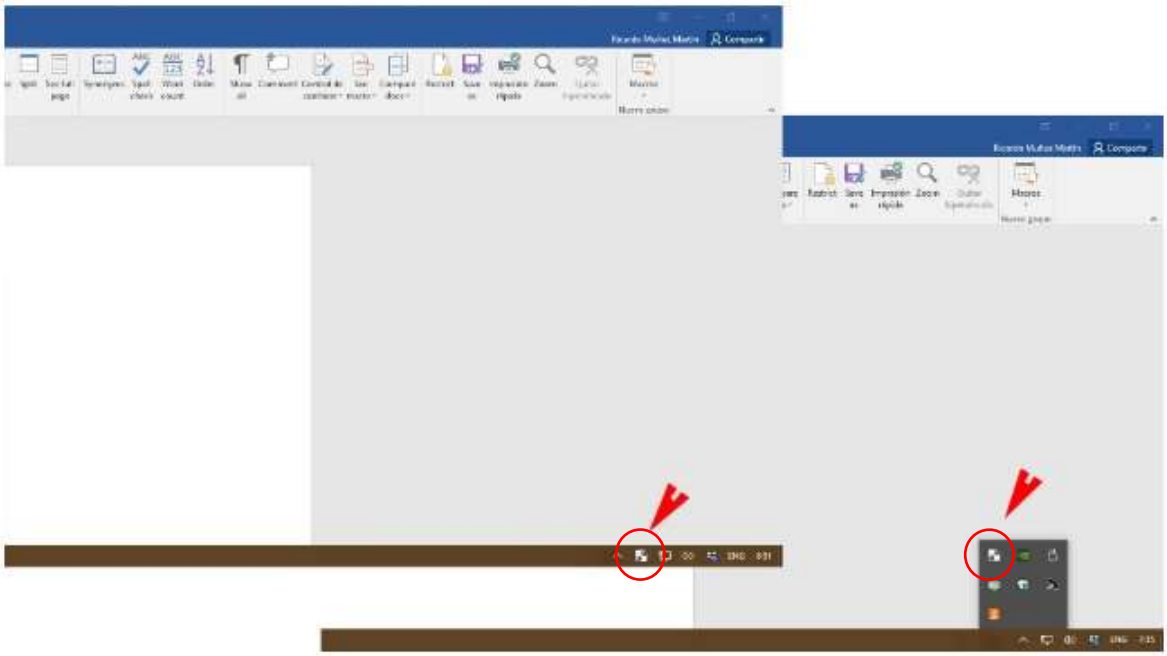
1. Click on the icon to get started.
2. You will be asked to introduce some information about the session. Inputlog uses some of this information to create a dedicated folder for each session.
3. In Participant, remember to write the alias you were assigned in the first questionnaire.
4. Please note that **Text language** refers to the one you are going to be typing in. If you will be typing in English, choose EN. If you will be typing in German, choose GE, etc.
5. In Session, write the text number and half. For instance, for the first half of text 1, you should enter 1.1. For the second half of text 1, you should enter 1.2, and so on.
6. In group, enter the name of your university or institution.
7. To start the session, press *Record.*



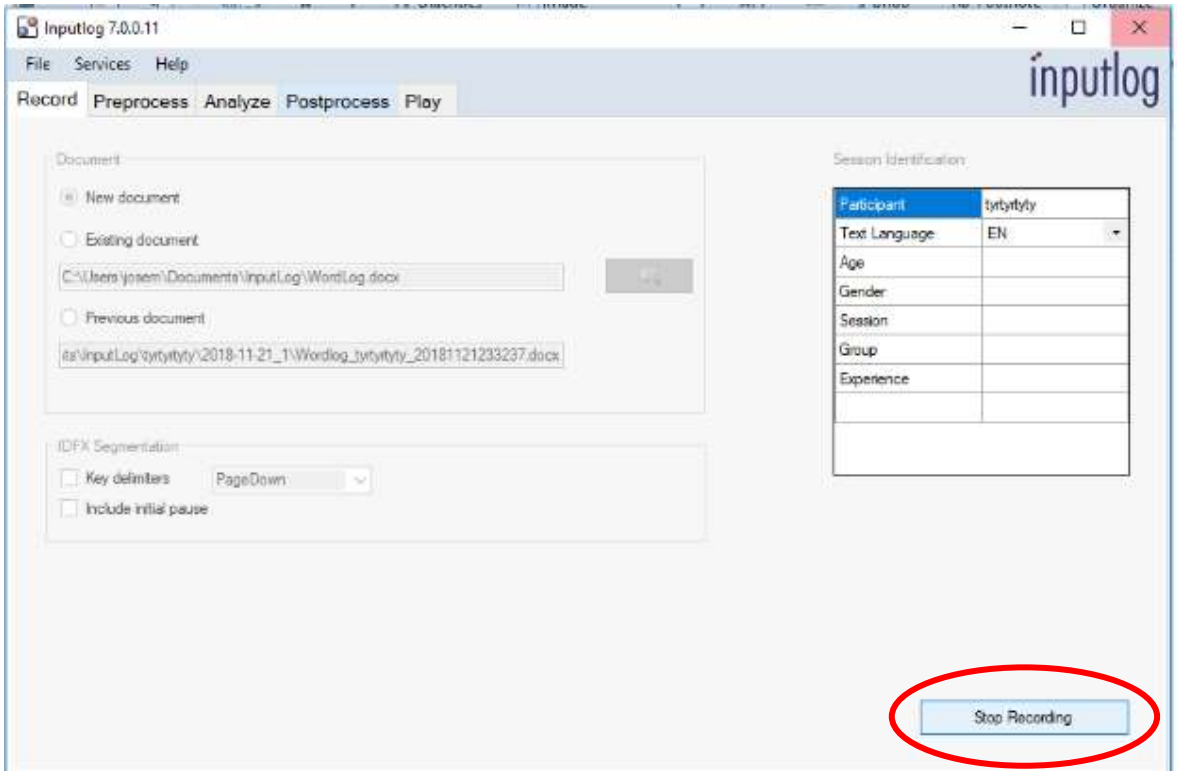

8. Once you press record, Inputlog's window will hide and **an empty Word document will open. This is where you need to type in your translation.** You may open and close other documents

(Word or other formats), programs, and web browsers, but **your target text needs to be typed in this Word document Inputlog just generated**.

9. You can save as you usually do. When you finish your translation or the time is up, go to the right bottom corner of the screen (exact place varies), and click on Inputlog's logo



10. press *Stop Recording*



## How to use it as informant: sending data

1. Once you have stopped recording, go to -> Documents -> Inputlog -> and find the folder with the name you introduced in the "Participant" slot. There, you will find your translation and another file with the extension .idfx
2. Just zip the whole folder and send it to the researcher email.

# INFORMED CONSENT

## Information on the processing of personal data

### pursuant to art. 13 of Regulation (EU) 2016/679

You are invited to participate in a study on translating from English at the PC, carried out by César Andrés González Fernández, PhD student at the Department of Interpreting & Translation of the University of Bologna, Italy.

Pursuant to art. 13 of Regulation (EU) 2016/679 (General Data Protection Regulation), please note that the Department of Interpreting & Translation is the Data Controller and will process your personal data in compliance with the requirements of Regulation (EU) 2016/679 (General Data Protection Regulation) and the Italian Decree 196 dated 30 June 2003 as amended (Data Protection Code).

#### PARTIES INVOLVED IN PROCESSING

- **Data Controller**

César Andrés González Fernández

- **Data Protection Officer of Alma Mater Studiorum – University of Bologna**

Department of Interpreting & Translation. Corso della Repubblica 135. FC 47101 Forlì (Italy)

#### PURPOSES AND METHODS OF PROCESSING

Your personal data, including any that might reveal health, racial or ethnic origin, sex life or sexual orientation, political opinions, religious or philosophical convictions or trade union membership will be kept separately and anonymized. The study may use such data as a source for understanding the other data in focus, which are those regarding how you type at the keyboard. In any case, any and all data will be processed by specifically authorised persons, both with and without the use of automated equipment, for the following purposes:

to abstract behavioral regularities regarding usual behavior at the keyboard and with the mouse.

#### (A) PARTICIPATION IN THE RESEARCH AND RELATED OPERATIONS AND ACTIVITIES

If you give your consent to participate in the study in question, some of your personal data will be collected through:

- survey and questionnaire
- keylogging

The typewriting and mouse data will be collected without identifying data (example: name, surname, etc. For no reason will the data be processed by authorized personnel (e.g.,: scientific manager and other researchers) with the aim of proceeding to the mere identification of the participant.

Your anonymized personal data without identification details may also be communicated to third parties for research purposes as part of the information provided about a set of informants.

The data collected and stored for the realization of the study in question, will be kept for 5 years. Furthermore, the data will be disseminated only in strictly anonymous form, for example through scientific publications, statistics and scientific conferences.

#### (B) DATA STORAGE FOR FUTURE RESEARCH ACTIVITIES

Considering that new discoveries could indicate unprecedented research opportunities for researchers or allow further studies and research on particular data for the study in question, you may allow prolonged storage of your data in a non-anonymous form for a period of time to 10 years from the conclusion of this study for possible future research activities and, if necessary, to contact you again to let you express, if it deems it, a new specific consent for a new research.
If, on the other hand, you refuse to consent to the processing described herein, your data will be deleted or made anonymous immediately upon expiry of the storage term of five years.

### (C) Conservation for administrative purposes

Your data will also be processed for administrative accounting purposes and kept for the time strictly necessary for the pursuit of these purposes, except for the ten-year period to ensure the fiscal, accounting and administrative requirements required by law and, possibly, longer terms, not determinable a priori, as a consequence of different conditions of lawfulness of the treatment (for example, legal actions that make the treatment necessary for over ten years).

### Legal basis and nature of the provision of data

The legal basis of the treatments referred to in point (A) described above lies in the consent, pursuant to art. 6, first paragraph, lett. a) of the Regulation (EU) 2016/679 (General Regulation on Data Protection) and, in the case of special categories of personal data, of art. 9, second paragraph, lett. a) of Regulation (EU) 2016/679. The consent to the processing for the purposes described above is optional.

The provision of data for the purposes referred to in point (B) is optional, not deriving from a regulatory obligation, but it is necessary to allow data to be stored for a longer period than that provided for the conclusion of the present study for possible future research activities and, if necessary, to contact you again to let you express, if it deems it, a new specific consent for a new research. Failure to provide the data for these purposes will have the sole consequence of being unable to implement the last described.

The provision of data for the purposes referred to in point (C) is necessary to comply with legal obligations regarding the conservation of administrative and accounting documents. In this case the legal basis can be found in the art. 6, paragraph 1, lett. c) and e), of Regulation (EU) 2016/679.

### Rights of the Data Subject

As a participant in this study and therefore a data subject, you may exercise the rights to request access to your personal data and its rectification or erasure, as well as to restrict the processing of your data, object to its processing and request its portability.

Please note that any consent given by you is given freely and may be revoked at any time, without any penalties or adverse effects, and without prejudicing the lawfulness of processing based on the consent given prior to revocation.

Requests to exercise the above rights may be presented to Alma Mater Studiorum – University of Bologna by contacting the Department of Interpreting & Translation. Corso della Repubblica 135. FC 47101 Forlì (Italy).

Lastly, should you believe that the processing of your personal data is in infringement of the provisions of Regulation (EU) 2016/679 or the Italian Decree 196/03 and subsequent amendments and additions, you have the right to lodge a complaint with the Italian data protection authority (known as the "Garante per la protezione dei dati personali"), pursuant to Article 77of the Regulation (UE) 2016/679, or to refer to the appropriate courts (art. 79 of the Regulation).

# Consent for the processing of personal data

I, the undersigned _____, born on _____ in _____,

pursuant to the provisions of Regulation (EU) 2016/679 and the Italian Decree 196/2003 and subsequent amendments and additions and having read the above "Information on the processing of personal data".

☐ give consent ☐ deny consent

for the processing - NECESSARY for the purpose of participating in the study in question – of my personal data for scientific research and statistical purposes in the manner and for the reasons described in the section entitled "Purposes and methods of processing" (point A).

☐ give consent ☐ deny consent

to the storage and further use - NOT NECESSARY for the purposes of participating in the study in question - of my personal data for the purposes and in the manner set forth in point (B).

*Date* *Signature*

_____ _____

# PRE-TASK QUESTIONNAIRE

[Administered online]
Thank you for participating in this research project!
As a translation student, you have been invited to take part in this research carried out by César González (cesarandres.gonzale2@unibo.it), PhD student of the Universita' di Bologna.

In the next screens, we will ask you to answer an online questionnaire asking for data that may be relevant. The first screen will ask for background social and demographic information. The second one, about language acquisition and English use. Please, tell the truth. Remember that everything will be anonymized.
It will take you approximately 5-10 minutes to complete the form.
Once again, thanks for your help.

## GENERAL INFORMATION

**Insert you alias**

**Are you lef or right handed?**
Left handed
Right handed
I really use both hands for (nearly) everything

**Do you touch type (i.e typing without using the sense of sight to find the keys)**
Yes
No

**How many fingers do you use when you type**

**Can you please type all the keys of your keyboard in lowercase (CAPITALS not necessary) from left to right and from top to bottom, starting by number 1 (possibly the first key to the bottom right of the Escape key)? For example 1234567890-=qwertyuiop[]\asdfghjkl;'zxcvbnm,./**

**Do you use a mouse**
yes
no

## MOUSE (OPTIONAL)

**How many buttons does your mouse have?**

## DEMOGRAPHICS

**Year born. Example: 1992.**

Gender
Female
Male
OTHER
Country where you were born

Country of residency

Countries where you have lived (at least one year). Example: Belgium from 2016 to 2018.

List all the languages you speak in decreasing order of command. Please, state how well (Native, C2, C1, B2, B1, A2, A1). For instance: Japanese (native), Tagalog (C1), Georgian (B2) and Selk'nam (B1).

Do you hold a university degree?
Yes
No

What was you major/minor? Write "None" if you do not have a major/minor

When did you graduate? (year)

Currently, you are studying a
BA
MA

What program are you enrolled in? (name of the program)

In which university?

Data of enrolment (year)

In which year through the program are you now?
1
2
3

Are you translating professionally now?
Yes
No

Are you freelancing
Yes
No

Are you volunteering translation now (internships, NGOs, etc.)? Please explain.

Are you part-timing
Yes
No

Years of professional translation experience?

Do you have any other job?
Yes
No

OTHER JOB (OPTIONAL)
Does you job entail translation?
Yes
No

Does your job entail other English-speaking duties
Yes
No

LANGUAGE ACQUISITION
At what age did you start learning English?

How did you learn English (more than one answer is fine)
Parents
Formal education
English-speaking country
Self-taught
Other

For how many years have you been learning English in formal education?

Have you ever been to an English-speaking country for more than three months?
Yes
No

ENGLISH-SPEAKING COUNTRY (OPTIONAL)
In which English-speaking country or countries? Example: In 2013-2014, England, for 16 months.

LANGUAGE USAGE
Do you listen to English daily
Yes
No

LISTENING (OPTIONAL)
For how long?
0-1 hours
1-3 hours
3-5 hours
5-7 hours
7+ hours

About what?

LANGUAGE USAGE
Do you read English daily?
Yes
No

READING (OPTIONAL)
For how long?
0-1 hours
1-3 hours
3-5 hours
5-7 hours
7+ hours

About what?

LANGUAGE USAGE
Do you speak English daily?

SPEAKING (OPTIONAL)
For how long?
0-1 hours
1-3 hours
3-5 hours
5-7 hours
7+ hours

About what?

With whom?

LANGUAGE USAGE
Do you write in english daily?
Yes
No

WRITING (OPTIONAL)

For how long?

0-1 hours
1-3 hours
3-5 hours
5-7 hours
7+ hours

To whom?

MASS MEDIA

Do you read the press in English

Only the headlines, daily
Only the headlines, weekly
Yes, daily
Yes, weekly
No

Do you listen to audio content in English

Yes, daily
Yes, weekly
Yes, monthly
No

Do you watch TV/movies/series in English

Yes, daily
Yes, weekly
Yes, monthly
No

SUBTITLES (OPTIONAL)

How do you mainly see the TV/movies/series in English

With subtitles
Without subtitles

# TRANSLATION COMMISSIONS

## Translation commission A

***Amazing Translations*** is a fast-growing young company for all enterprises' communication needs. Our personalized approach, professional prowess and quality of service have fostered an exceptionally rapid, steady, and solid growth of our company, both domestic and abroad. That is why we are ranked among the 50 largest European translation companies (TIR 2020). With offices in London and Berlin, we are the only translation company that provides the full set of communication services across languages.
Due to the increased volume of work and to achieve our high goals, ***Amazing Translations*** is looking for translators for the ENGLISH-SPANISH language pair. We will be happy to welcome new members to our team who meet the following conditions:
• good command of Microsoft Office,

• flexibility to adapt to and follow customers' instructions,
• adherence to agreed deadlines,
• responsiveness, accuracy, and reliability.

We offer

• work at home,
• part-time employment.

In ***Amazing Translations*** we hire top, committed, diligent, and responsible professionals who enjoy translating and are accurate in their word choices. Knowledge workers who deal with meanings, not with words.
If you are looking for work in this field, please send us the enclosed test translation, to be done in two sessions, each one of about one hour. Once you are done, just send the files to our Translation Department. Remember that you cannot use automatic translators, such as Google Translate or Deepl, but otherwise you may use digital dictionaries and freely search and surf the web. If you translation meets our standards, we will be happy to invite you to our office for an interview. Due to the pandemics, our interviews are now online but, of course, you figured that much. If you did not, perhaps this is not for you!
Good luck.

Translation comission B

## Freelance Translators Wanted

BabelizeMe Translation Services, with more than 18 years in the translation sector, is always looking for translators. The job is freelance and you work from home, part-time or full time. We are currently looking translators for the English-Spanish combination. Working with us provides you with

- free training
- plenty of projects to work on
- well-paid work
- get paid on time, every time

Suitable candidates to work with BabelizeMe need to perform a translation in two sessions of ca. one hour each, and do so with the Inputlog software installed and on through the whole sessions. Enclosed please find the original text in pdf format. Translate it accurately and then send it to our e-mail. Remember that the tone for this translation should be relaxed, but not too much. Needless to say, the use of automatic translators is a cause not to qualify. Our team of in-house revisers will evaluate your translation. If you succeed, we will will send you all the information you need to start working as a translator for BabelizeMe Translation Services.

Best wishes,

Translation comission C

# Dolet Translation is looking for translators!

Are you a skilled translator or interpreter who is looking to further their career as part of a well-established fast-growing translation company with a reputation for providing exceptional services around the world?
We have a wide range of opportunities available, a selection of which you'll find below.
In addition to our London office we have translation offices in Cape Town, Johannesburg, Vienna, Maastricht, Cologne, Berlin and many other German cities, **Dolet Translation** also have freelance opportunities for translators and interpreters wherever you are in the world.
What makes us different from other translation agencies is that we specifically look to work with translators who are not only native speakers, but who are also specialists in their field. We frequently have opportunities for translators with backgrounds in:

- Technology
- Medical
- Pharmaceutical
- Chemistry

Over the past 20 years, we have built Dolet Translation around a few central principles:

- Accuracy
- Precision
- Trust
- Personal service
- Being on fire at work

If you share a passion for these principles, then we want to hear from you. Take a look at our latest translation test (enclosed). You have to translate the text into Spanish without the help of automatic translation tools such as Deepl or Google Translate on about two hours, in two different sessions. Also, be careful to respect the time limit for the translation and remember that expecting a somewhat formal text, but not too stiff and old-fashioned.. When you finish, send the translated text to our e-mail. If you pass the test, you will be able to start translation projects right away.

We look forward to having you as part of our team!

# SOURCE TEXTS

## TEXT A - FIRST PART

**How did 18th-century vampire hunters identify the undead? Blood and fingernails.**

Gruesome accounts from eastern Europe, collected in a scholarly work on the supernatural, detailed the methods used to detect and destroy vampires.

Bram Stoker's original manuscript of Dracula included a preface that was cut before the novel was published in 1897. In this outtake, the creator of the world's most famous vampire believed that he was not writing pure fiction: "I am quite convinced that there is no doubt whatever that the events here described really took place, however unbelievable and incomprehensible they might appear at first sight. And I am further convinced that they must always remain to some extent incomprehensible."

Count Dracula was the literary culmination of two centuries of a resolute belief in the undead who walked among, and attacked, the living in eastern Europe. One of the strongest influences on Stoker, and other 19th-century authors, was the work of 18th-century Benedictine monk and distinguished biblical scholar Antoine Augustin Calmet.

A valuable repository for vampire lore, Calmet's two-volume supernatural survey, Dissertations Upon the Apparitions of Angels, Daemons, and Ghosts, and Concerning the Vampires of Hungary, Bohemia, Moravia, and Silesia, was published in 1746. The author carefully collected and examined numerous reports of vampire attacks that were emerging from eastern Europe in the late 17th and early 18th centuries. These accounts triggered an intense scholarly debate as philosophers and physicians alike sought to resolve the disconnect between the reports' fantastic details and their reputable sources.

**Calmet's case studies.**

Calmet acknowledged in his preface that the academic study of supernatural forces might invite criticism and derision, but he insisted that the testimonies from such reliable witnesses were too detailed and consistent to dismiss as pure delusion or outright invention. The validity of the various vampire reports, he insisted, merited careful consideration.

He documented many accounts of those who claimed to see the dead that "come back to earth, talk, walk, infest villages, ill use both men and beasts, suck the blood of their near relations, destroy their health, and finally cause their death." These undead, he wrote, "are called by the name of vampires." One of the most famous cases in Calmet's collection came from Austrian army surgeon Johann Flückinger. The doctor described the case of Arnold Paole, a soldier and alleged vampire victim from a Serbian village. To banish vestiges of the vampire, Paole ate dirt from its grave and smeared himself with its blood. He returned to his life as a farmer, but soon after died in a hay wagon accident.

About a month after his death, villagers claimed that Paole had risen from the dead and killed several people. Animals and livestock were also attacked and drained of blood.

## TEXT A - SECOND PART

Suspecting vampirism, the villagers exhumed Paole's body. They found it intact—even the nails had grown. Fresh blood covered the inside of the coffin. The villagers thus "drove a stake through his heart, whereby he gave an audible groan and bled copiously." The bodies of other villagers, thought to have been also transformed into vampires, were disinterred and likewise maimed in an attempt to "kill" them for good.

### Hair and nails.

The incorruptibility of a corpse was thought to be evidence that a dead person was a vampire. Calmet noted that some bodies, after several months or even years in the grave, were found with "the blood in a liquid state, the flesh entire, the limbs flexible and pliable."

The observation was accurate, but science rather than the supernatural can explain such postmortem phenomena. In large part, the belief in vampirism grew out of a lack of knowledge about the natural processes of decomposition after death, which can, under certain conditions, be delayed for a long period of time.

A body can remain well preserved through two natural processes; one of them, saponification, occurs when the body is buried in a cold, damp environment, as is common in eastern Europe. During the saponification process, the body's fatty acids turn into a waxy, soap-like compound that covers the corpse and prevents putrefaction. A saponified body also retains a certain flexibility, as described in Calmet's work.

Accounts in Calmet's Dissertation also noted that vampires' hair and fingernails continued to lengthen even after death. Certain postmortem changes may have given the illusion of continued growth. After death, the skin dehydrates, causing it to retract from the hair follicles. This may make the hair, especially stubble on the chin, look longer. The same is true of nails, as the skin around them retracts and makes more of the nail bed visible.

### Blood of the vampire.

Bloodstains on an unearthed corpse was also a sign that someone had become a vampire. As Calmet explained, "[Vampires] suck the blood of living men or animals in such abundance that sometimes it flows from them at the nose, and sometimes the corpse swims in its own blood oozed out in its coffin."

Again, medical science can provide an explanation. The length of time that blood remains liquid depends on environmental conditions. In cold temperatures the blood can stay fluid for at least three to four days. If bodies were unearthed during that period on suspicion of vampirism, blood could still be found in their veins. Stories of corpses being stained with blood or "swimming" in blood (the latter likely an exaggeration) may have been derived from postmortem hemorrhages.

A blow to the body during transfer to its resting place can result in a trauma sufficient to make blood appear to flow from the nose or mouth.

## TEXT B - FIRST PART

### Interview with Mary Watson

**For those who don't know, could you start off by telling us a little bit about your new novel, The Wickerlight?**

Zara and her family are reeling after the unexpected death of her sister, Laila. Zara begins to piece together Laila's last months and finds herself in the middle of an ancient feud between two secret magical factions in their small Irish village. David is trying to recover a stolen artefact, and as he searches, he finds things he hadn't realised he'd lost.

**How was the process of writing a companion novel in the same world, but with a different focus?**

It was a really natural progression. I felt like Wren had told her story but there were a few threads to explore in the world I'd created. And David was a character who niggled at me. I knew I wanted to come to the world from the outside, with characters who weren't part of the secret communities, and Zara and David's voices hit the right note.

**How did you keep track of the different strands and interweaving narratives?**

I prefer to write in order. So the events dictated whose voice went next. There were a few scenes I had to rewrite from David or Zara's POV because I needed a particular event at that point and wanted to keep them to alternate chapters. But they both have their own stories, which intersect at key moments.

**How did you approach the writing process this time around? Do you have a set routine or does it vary?**

It varies a little. But broadly, I think and generate ideas using notebooks and draft on computer. The book comes alive through a combination of drafting and outlining. I revise a lot. I write in my study at home, I can maybe edit at coffee shops but I'm easily distracted. I use scented candles and music (game soundtracks are my favourite) as sensory triggers to help me shift mental space from the school run and doing the dishes to a small village where magic is real. With each book there are one or two trigger songs I'll play a million times, until my family beg for reprieve, and when I am moving between projects or returning for edits these songs bring the world back to me. It's so Pavlovian now that when I hear these songs, the characters wake up.

**You write from the perspective of two characters: Zara and David. What are the challenges/rewards of writing in a multiple POV?**

It's tricky to keep them distinct when they both have my voice which is inevitable and present in every book I've written. But these two characters have different attitudes to the world and I find myself slipping into the way they think when writing them. Zara is more self-conscious, maybe even a little uptight while David is self-deprecating and has a more black and white view of the world. Their thought and speech patterns became clearer to me the more I fleshed them out and it felt different writing the two. I liked being able to further the story outside of each protagonist's view, and in The Wickerlight it was essential because Zara doesn't know the magic world and I didn't want her discovery of magic to be the main focus of the book.

## TEXT B - SECOND PART

**How do you organise yourself, as a writer, to keep track of the world you're writing about?**

As I'm going along, I plot the scenes with post-its and washi tape in an enormous, bound sketchbook. This way I can visualise where everything is in relation to each other. I also divide a page in quarters and decide which events need happen in which quarter of the novel, and whether it's the early or later part of the quarter. I read on Kindle a lot and 25%, 50% and 75% feel like natural markers to me. Of course it's not exact, but dividing by quarters rather than a three act narrative works better for me.

**Your writing overflows with descriptions of the natural world. How much of an influence is landscape for you?**

I do a lot of creative thinking while walking, and my neighbourhood is very inspiring with trees and fields and a lake, and this is how Kilshamble was formed. Writing is a dialogue with the world around me. While I don't have to be in a place to write it, I do have to have a good sense of it.

**Following on from the previous question, what landscapes have inspired you?**

I love nature, but the beauty of rundown and abandoned places really appeals to me and I think this is there in both books. I am also inspired by Cape Town, my home city which is naturally extraordinarily beautiful but has an uncomfortable mix of privilege and poverty.

**Where is your favourite place to write?**

My study, with the door open because I'm alone at home, and The Witcher 3 soundtrack blasting from another room. A tray with tea and my homemade almond sugar free biscuits.

**For you, what makes a great story?**

I love nuance and texture in a story, and I also like riveting plot. It's a difficult balance, because too much nuance interferes with plot, and too much plot doesn't always lend itself to texture. But books that veer towards this balance are my favourite.

**Best bit of writing advice you've ever heard?**

To be honest, when I see Twitter threads with writing advice they freeze me up. People like and value such different things. The best advice? Find what works for you, whether it's content or style or practice. Writing is not easy, and sticking at it is even harder. Listen to what works for others, evaluate, and then choose your own path.

## TEXT C - FIRST PART

## FULL PRESCRIBING INFORMATION

## INDICATIONS AND USAGE

Natesto is indicated for replacement therapy in adult males for conditions associated with a deficiency or absence of endogenous testosterone.

Primary hypogonadism (congenital or acquired): testicular failure due to conditions such as cryptorchidism, bilateral torsion, orchitis, vanishing testis syndrome, orchiectomy, Klinefelter's syndrome, chemotherapy, or toxic damage from alcohol or heavy metals. These men usually have low serum testosterone concentrations and gonadotropins (follicle-stimulating hormone [FSH], luteinizing hormone [LH]) above the normal range.

Hypogonadotropic hypogonadism (congenital or acquired): idiopathic gonadotropin or luteinizing hormone-releasing hormone (LHRH) deficiency or pituitaryhypothalamic injury from tumors, trauma, or radiation. These men have low testosterone serum concentrations but have gonadotropins in the normal or low range.

### Limitations of use

Safety and efficacy of Natesto in males less than 18 years old have not been established.

## DOSAGE AND ADMINISTRATION

### Dosing

The recommended dose of Natesto is 11 mg of testosterone (2 pump actuations; 1 actuation per nostril) administered intranasally three times daily for a total daily dose of 33 mg. Serum total testosterone concentrations should be checked periodically, starting as soon as one month after initiating treatment with Natesto. When the total testosterone concentration consistently exceeds 1050 ng/dL, therapy with Natesto should be discontinued. If the total testosterone concentration is consistently below 300 ng/dL, an alternative treatment should be considered.

### Administration Instructions

Natesto is administered intranasally three times daily once in the morning, once in the afternoon and once in the evening (6 to 8 hours apart), preferably at the same time each day. Patients should be instructed to completely depress the pump 1 time in each nostril to receive the total dose. Do not administer Natesto to other parts of the body.

### Preparing the Pump

When using Natesto for the first time, patients should be instructed to prime the pump by inverting the pump, depressing the pump 10 times, and discarding any small amount of product dispensed directly into a sink and then washing the gel away thoroughly with warm water. The tip should be wiped with a clean, dry tissue. If the patient gets Natesto gel on their hands, it is recommended that they wash their hands with warm water and soap. This priming should be done only prior to the first use of each dispenser.

## TEXT C - PART 2

### Administering the Dose

To administer the dose, patients should be instructed to perform the following steps:

- Blow the nose.
- Remove the cap from the dispenser.
- Place the right index finger on the pump of the actuator and while in front of a mirror, slowly advance the tip of the actuator into the left nostril upwards until their finger on the pump reaches the base of the nose.
- Tilt the actuator so that the opening on the tip of the actuator is in contact with the lateral wall of the nostril to ensure that the gel is applied to the nasal wall.
- Slowly depress the pump until it stops.
- Remove the actuator from the nose while wiping the tip along the inside of the lateral nostril wall to fully transfer the gel.
- Using your left index finger, repeat the steps outlined in bullets 3 through 6 for the right nostril.
- Use a clean, dry tissue to wipe the tip of the actuator.
- Replace the cap on the dispenser.
- Press on the nostrils at a point just below the bridge of the nose and lightly massage.
- Refrain from blowing the nose or sniffing for 1 hour after administration.

The dispenser should be replaced when the top of the piston inside the dispenser reaches the arrow at the top of the inside label. The inside label may be found by unwrapping the outer flap from around the container.

### Use with Nasally Administered Drugs Other Than Sympathomimetic Decongestants

The drug interaction potential between Natesto and nasally administered drugs other than sympathomimetic decongestants is unknown. Therefore, Natesto is not recommended for use with nasally administered drugs other than sympathomimetic decongestants (e.g., oxymetazoline).

### Temporary Discontinuation of Use for Severe Rhinitis

If the patient experiences an episode of severe rhinitis, temporarily discontinue Natesto therapy pending resolution of the severe rhinitis symptoms. If the severe rhinitis symptoms persist, an alternative testosterone replacement therapy is recommended.

## DOSAGE FORMS AND STRENGTHS

Natesto is a slightly yellow gel for intranasal use and is available in a dispenser with a metered dose pump. One pump actuation delivers 5.5 mg of testosterone.

## CONTRAINDICATIONS

Natesto is contraindicated in men with carcinoma of the breast or known or suspected carcinoma of the prostate.

Natesto is contraindicated in women who are or who may become pregnant, or who are breastfeeding. Natesto may cause fetal harm when administered to a pregnant woman. Natesto
may cause serious adverse reactions in nursing infants. Exposure of a fetus or nursing infant to androgens may result in varying degrees of virilization. If a pregnant woman is exposed to Natesto, she should be apprised of the potential hazard to the fetus.

# POST-TASK QUESTIONNAIRE

Thank you for participating in this research project!

As a translation student, you have been invited to take part in this research carried out by César González (cesarandres.gonzale2@unibo.it), PhD student of the Universita' di Bologna.

In the next screens, we will ask you to answer an online questionnaire asking for data that may be relevant. Remember that in order to answer it, you must have completed the translation tasks.

Once again, thanks for your help.

SECTION 1

[TEXT A INSERTED]

How difficult was your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Very easy | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Very difficult |

Are you satisfied with your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Very dissatisfied | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Very satisfied |

Did you enjoy working on this translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Which aspect/s of you translation are you most dissatisfied with and why?

Which aspect/s of you translation are you most satisfied with and why?

What did you find most difficulty when translating? Copy and paste whateverit is from the original.

Was the lack of background knowledge problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Was the writing of the original text problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Were specific words problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Were long sentences problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

SECTION 2
[TEXT B INSERTED]

How difficult was your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Very easy | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Very difficult |

Are you satisfied with your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Very dissatisfied | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Very satisfied |

Did you enjoy working on this translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Which aspect/s of you translation are you most dissatisfied with and why?

Which aspect/s of you translation are you most satisfied with and why?

What did you find most difficulty when translating? Copy and paste whateverit is from the original.

Was the lack of background knowledge problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Was the writing of the original text problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Were specific words problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Were long sentences problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

SECTION 3
[TEXT C INSERTED]

How difficult was your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Very easy | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Very difficult |

Are you satisfied with your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Very dissatisfied | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | Very satisfied |

Did you enjoy working on this translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Which aspect/s of you translation are you most dissatisfied with and why?

Which aspect/s of you translation are you most satisfied with and why?

What did you find most difficulty when translating? Copy and paste whateverit is from the original.

Was the lack of background knowledge problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Was the writing of the original text problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Were specific words problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

Were long sentences problematic for your translation?

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | |
|---|---|---|---|---|---|---|---|---|---|
| Not at all | ○ | ○ | ○ | ○ | ○ | ○ | ○ | ○ | A lot |

## SECTION 4

**Which was the basic translation unit you focused when translating the texts?**
Word
Phrase
Sentence
Above sentence
Text

**Which one of the texts did you find easier to translate?**
Vampires
Interview
Prescribing information

**Which one of the texts did you find more difficult to translate?**
Vampires
Interview
Prescribing information

# APPENDIX C. TEXT STRETCHES ANALIZED

## Hypothesis 1 - 0% coincidences - Spanish group

### Text A and Text B

No data to analyze.

### Text C

| Code | ST stretch |
|---|---|
| TT03C01 | One pump actuation |
| TT03C02 | or known or suspected |

## Hypothesis 1 - 0% coincidences - Italian group

### Text A

| Code | ST stretch |
|---|---|
| TT01C01 | drove a stake |
| TT01C02 | whereby he gave an audible groan |
| TT01C03 | to be evidence |
| TT01C04 | can explain |
| TT01C05 | grew out of a lack |
| TT01C06 | about the natural processes |
| TT01C07 | as is common |
| TT01C08 | Accounts in Calmet's Dissertation also noted |
| TT01C09 | of continued growth. |
| TT01C10 | This may make |
| TT01C11 | and makes |
| TT01C12 | also a sign |
| TT01C13 | in such abundance |
| TT01C14 | that sometimes it flows from them |

| | |
|---|---|
| TT01C15 | oozed out |
| TT01C16 | during that period |
| TT01C17 | [blood] could still be found |
| TT01C18 | or “swimming” |
| TT01C19 | [A blow] to the body |

## Text B

| Code | ST stretch |
|---|---|
| TT02C01 | As I’m going along |
| TT02C02 | an enormous, bound sketchbook. |
| TT02C03 | where everything is in relation to each other. |
| TT02C04 | it’s the early [or later] part |
| TT02C05 | like natural markers [to me] |
| TT02C06 | it’s not exact |
| TT02C07 | [Your writing] overflows |
| TT02C08 | very inspiring |
| TT02C09 | While I don’t have to be [in a place to write it,] |
| TT02C10 | I do have to have a good sense of it. |
| TT02C11 | Following on |
| TT02C12 | rundown and abandoned places really appeals to me |
| TT02C13 | I am also inspired |
| TT02C14 | has an uncomfortable mix |
| TT02C15 | a great story? |
| TT02C16 | love nuance and texture [in a story] |
| TT02C17 | [plot]doesn’t always lend itself to texture |
| TT02C18 | that veer towards this balance |
| TT02C19 | To be honest, |
| TT02C20 | when I see [Twitter] threads |

| | |
|---|---|
| TT02C21 | People like and value |

## Text C

| Code | ST stretch |
|---|---|
| TT03C01 | [patients] should be instructed to perform |
| TT03C02 | so that |
| TT03C03 | along the inside of the lateral nostril wall |
| TT03C04 | to fully transfer [the gel] |
| TT03C05 | at a point just below |
| TT03C06 | may be found by unwrapping the outer flap from around the container. |
| TT03C07 | Natesto is not recommended for use |
| TT03C08 | is recommended |
| TT03C09 | a slightly yellow gel |
| TT03C10 | nursing infant |

## Hypothesis 1 - less than 20% of coincidences - Spanish group

### Text A

| Code | ST stretch |
|---|---|
| TT01C01 | an audible groan |
| TT01C02 | thought to have been also transformed |
| TT01C03 | to be evidence |
| TT01C04 | the flesh entire |
| TT01C05 | under certain conditions |
| TT01C06 | may have been derived |

### Text B

| Code | ST stretch |
|---|---|
| TT02C01 | feel like natural markers |
| TT02C02 | I do a lot of creative thinking |
| TT02C03 | I do have |
| TT02C04 | good sense of it. |
| TT02C05 | which is naturally extraordinarily beautiful |
| TT02C06 | that veer towards this balance |
| TT02C07 | and sticking at it |

### Text C

| Code | ST stretch |
|---|---|
| TT03C01 | should be instructed |
| TT03C02 | of the actuator |
| TT03C03 | slowly advance |
| TT03C04 | of the actuator |
| TT03C05 | the actuator |
| TT03C06 | of the actuator |

| | |
|---|---|
| TT03C07 | Remove the actuator |
| TT03C08 | while wiping |
| TT03C09 | outlined in bullets 3 through 6 |
| TT03C10 | (to wipe the tip) of the actuator |
| TT03C11 | or sniffing |
| TT03C12 | should be replaced |
| TT03C13 | AND STRENGTHS |
| TT03C14 | One pump actuation |
| TT03C15 | or known or suspected |
| TT03C16 | in varying degrees |
| TT03C17 | the potential hazard |

## Hypothesis 1 - less than 20% of coincidences - Italian group

### Text A

| Code | ST stretch |
|---|---|
| TT01C01 | drove a stake |
| TT01C02 | whereby he gave an audible groan |
| TT01C03 | to be evidence |
| TT01C04 | can explain |
| TT01C05 | grew out of a lack |
| TT01C06 | about the natural processes |
| TT01C07 | as is common |
| TT01C08 | Accounts in Calmet's Dissertation also noted |
| TT01C09 | of continued growth. |
| TT01C10 | This may make |
| TT01C11 | and makes |
| TT01C12 | also a sign |
| TT01C13 | in such abundance |
| TT01C14 | that sometimes it flows from them |
| TT01C15 | oozed out |
| TT01C16 | during that period |
| TT01C17 | [blood] could still be found |
| TT01C18 | or "swimming" |
| TT01C19 | [A blow] to the body |
| TT01C20 | thought to have been |
| TT01C21 | was accurate |
| TT01C22 | under certain conditions |
| TT01C23 | also noted |
| TT01C24 | on an unearthed corpse |
| TT01C25 | of living men |

| | |
|---|---|
| TT01C26 | In cold temperatures |

## Text B

| Code | ST stretch |
|---|---|
| TT02C01 | As I'm going along |
| TT02C02 | an enormous, bound sketchbook. |
| TT02C03 | where everything is in relation to each other. |
| TT02C04 | it's the early [or later] part |
| TT02C05 | like natural markers [to me] |
| TT02C06 | it's not exact |
| TT02C07 | [Your writing] overflows |
| TT02C08 | very inspiring |
| TT02C09 | While I don't have to be [in a place to write it,] |
| TT02C10 | I do have to have a good sense of it. |
| TT02C11 | Following on |
| TT02C12 | rundown and abandoned places really appeals to me |
| TT02C13 | I am also inspired |
| TT02C14 | has an uncomfortable mix |
| TT02C15 | a great story? |
| TT02C16 | love nuance and texture [in a story] |
| TT02C17 | [plot]doesn't always lend itself to texture |
| TT02C18 | that veer towards this balance |
| TT02C19 | To be honest, |
| TT02C20 | when I see [Twitter] threads |
| TT02C21 | People like and value |
| TT02C22 | How much of an influence |
| TT02C23 | I do a lot of creative thinking |
| TT02C24 | think this is there |

| | |
|---|---|
| TT02C25 | from another room |
| TT02C26 | you've ever heard |
| TT02C27 | such different things |

## Text C

| Code | ST stretch |
|---|---|
| TT03C01 | [patients] should be instructed to perform |
| TT03C02 | so that |
| TT03C03 | along the inside of the lateral nostril wall |
| TT03C04 | to fully transfer [the gel] |
| TT03C05 | at a point just below |
| TT03C06 | may be found by unwrapping the outer flap from around the container. |
| TT03C07 | Natesto is not recommended for use |
| TT03C08 | is recommended |
| TT03C09 | a slightly yellow gel |
| TT03C10 | nursing infant |
| TT03C11 | to ensure |
| TT03C12 | the top |
| TT03C13 | Other Than Sympathomimetic Decongestants |
| TT03C14 | other than sympathomimetic decongestants |
| TT03C15 | other than sympathomimetic decongestants |
| TT03C16 | with a metered dose pump |
| TT03C17 | are breastfeeding |
| TT03C18 | nursing infants |

## Hypothesis 2 - 100% coincidences - Spanish group

### Text A

| Code | TT stretch |
|---|---|
| TT01C01 | habían crecido |
| TT01C02 | en vampiros |
| TT01C03 | un vampiro |
| TT01C04 | la ciencia |
| TT01C05 | el proceso de saponificación |
| TT01C06 | Un cuerpo saponificado |
| TT01C07 | de Calmet |
| TT01C08 | la piel |
| TT01C09 | lo mismo |
| TT01C10 | las uñas |
| TT01C11 | la piel |
| TT01C12 | de sangre |
| TT01C13 | Los vampiros |
| TT01C14 | la sangre |
| TT01C15 | cuatro días |
| TT01C16 | Un golpe |
| TT01C17 | la nariz |
| TT01C18 | la boca |

### Text B

| Code | TT stretch |
|---|---|
| TT02C01 | de la novela |
| TT02C02 | la naturaleza, |
| TT02C03 | la puerta abierta |
| TT02C04 | en casa |

| | |
|---|---|
| TT02C05 | sin azucar |
| TT02C06 | ¿El mejor consejo? |

Text C

| Code | TT stretch |
|---|---|
| TT03C01 | habían crecido |
| TT03C02 | en vampiros |
| TT03C03 | un vampiro |
| TT03C04 | la ciencia |
| TT03C05 | el proceso de saponificación |
| TT03C06 | Un cuerpo saponificado |
| TT03C07 | de Calmet |
| TT03C08 | la piel |
| TT03C09 | lo mismo |
| TT03C10 | las uñas |
| TT03C11 | la piel |
| TT03C12 | de sangre |
| TT03C13 | Los vampiros |
| TT03C14 | la sangre |
| TT03C15 | cuatro días |
| TT03C16 | Un golpe |
| TT03C17 | la nariz |
| TT03C18 | la boca |

## Hypothesis 2 - 100% coincidences - Italian group

### Text A

| Code | TT stretch |
|---|---|
| TT01C01 | di vampirismo |
| TT01C02 | riesumarono il corpo di Paole |
| TT01C03 | le unghie |
| TT01C04 | L'interno della bara |
| TT01C05 | i corpi |
| TT01C06 | di "ucciderli" |
| TT01C07 | stato liquido |
| TT01C08 | dopo la morte |
| TT01C09 | Un corpo |
| TT01C10 | la saponificazione |
| TT01C11 | in un ambiente freddo e umido |
| TT01C12 | Durante il processo di saponificazione gli acidi grassi |
| TT01C13 | si trasformano |
| TT01C14 | la putrefazione |
| TT01C15 | Un corpo saponificato |
| TT01C16 | nell'opera di Calmet |
| TT01C17 | di Calmet |
| TT01C18 | e le unguie |
| TT01C19 | dei vampiri |
| TT01C20 | più lunghi |
| TT01C21 | le unghie |
| TT01C22 | la pelle |
| TT01C23 | di sangue |
| TT01C24 | [I vampiri] |
| TT01C25 | una spiegazione |

| | |
|---|---|
| TT01C26 | il sangue |
| TT01C27 | tre o quatto giorni |
| TT01C28 | Se i corpi |
| TT01C29 | macchiati di sangue |
| TT01C30 | o dalla boca |

## Text B

| Code | TT stretch |
|---|---|
| TT02C01 | le scene |
| TT02C02 | In questo modo |
| TT02C03 | del romanzo |
| TT02C04 | di descrizioni |
| TT02C05 | è un dialogo con il mondo |
| TT02C06 | Amo la natura |
| TT02C07 | in entrambi i libri |
| TT02C08 | Qual è |
| TT02C09 | il mio studio |
| TT02C10 | la colonna sonora di The Witcher 3 |
| TT02C11 | Un vassoio |
| TT02C12 | fatti in casa |
| TT02C13 | i libri |
| TT02C14 | Il miglior consiglio |
| TT02C15 | e poi |

## Text C

| Code | TT stretch |
|---|---|
| TT03C01 | il dito |
| TT03C02 | la base del naso |

| | |
|---|---|
| TT03C03 | Inclinare l'erogatore |
| TT03C04 | Premere lentamente |
| TT03C05 | Rimuovere l'erogatore dal naso |
| TT03C06 | Se il paziente |
| TT03C07 | dei sintomi |
| TT03C08 | per uso intranasale |
| TT03C09 | 5,5 mg di testosterone |
| TT03C10 | o sospetto |
| TT03C11 | al feto |
| TT03C12 | se somministrato |
| TT03C13 | L'esposizione |

## Hypothesis 2 - above 80% of coincidences - Spanish group

### Text A

| Code | TT stretch |
|---|---|
| TT01C01 | el cuerpo de Paole |
| TT01C02 | Lo encontaron intacto |
| TT01C03 | las uñas |
| TT01C04 | habían crecido |
| TT01C05 | El interior |
| TT01C06 | del ataúd |
| TT01C07 | una estaca |
| TT01C08 | Los cuerpos |
| TT01C09 | en vampiros |
| TT01C10 | un vampiro |
| TT01C11 | algunos cuerpos |
| TT01C12 | varios meses |
| TT01C13 | incluso años |

| | |
|---|---|
| TT01C14 | en estado líquido |
| TT01C15 | La observación |
| TT01C16 | la ciencia |
| TT01C17 | la creencia |
| TT01C18 | de conocimiento |
| TT01C19 | los procesos naturales |
| TT01C20 | de descomposición |
| TT01C21 | la muerte |
| TT01C22 | de tiempo |
| TT01C23 | Un cuerpo |
| TT01C24 | dos procesos naturales |
| TT01C25 | uno de ellos |
| TT01C26 | la saponificación |
| TT01C27 | ocurre cuando |
| TT01C28 | el cuerpo de Paole |
| TT01C29 | y húmedo |
| TT01C30 | el proceso de saponificación |
| TT01C31 | los ácidos grasos |
| TT01C32 | del cuerpo |
| TT01C33 | que cubre |
| TT01C34 | la putrefacción |
| TT01C35 | Un cuerpo saponificado |
| TT01C36 | de Calmet |
| TT01C37 | el pelo |
| TT01C38 | y uñas |
| TT01C39 | de los vampiros |
| TT01C40 | la piel |
| TT01C41 | se deshidrata |
| TT01C42 | el pelo |

| | |
|---|---|
| TT01C43 | lo mismo |
| TT01C44 | las uñas |
| TT01C45 | la piel |
| TT01C46 | de sangre |
| TT01C47 | se había convertido |
| TT01C48 | Los vampiros |
| TT01C49 | la sangre |
| TT01C50 | que a veces |
| TT01C51 | en su propia sangre |
| TT01C52 | una explicación |
| TT01C53 | la sangre |
| TT01C54 | depende de |
| TT01C55 | la sangre |
| TT01C56 | cuatro días |
| TT01C57 | Los cuerpos |
| TT01C58 | ese periodo |
| TT01C59 | en sus venas |
| TT01C60 | Las historias |
| TT01C61 | una exageración |
| TT01C62 | Un golpe |
| TT01C63 | la nariz |
| TT01C64 | la boca |

## Text B

| Code | TT stretch |
|---|---|
| TT02C01 | como escritora, |
| TT02C02 | las escenas |
| TT02C03 | De esta manera, |

| | |
|---|---|
| TT02C04 | También divido |
| TT02C05 | y decido |
| TT02C06 | de la novela |
| TT02C07 | 50% y 75% |
| TT02C08 | es un diálogo |
| TT02C09 | con el mundo |
| TT02C10 | ¿Qué paisajes |
| TT02C11 | Me encanta |
| TT02C12 | la naturaleza, |
| TT02C13 | y creo |
| TT02C14 | en ambos libros |
| TT02C15 | mi ciudad natal, |
| TT02C16 | ¿Cuál es |
| TT02C17 | para escribir? |
| TT02C18 | Mi estudio |
| TT02C19 | la puerta abierta |
| TT02C20 | porque estoy sola |
| TT02C21 | en casa |
| TT02C22 | la banda sonora |
| TT02C23 | de The Witcher 3 |
| TT02C24 | desde otra habitación. |
| TT02C25 | una bandeja |
| TT02C26 | con té |
| TT02C27 | sin azucar |
| TT02C28 | los libros |
| TT02C29 | son mis favoritos |
| TT02C30 | el mejor consejo |
| TT02C31 | ¿El mejor consejo? |
| TT02C32 | Escribir no es |

| | |
|---|---|
| TT02C33 | tu propio camino. |

## Text C

| Code | TT stretch |
|---|---|
| TT03C01 | la dosis |
| TT03C02 | Para administrar la dosis, |
| TT03C03 | los pacientes |
| TT03C04 | los siguientes pasos |
| TT03C05 | la nariz |
| TT03C06 | del dispensador |
| TT03C07 | un espejo |
| TT03C08 | la punta |
| TT03C09 | hasta que el dedo |
| TT03C10 | la base |
| TT03C11 | la nariz |
| TT03C12 | la punta |
| TT03C13 | en contacto |
| TT03C14 | con la pared lateral |
| TT03C15 | el gel |
| TT03C16 | hasta que |
| TT03C17 | de la nariz |
| TT03C18 | la punta |
| TT03C19 | el gel |
| TT03C20 | y seco |
| TT03C21 | para limpiar |
| TT03C22 | la punta |
| TT03C23 | la nariz |
| TT03C24 | 1 hora |

| | |
|---|---|
| TT03C25 | del pistón |
| TT03C26 | entre Natesto |
| TT03C27 | Si el paciente |
| TT03C28 | un episodio |
| TT03C29 | los síntomas |
| TT03C30 | se recomienda |
| TT03C31 | Natesto es un gel |
| TT03C32 | está disponible |
| TT03C33 | 5,5 mg de testosterona |
| TT03C34 | puede causar |
| TT03C35 | una mujer embarazada |
| TT03C36 | puede causar |
| TT03C37 | la exposición |
| TT03C38 | de virilización |
| TT03C39 | una mujer embarazada |

## Hypothesis 2 - above 80% of coincidences - Italian group

### Text A

| Code | TT stretch |
|---|---|
| TT01C01 | di vampirismo |
| TT01C02 | gli abitanti del villagio |
| TT01C03 | riesumarono il corpo di Paole |
| TT01C04 | le unghie |
| TT01C05 | L'interno della bara |
| TT01C06 | sangue fresco |
| TT01C07 | Gli abitanti |
| TT01C08 | i corpi |
| TT01C09 | di altri abitanti |

| | |
|---|---|
| TT01C10 | in vampiri furono |
| TT01C11 | e mutilati |
| TT01C12 | di "ucciderli" |
| TT01C13 | un cadavere |
| TT01C14 | fosse un vampiro |
| TT01C15 | alcuni corpi |
| TT01C16 | il sangue |
| TT01C17 | stato liquido |
| TT01C18 | gli arti flessibili |
| TT01C19 | In gran parte |
| TT01C20 | la credenza |
| TT01C21 | di decomposizione |
| TT01C22 | dopo la morte |
| TT01C23 | Un corpo |
| TT01C24 | la saponificazione |
| TT01C25 | quando il corpo |
| TT01C26 | in un ambiente freddo e umido |
| TT01C27 | nell'Europa dell'Est |
| TT01C28 | Durante il processo di saponificazione gli acidi grassi |
| TT01C29 | del corpo |
| TT01C30 | si trasformano |
| TT01C31 | che ricopre |
| TT01C32 | la putrefazione |
| TT01C33 | Un corpo saponificato |
| TT01C34 | una certa flessibilità |
| TT01C35 | nell'opera di Calmet |
| TT01C36 | di Calmet |
| TT01C37 | i pelli |
| TT01C38 | e le unguie |

TT01C39 dei vampiri

TT01C40 anche dopo la morte

TT01C41 l'ilusione

TT01C42 Dopo la morte la pelle si disidrata

TT01C43 i pelli

TT01C44 più lunghi

TT01C45 Lo stesso

TT01C46 le unghie

TT01C47 la pelle

TT01C48 del vampiro

TT01C49 di sangue

TT01C50 [I vampiri]

TT01C51 Di nuovo

TT01C52 la medicina

TT01C53 può fornire

TT01C54 una spiegazione

TT01C55 in cui il sangue rimane

TT01C56 il sangue

TT01C57 per almeno

TT01C58 tre o quatto giorni

TT01C59 Se i corpi

TT01C60 macchiati di sangue

TT01C61 nel sangue (quest'ultima

TT01C62 un'esagerazione

TT01C63 emorragie postmortem

TT01C64 Un colpo

TT01C65 un trauma sufficiente

TT01C66 che il sangue

TT01C67 dal naso

| | |
|---|---|
| TT01C68 | o dalla boca |

## Text B

| Code | TT stretch |
|---|---|
| TT02C01 | Come ti organizzi |
| TT02C02 | per tenere traccia |
| TT02C03 | del mondo |
| TT02C04 | le scene |
| TT02C05 | In questo modo |
| TT02C06 | e decido |
| TT02C07 | del romanzo |
| TT02C08 | 50% e 75 % |
| TT02C09 | in tre atti |
| TT02C10 | di descrizioni |
| TT02C11 | e il mio quartiere |
| TT02C12 | con i suoi alberi |
| TT02C13 | è un dialogo con il mondo |
| TT02C14 | Amo la natura |
| TT02C15 | e credo |
| TT02C16 | in entrambi i libri |
| TT02C17 | Qual è |
| TT02C18 | il tuo posto preferito |
| TT02C19 | per scrivere |
| TT02C20 | il mio studio |
| TT02C21 | con la porta aperta |
| TT02C22 | la colonna sonora di The Witcher 3 |
| TT02C23 | a tutto volume |
| TT02C24 | Un vassoio |

| | |
|---|---|
| TT02C25 | e i miei biscotti |
| TT02C26 | alle mandorle |
| TT02C27 | senza succhero |
| TT02C28 | fatti in casa |
| TT02C29 | una storia |
| TT02C30 | una storia |
| TT02C31 | perche troppe sfumatore |
| TT02C32 | i libri |
| TT02C33 | sono i miei preferiti |
| TT02C34 | Il miglior consiglio |
| TT02C35 | per gli altri |
| TT02C36 | e poi |

## Text C

| Code | TT stretch |
|---|---|
| TT03C01 | Soffiare il naso |
| TT03C02 | Rimuovere il tappo |
| TT03C03 | sulla pompa dell'erogatore e |
| TT03C04 | uno spechio |
| TT03C05 | la punta |
| TT03C06 | dell'ergoratore |
| TT03C07 | nella narice sinistra |
| TT03C08 | il dito |
| TT03C09 | sulla pompa |
| TT03C10 | la base del naso |
| TT03C11 | Inclinare l'erogatore |
| TT03C12 | l'apertura |
| TT03C13 | in contatto |
| TT03C14 | con la parete laterale della narice |
| TT03C15 | il gel |

| | |
|---|---|
| TT03C16 | Premere lentamente |
| TT03C17 | Rimuovere l'erogatore dal naso |
| TT03C18 | la punta |
| TT03C19 | il gel |
| TT03C20 | per la narice destra |
| TT03C21 | per pulire |
| TT03C22 | la punta |
| TT03C23 | dell'erogatore |
| TT03C24 | e massagiare delicatamente |
| TT03C25 | il naso |
| TT03C26 | quando la parte |
| TT03C27 | raggiunge la freccia |
| TT03C28 | L'etiquetta interna |
| TT03C29 | per via nasale |
| TT03C30 | per via nasale |
| TT03C31 | per via nasale |
| TT03C32 | Se il paziente |
| TT03C33 | dei sintomi |
| TT03C34 | Se i sintomi |
| TT03C35 | una terapia sostitutiva |
| TT03C36 | Natesto è un gel |
| TT03C37 | per uso intranasale |
| TT03C38 | 5,5 mg di testosterone |
| TT03C39 | Natesto è controindicato |
| TT03C40 | o sospetto |
| TT03C41 | Natesto è controindicato |
| TT03C42 | Natesto può |
| TT03C43 | al feto |
| TT03C44 | se somministrato |

| | |
|---|---|
| TT03C45 | Natesto può causare |
| TT03C46 | L'esposizione |
| TT03C47 | Se una donna |

# APPENDIX D. TARGET TEXTS, REPRESENTATIONS OF THE TRANSLATION PROCESS AND CALCULATIONS

https://drive.google.com/drive/folders/1RPKosxgtYdIJX67Ns_Aj_lvx_tKii0HB?usp=share_link