



Domain knowledge in simultaneous interpreting: an exploratory study of students' interpreting process

Conhecimento de domínio na interpretação simultânea:
um estudo exploratório do processo de interpretação de estudantes¹

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ABSTRACT: This article analyzes the role that domain knowledge plays on the understanding of and performance in simultaneous interpreting tasks. Students from two classes of the undergraduate program in Translation of the Federal University of Uberlândia answered a questionnaire and performed a simultaneous interpreting session. The questionnaires were used to analyze the participants beliefs, while the sessions were audio-recorded for the analysis of cognitive effort (i.e., omissions, additions, head starts, pauses, meaning errors, and logical-time sequence errors). The results pointed to some changes in the students' declarative knowledge and procedural knowledge after they had received theoretical and practical training in simultaneous interpreting. However, it was not sufficient to help them find interpreting strategies to avoid a high level of cognitive effort. This research contributes to both process research and interpreter training.

RESUMO: Esta pesquisa analisa o papel exercido pelo conhecimento de domínio na compreensão e no desempenho de tarefas de interpretação simultânea. Estudantes de duas turmas do Curso de Graduação em Tradução da Universidade Federal de Uberlândia responderam a um questionário e atuaram em uma sessão de interpretação simultânea. Os questionários foram analisados quanto à crença dos participantes, ao passo que as sessões foram gravadas e analisadas quanto ao esforço cognitivo despendido (i.e., omissões, adições, *head starts*, pausas, erros de significação e de sequência lógico-temporal). Os resultados apontam algumas mudanças nos conhecimentos declarativo e procedimental dos alunos após o recebimento de formação teórica e prática sobre interpretação simultânea. Porém, esse conhecimento não foi suficiente para ajudá-los a encontrar estratégias de interpretação que evitassem um alto nível de esforço cognitivo. Os resultados desta pesquisa contribuem tanto para os estudos processuais quanto para a formação de intérpretes.

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KEYWORDS: Simultaneous Interpreting. Domain Knowledge. Interpreter Training. Cognitive Effort.

PALAVRAS-CHAVE: Interpretação Simultânea. Conhecimento de Domínio. Formação de Intérpretes. Esforço cognitivo.

1. Introduction

The simultaneous interpreters' ability to listen to a speech in one language and, nearly at the same time, re-express it in another language intrigues practitioners and researchers from different disciplines, including Translation Studies and Cognitive Psychology. Such researchers have been trying to account for this phenomenon by building on assumptions and methods from their own domain areas.

A research field interested in this phenomenon is Translation Process Research (TPR). One of the aspects analyzed in this field is the impact domain knowledge has on simultaneous interpreters' performance, especially when it comes to cognitive effort (TISELIUS; JENSET, 2011; TIMAROVÁ, 2010; TISELIUS, 2013).

By drawing on TPR and carrying out applied, exploratory, and empirical research (HALE; NAPIER, 2013), this article taps into the performance of four translation students who assumedly acquired domain knowledge in simultaneous interpreting² as compared to four students who did not have such knowledge. As such, the research herein reported was not focused on the interpreting product itself, but rather on the processes underlying an interpreter's delivery (ALVES, 2003).

Such research was built on the assumption that interpreters should have not only linguistic knowledge, but also, and most importantly, domain knowledge (LIU; SCHARLLERT; CARROLL, 2004). Domain knowledge is an individual's knowledge about a specific content, field of interest or practice (SCARDAMALIA; BEREITER,

² Students who participated in this investigation had only one course on this topic during the entire undergraduate program. Further information is provided in the Final Remarks section.

1991). According to Ericsson (2000), a highly specialized domain knowledge of the source text is crucial to superior performance in several domains of expertise.

The general objective of this article is to analyze the role domain knowledge—including both declarative knowledge (assessed through questionnaires) and procedural knowledge (assessed through recordings of a simultaneous interpreting session)—plays on the performance and understanding of simultaneous interpreting tasks. To this end, two specific objectives were established, namely: 1) to assess whether students' beliefs about simultaneous interpreting changed after they assumedly acquired theoretical and practical training to perform simultaneous interpreting tasks; and 2) to assess whether domain knowledge had an impact on the cognitive effort of translation students during a simultaneous interpreting session, by analyzing their (a) omissions, (b) additions, (c) head starts, (d) pauses, (e) meaning errors, and (f) logical-time sequence errors.

This article consists of five sections, including this Introduction. Section 2 provides the theoretical framework. Section 3 describes the methodology used to collect and analyze the data. Section 4 provides the most relevant results of the data collected through questionnaires and recordings, as well as briefly discusses the findings based on the literature. Section 5 provides some final remarks, including the limitations of this study and suggestions for further research.

2. Theoretical framework

Translation and Interpreting are different areas within Translation Studies. Translation refers to written texts, while interpreting refers to oral texts (LEDERER, 2003). However, they share the same purpose:

The main purpose of both translation and interpreting is to transfer [*sic*] a message expressed in a certain language to another language, so it can be understood by a community that does not speak the language

in which this message was originally produced. (PAGURA, 2003, p. 223)³

Despite such similarities, interpreting and translation are different from each other in several aspects. During the translation task, translators have time to lookup external sources, while interpreters have time only to search their memories (VIANNA, 2006). Unlike translators, interpreters have no time to review the target speech; in fact, interpreters need to analyze the content of the source message and re-express it in the target language with all its sentences connected and within the conventions of the target culture a few minutes (or seconds) apart from the utterance of the source speech (PAGURA, 2003). Another difference is that an interpreter, while performing his/her delivery, can only have access to what s/he has retained in the memory while listening to the speaker (VIANNA, 2006).

There are different interpreting modes and types. According to Pagura (2003), the interpreting modes are: consecutive, liaison, and simultaneous interpreting.

In the *consecutive* mode, interpreters listen to and take notes of a relatively long speech before taking the turn to re-express the speech in the target language. It generally happens in events that convene a small group of people and involve only two languages. In the *liaison* mode, interpreters sit next to the listener and interpret short sentences, to both native and foreign languages, alternating their delivery with the speaker's speech. It is usually performed during small meetings and by untrained people (PAGURA, 2003).

In the *simultaneous* mode,

³ Our translation to: “O propósito principal tanto da tradução quanto da interpretação é fazer com que uma mensagem expressa em determinado idioma seja transposta [*sic*] para outro, a fim de ser compreendida por uma comunidade que não fale o idioma em que essa mensagem foi originalmente concebida” (PAGURA, 2003, p. 223).

Interpreters—always in pairs—work isolated within a glass booth, so that they can see the speaker and listen to his/her speech through headphones. They process the message and re-express it in the target language through a microphone connected to a sound system that takes their speech to the listeners, who listen to it through headphones or receptors similar to portable radios. (PAGURA, 2003, p. 211)⁴

In performing simultaneous interpreting, while interpreters are making their delivery in the target language, they need to pay attention to the next unit of sense⁵ that will be uttered by the speaker or they will incur the risk of not being able to express it right after.

Interpreting can also be classified according to where it is performed and to its objective (PAGURA, 2003). This results in the so-called interpreting types, such as community interpreting, conference interpreting and escort interpreting. Interpreting types may be performed in any mode (e.g., liaison community interpreting).

Simultaneous interpreting has become an object of research because it is an unusual act. As Ericsson (2000) points out, most studies on simultaneous interpreting aim to analyze only the characteristics of the target speech produced, i.e., the interpreting product, usually by comparing the professional interpreters' performance to that of bilinguals and/or novice interpreters. However, the examination of both process and product may provide a richer picture of the task performed by an individual (KOBUS; PROCTOR; HOLSTE, 2001). To study different phenomena through the process perspective allows us to scrutinize the decision making and the problem solving involved in the production of the outcome and to complement the data provided by the product (FARRINGTON-DARBY; WILSON, 2006).

⁴ Our translation to: “os intérpretes – sempre em duplas – trabalham isolados numa cabine com vidro, de forma a permitir a visão do orador e recebem o discurso por meio de fones de ouvido. Ao processar a mensagem, re-expressam-na na língua de chegada por meio de um microfone ligado a um sistema de som que leva sua fala até os ouvintes, por meio de fones de ouvido ou receptores semelhantes a rádios portáteis” (PAGURA, 2003, p. 211).

⁵ Defined as “what results from this fusion of the semanticisms of words and cognitive inputs” (LEDERER, 2003, p. 18).

Domain knowledge is one of the factors that can be studied through process analysis. As the knowledge about a specific content, field of interest or practice (SCARDAMALIA; BEREITER, 1991), it includes *declarative knowledge* and *procedural knowledge*, among others. Declarative knowledge is what people know about something, it is the representation of some domain; meanwhile, procedural knowledge is “know-how”, it is how people actually do the activity they claim to know (GONÇALVES, 2006, p. 81).

In translation, “domain knowledge raises the number of words that can be processed by the working memory during the translation task”⁶ and has a positive impact on the accomplishment of a translation task (DA SILVA, 2007, p. 90). Translators tend to understand the source text better when it features contents within a domain that is relevant to them (HAMBRICK; ENGLE, 2002). Highly specialized domain knowledge of the source text is very important to superior performance in several domains of expertise (ERICSSON, 2000).

Besides domain knowledge, other factors, may influence the translation or interpreting process and product. For instance, what one believes that the act of translating is, or what a good translation is, or what role a translator plays (PAGANO, 2000). In translation training, this is referred to as a belief, i.e., everything a student presumes about learning and about acquiring knowledge (PAGANO, 2000).

Students’ beliefs about the act of simultaneously interpreting a speech can affect their productions. Negative or inadequate beliefs may lead to inadequate and insufficient performances (PAGANO, 2000). By the same token, adequate beliefs take translators, and interpreters alike, to success through the selection of the appropriate resources. They “filter the ways of thinking of and approaching the translation and

⁶ Our translation to: “O conhecimento de domínio aumenta o número de palavras que podem ser operacionalizadas pela memória de trabalho durante a tarefa tradutória” (DA SILVA, 2007, p. 90).

have a considerable effect both on the translation student's performance and on the work to be done"⁷ (PAGANO, 2000, p. 11).

Esqueda and Oliveira (2013) review the work of Rodrigues (2004), who corroborates Pagano (2000) and states that one of the major beliefs about translation is that a person should have a "gift" if s/he is to be(come) a good translator, that is, there is no need for specific training. Ericsson (2000) contends such a statement is common sense and provides a study which refuses this idea (i.e., MOSER-MERCER et al., 2000). According to Pagano (2000), beliefs can be changed through experience or deliberate intervention of someone in the learning process.

In translation and interpreting tasks, performance can be measured or analyzed through the cognitive effort they involve or require to be completed. Performance in an interpreting task entails the assumption that the target speech features the "complete original message, with all its details, and reflect the characteristics of the target language"⁸ (SELESKOVITCH, 1978, [s.p.]). Some markers of cognitive effort are identifiable when interpreters fail or come at odds to achieve this. They are referred to as *problem triggers* by Gile (1999) and may arise for several reasons, including: insufficient linguistic and/or extra linguistic knowledge of one or both languages in use, cognitive saturation, trouble in dealing with the task processing itself (processing capacity deficit), or poor conditions in the delivery of the source speech (the relevant segments might have been poorly pronounced or delivered too quickly).

Such problem triggers may generate failures to the next relevant segment itself and at a distance, thereby causing a failure sequence (GILE, 1999). This may happen due to a local attentional management deficit.

⁷ Our translation to: "[As crianças] filtram as formas de pensar e abordar a tradução e têm um efeito considerável no desempenho do tradutor-aprendiz e no trabalho a ser desenvolvido" (PAGANO, 2000, p. 11).

⁸ Our translation to: "a mensagem original deve ser completa, provida de todos os detalhes e deve refletir as características a língua de chegada" (SELESKOVITCH, 1978, [s.p.]).

According to Ericsson (2000), readers (translators), and listeners (interpreters) alike, begin to engage in problem-solving activities when the text is difficult to understand, either because of unfamiliar vocabulary or lack of necessary background knowledge. Some of such problem-solving activities are called *strategies*. From Pagano's (2000) standpoint, strategies are all forms of problem-solving actions in which an individual engages, either consciously or unconsciously.

Li (2013, p. 105) contends that strategies "are intentional and goal-oriented procedures to solve problems resulting from the interpreters' processing capacity limitations or knowledge gap, or to facilitate the interpreter's task". The author contends there are several strategies which may reduce the interpreters' cognitive load and help interpreters solve or avoid cognitive or language problems. Identifying the strategies used by the interpreters can reveal "the relations between the original discourse, the interpreted discourse, the possible problems in interpreting, the strategies applied, and the communicative setting" (LI, 2013, p. 108).

The use of strategies is revealing of cognitive effort. They can also be associated with some markers of cognitive effort, including those related to: meaning, such as omissions and additions (PIO, 2003); fluency, such as head starts and pauses (PIO, 2003); meaning errors (GILE, 2011) and logical-time sequence errors (PIO, 2003).

An *omission* happens when the original message is rendered in a more general and concise way (LI, 2013). Knowing what to omit is an important ability for interpreters (SHLESINGER, 2000), who usually do this deliberately aiming at reducing effort and ensuring greater target-speech clarity (PIO, 2003). Therefore, omissions are often (but not necessarily) a strategy to avoid cognitive overload and producing ungrammatical or unfinished sentences (GILE, 2011).

Additions are new materials added or expansion of the source speech that the interpreters perform to express a clearer message or to avoid the delivery of unclear information in the target speech (LI, 2013). They are a survival strategy that

interpreters use to avoid leaving the listener in complete silence. However, this may change the meaning of the source speech, and sometimes lead to discontinuity errors (PIO, 2003). Pio (2003, p. 83) reinforces Barik's (1994) argument that interpreters add neutral information as "a remedy for previous omission." When they do so, additions can co-occur with different errors, which may create "contradictions, ambiguous statements or misinterpretations, and logical-time sequence errors" (PIO, 2003, p. 93).

Head start, also called *ear-voice span (EVS)*, *décalage*, or *time lag*, is the "time spent to process the information received and then reorganize its form of uttering"⁹ (PAGURA, 2003, p. 211). Interpreters decide how much time they will lag behind the speaker based on their memory capacity limitations (GILE, 1999). Timarová, Dragsted and Hansen (2011, p. 121), while reviewing the works of Pöchhacker (2004) and Treisman (1965), state the head start "provides insight into the temporal characteristics of simultaneity in interpreting, speed of translation and also into the cognitive load and cognitive processing involved in the translation/interpreting process." The head start is influenced by both external factors (e.g., the speaker's delivery rate, text type, language difficulty, and accent) and internal factors (e.g., subjective perception of speech difficulty, strategies, familiarity with the topic, and segmentation of the input) (TIMAROVÁ; DRAGSTED; HANSEN, 2011).

There is a consensus that a "longer time lag in interpreting reflects more elaborate processing" (TIMAROVÁ; DRAGSTED; HANSEN, 2011, p. 139). Therefore, interpreters that spend more than four seconds to start interpreting, according to Lee (2002), could have found a problem that they do not know how to solve. This may lead to incorrect interpreting which cannot be considered a strategic action deliberately taken by the interpreter.

⁹ Our translation to: "espaço de tempo para processar a informação recebida e reorganizar sua forma de expressão" (PAGURA, 2003, p. 211).

Pauses indicate that a cognitive process is taking place, with a search for planning strategies to solve a problem (SCHILPEROORD, 1996). There are four main possible causes for a pause: cognitive, physical (breathing or articulatory pauses, which normally last less than .25 seconds), social-psychological (stress or speaking anxiety), and communicative causes (time for the speaker to prepare the subsequent speech and for the interlocutors to understand the message) (SCHILPEROORD, 1996). Pio (2003) defines a long unfilled pause “as a silence between two speech sequences lasting more than three seconds” (PIO, 2003, p. 75)

Meaning errors are incorrect interpreting of words. This happens more frequently with false cognates. They occur when the interpreter does not understand a word, or a group of words uttered by the speaker (GILE, 2011). They

... can result from insufficient background knowledge or linguistic knowledge, or from signal distortions (the speaker’s strong unfamiliar accent, background noise), from cognitive saturation affecting the Listening Effort, or, more interestingly, from a processing capacity deficit in the Production Effort. (GILE, 2011, p. 206)

Logical-time sequence errors are discontinuities that change the logical relation between source-target speech information units (logical sequence) or source-target speech time references (time sequence) (PIO, 2003). They represent a change in the speaker’s communicative intentions and, consequently, in the source speech meaning (PIO, 2003). These are the types of discontinuity errors that “reflect insufficient knowledge of the relevant languages and/or insufficient extralinguistic knowledge, but also saturation¹⁰ due to high processing capacity requirements as well as processing capacity management errors” (GILE, 2011, p. 205). Less time for interpreters to segment information units and connect them according to the time

¹⁰ Cognitive saturation occurs when the interpreter consumes most of his/her total available cognitive capacity. It can be caused by cognitive overload or local attentional deficit and, consequently, deterioration of the interpreter’s output (GILE, 1999).

sequence in the source speech may also lead to such errors (PIO, 2003). Logical sequence errors generate fragmented utterances, unfinished sentences and omission of large units of the source discourse (PIO, 2003). Errors in verb tense and mode, as well as changes to time references, days and years, represent time sequence errors (PIO, 2003).

After providing the relevant theoretical framework to this investigation, the next section describes the methodology used to collect and analyze some of the aforementioned problems.

3. Methodology

This is an applied, exploratory, and empirical study (HALE; NAPIER, 2013). Domain knowledge of Translation Studies, especially about interpreting, was defined as the independent variable; and cognitive effort, which may be related to the participants' beliefs about interpreting, was the dependent variable.

Participants were students from two classes of the undergraduate program in Translation at the Federal University of Uberlândia. The Experimental Group (EG) comprised students who were attending the 60-hour-long (fulfilled in 4 months) course "Interpreting Foundations" (*Fundamentos da Interpretação*), in their sixth semester; and the Control Group (CG) comprised students, in their fourth semester, who had not taken this course yet. The data were collected during the second semester of 2017. All students were chosen by convenience and provided informed consent as approved by the university's research ethics committee (Approval No. 1,314,979).

Students were asked to answer a questionnaire in Portuguese and to perform a simultaneous interpreting session. EG participants were also asked to answer the same questionnaire once again two months later, by the end of the semester.

Students from the EG had already received some theoretical and practical training in consecutive interpreting during previous classes of "Interpreting

Foundations” by the time they answered the questionnaire for the first time (Questionnaire 1—Q1), but they had not received any training in simultaneous interpreting yet. Students from the CG had not received any specific, formal training in interpreting, but had already had a reasonable level of formal training in translation.

The questionnaire was based on Esqueda and Oliveira (2013) and Soares (2015). It encompassed 14 open-ended questions to determine the groups’ profiles (not reported in this article)¹¹. It also included two open-ended questions to identify the participants’ opinions and beliefs about simultaneous interpreting (not reported in this article). In addition, it encompassed one closed-ended question about their level of agreement with 13 statements. Finally, an open-ended question asked for further comments, if any (not reported in this article). The questionnaire was piloted with five students from the second semester of the same undergraduate program in Translation to ensure that it was a valid instrument (HALE; NAPIER, 2013).

According to Ericsson (2000) there are several inconsistencies between actual behavior and answers from questionnaires. This is the reason why the participants were asked to also perform a simultaneous interpreting session.

Four students in the EG and four students in the CG were recruited to perform a simultaneous interpreting session of a five-minute video three weeks after they had answered the questionnaire (Q1, in the EG’s case). The interpreting sessions were conducted individually at the Laboratory of Languages (LabLing) in the Institute of Language and Linguistics, at the Federal University of Uberlândia. Each student was on a separate booth, with adequate equipment (an individual screen showing the video to be interpreted, headphones, a microphone, and a suite to regulate the microphones’ and the headphones’ volume). The input video (in .mp4 format) featured a speaker talking about interpreting as a career, similarities and differences between interpreting and translation, and similarities and differences between

¹¹ For further details, please see <https://repositorio.ufu.br/handle/123456789/21876>.

consecutive and simultaneous interpreting, a topic students, mainly in the EG, could assumedly master. The interpreting sessions were recorded using software *Sanako 9.3* and were saved as audio files (.mp3 format).

Students from the EG had their performances recorded during a regular “Interpreting Foundations” class, as part of the practical activities proposed by the professor in charge of the course. Students from the CG had their sessions scheduled in a timeslot different from their class time, but also with the assistance of the professor in charge of the course. They received guidance about the equipment, since they were unfamiliar with it, and about the task to be performed.

The data collected through the questionnaires were processed using *Google Forms* and *Microsoft Excel*. All questionnaire data presented a percentage in relation to the total number of participants: 13 students answered Questionnaire 1 (Q1) in the EG, 11 students answered Questionnaire 2 (Q2) in the EG¹², and 10 students answered the Questionnaire in the CG.

The EG’s Q1 was answered by the students before they had training in simultaneous interpreting (i.e., before assumedly acquiring domain knowledge about simultaneous interpreting), but after they had training in consecutive interpreting. Q2 was answered by the same students after they had had classes about simultaneous interpreting. In total, students had 24 hours of training in simultaneous interpreting, which included theoretical and practical activities.

Comparisons were made between the answers to the EG’s Q1 and Q2, and between the answers to the EG’s Q2 and the CG’s Questionnaire. These comparisons aimed: 1) to identify potential differences in the perception of EG students about the influence of domain knowledge on simultaneous interpreting before and after receiving theoretical and practical training, and 2) to assess whether there were differences in the perception the students from each group had about the influence of

¹² Two of the students who answered Questionnaire 1 were absent the day Questionnaire 2 was applied.

domain knowledge on simultaneous interpreting. *Google Forms* was used to generate the percentages for questions 1 to 14, i.e., the questions which describe the groups' profiles. *Microsoft Excel* was used to generate descriptive data for questions 15 to 17, i.e., the questions which identify the participants' beliefs and domain knowledge.

The recordings of the simultaneous interpreting sessions were analyzed using free software *ELAN 5.2*. Both source and target speeches were transcribed. Before the analysis of the recordings, the source and the target audio speeches were synchronized. All the source speech unfilled pauses and beginnings of sentences with complete ideas were marked to measure the head start. A template was created with all the elements aforementioned and used with all target speeches to maintain a pattern in the analysis of recordings.

In all recordings, the analysis targeted each occurrence of 1) omission, 2) addition, 3) head start, 4) pause, 5) meaning errors, and 6) logical-time sequence errors. These markers of cognitive effort were separated for analysis purposes, but are related, closely interdependent, and influence each other (PIO, 2003).

Omissions were identified and classified according to their type: omission of source speech words that impaired sentence comprehension, omission of the source speech parts of sentences that impaired comprehension of the entire segment, omission of complete sentences that impaired comprehension of the entire segment, sentence restructuring using fewer words, sentence restructuring using different words (but not necessarily fewer words). In contrast, additions were considered new material added or expanded source speech. Words and sentences with meaning that had not been explicitly uttered by the speaker constituted examples of new material.

Head start (i.e., the distance, or lag, between the speakers' input and the interpreters' output) was measured for each sentence following Timarová, Dragsted and Hansen (2011). Sentence beginnings in the source speech were marked as the initial cue of head start and the beginnings of the correspondent sentences in the target

speech were marked as its final cue. Sentences completely omitted were registered as missing values (omissions), rather than as head starts. A threshold of four seconds was set as a head start reference value, as adopted by Lee (2002).

Pauses were identified following Pio (2003), with three seconds as the threshold. All filled pauses (i.e., containing hesitations, false starts, repetitions and corrections) were excluded. Although they do have an impact on performance and should be identified separately, it was assumed that such a procedure would not have a major impact on the results because such items are more related to fluency than to meaning. Physical pauses, such as breathing or articulatory pauses, which normally last less than .25 seconds, were not counted.

Meaning errors included all incorrect interpreting of false cognates and words with different meaning in the source and target languages. The most important errors of this type in this research were those related to the interpreting domain.

Logical-time sequence errors were subdivided according to the effect they produced on the target speech (PIO, 2003): changes to the time sequence in the source speech, changes to the source speech message, break of the logical relation across sentences (with the one before, the one after, or both), break of the logical relation within a sentence, and non-compliance with the speaker's communicative intentions.

All data obtained through *ELAN* 5.2 were exported as .txt files, which were manipulated as *Microsoft Excel* spreadsheets. The filter function of the software was used to obtain the number of each marker of cognitive effort (and their subcategories). Subsequently, average values and percentages were obtained for each marker (and their subcategories). Doubts related to data compilation and manipulation were discussed between the researchers of this paper. In addition, process and product data were triangulated to understand the role of domain knowledge.

4. Results

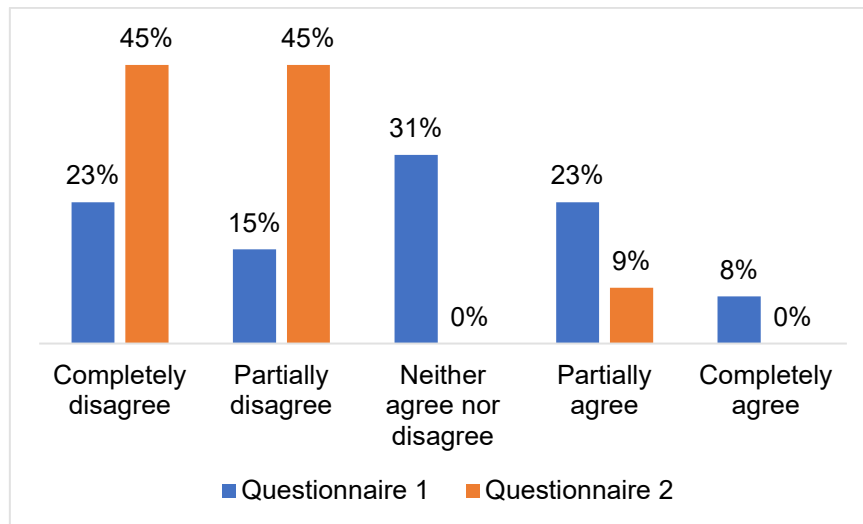
4.1 Questionnaires

This section provides an overview of some of the results for EG's beliefs and domain knowledge (declarative knowledge about interpreting) before and after formal training. It also presents a comparison between the EG's and the CG's beliefs and domain knowledge (declarative knowledge about interpreting).

Students were asked to indicate their level of agreement (completely disagree, partially disagree, neither agree nor disagree, partially agree, or completely agree) with 13 statements. Nine of them aimed at identifying their beliefs about the characteristics of a good simultaneous interpreter, and six of them were aimed at identifying their domain knowledge (declarative knowledge) about simultaneous interpreting. Two of these six statements referred to both topics (beliefs and domain knowledge). This article reports the most relevant results.

The statement "A good simultaneous interpreter is someone who has a special gift to perform this task" represents one of the most common beliefs about translation/interpreting (see PAGANO, 2000). Before the theoretical and practical training in simultaneous interpreting, the participants had varied opinions about it. After training, however, most of them disagreed with this idea, as shown in Graph 1.

Graph 1 – EG's answers for the sentence "A good simultaneous interpreter is someone who has a special gift to perform this task".

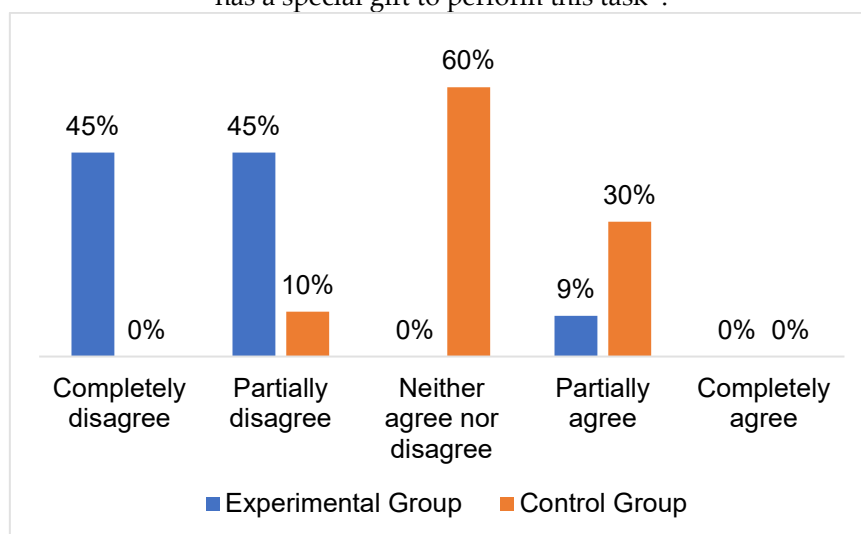


Source: the authors.

Surprisingly, some students (9% partially agreed) in the sixth semester of an undergraduate program in Translation, with only two semesters ahead of them before graduation, still believed that a special gift is necessary to be(come) a good interpreter. Even though interpreting is studied only at the end of the Translation program, it was expected that training in translation would have an impact on such a belief, and 100% of them would have disagreed with the statement, as translation and interpreting are closely related tasks and lecturers try to deconstruct such a belief about translation from the very beginning in the program. It might be the case that students see interpreting as a much more difficult task than translation, and beliefs about interpreting should be targeted differently.

In contrast, most students in the CG (60%) neither agreed nor disagreed with this idea, while 30% partially agree with it (see Graph 2). This difference between EG and CG results, and an increase from 38% to 90% disagreement with the statement in Graph 1, seems to reflect the influence that theoretical and practical training in simultaneous interpreting had on students' beliefs. Even though some EG students still agreed with this statement, it seems that specific training in interpreting played a role in changing beliefs.

Graph 2 – EG's and CG's answers for the sentence "A good simultaneous interpreter is someone who has a special gift to perform this task".



Source: the authors.

In the EG's Q1, 92% of participants disagreed, 46% completely and 46% partially disagreed, with the statement "A good simultaneous interpreter is someone concerned with reproducing exactly what the speaker is saying". In the EG's Q2, the overall percentage was similar, 91%, with 55% of participants completely disagreeing and 36% partially disagreeing. In the CG, 20% of students disagreed completely and 40% disagreed partially with this statement. As the number of complete disagreement was higher in the EG's Q2, and there was a high percentage of agreement (30%) in the CG, it seems that theoretical and practical training in simultaneous interpreting could help students become more certain that interpreters cannot reproduce every word uttered by the speaker.

In both Q1 and Q2, all EG participants agreed with the statement that "A good simultaneous interpreter should prepare herself/himself to interpret by researching about the topic of the speech" (92% completely agreed and 8% partially agreed in Q1, and 100% completely agreed in Q2). All CG students also agreed with it. Also, the comparison between EG and CG results seems to indicate CG students were aware of the role preparation plays in the interpreter's performances, even being in the fourth semester of the undergraduate program and before taking any interpreting course.

This could indicate that, during the program, they learned about preparation, but regarding translation, and related their beliefs about translation to interpreting.

Most EG students disagreed with the statement that “A cardiologist who masters a foreign language will perform the simultaneous interpreting of a conference about Cardiology more easily than an interpreter” (62% in Q1, and 81% in Q2). In the CG, 80% of students disagreed with the statement. Besides, 9% of the students in the EG partially agreed with the statement, and the remaining 20% in the CG neither agreed nor disagreed with it. These results show more CG students, compared to EG students, had a belief that domain knowledge of simultaneous interpreting is more important than linguistic knowledge and knowledge of the topic. Since CG students had not had any theoretical and practical training in simultaneous interpreting yet, and EG students already had it, the expectation was in the opposite direction: more students in the EG than students in the CG disagreeing with this statement.

Finally, in Q2, 18% of EG students agreed to the statement “The quality of the simultaneous interpreting of a conference about Cardiology performed by a cardiologist who masters the foreign language will be superior to that performed by an interpreter”. The results for this statement were surprising: the percentage was higher in Q2 (18%) than in Q1 (15%), and the CG presented only 10% of agreement, a percentage lower than the one presented by the EG (even after assumedly acquiring domain knowledge about simultaneous interpreting).

4.2 Analysis of the Interpreting Task

This section reports the comparisons between the data collected through recordings of a simultaneous interpreting task performed by both EG and CG students. Comparisons between the groups are presented through the average values of each marker.

The average number of omissions was similar in both groups: 22 (EG) and 25 (CG). The three types of omissions that may influence target speech comprehension of small chunks of information (omissions of source speech words that impaired sentence comprehension; omission of source speech sentence parts that impaired comprehension of the entire segment; restructuring of sentences using different words, but not necessarily fewer words) represented 14% of all the EG's omissions and 10% of all the CG's omissions. They can, sometimes, help the interpreter avoid cognitive overload by eliminating the reverbaling of small parts of the source speech, but they can also compromise this reverbaling due to unsuccessful restructuring.

The last omission subcategory is restructuring of sentences using fewer words. It accounted for 50% of all omissions in the EG and 62% in the CG. This type of omission could not be considered strategy because it caused discontinuities (changed the logical relation between segments, caused lack of logical sense, or altered the segments' time sequence) and changed the source speech message. These data also seem to indicate that most of the students did not have sufficient domain knowledge of simultaneous interpreting, especially procedural knowledge, and could not avoid omission as an error, which had a negative impact on their performances.

The EG made on average two additions, while the CG made ten. In other words, EG students did not use addition as a strategy to solve problems, but CG students did. The latter's additions probably were an unintentional cognitive solution, since the students from this group had no training in interpreting. Besides, a qualitative analysis of the CG's additions showed they were poor solutions, which entailed further errors. For example, a CG participant added, "que você não comeria outros lugares" [that you wouldn't eat other places] to the source speech segment "or going to a fancy dinner where you will be eating the same fancy food as the delegates." The entire segment produced by the interpreter was "indo a um jantar que você... onde você... em que você comerá... comidas que você não comeria outros lugares" ["going to a dinner that you...

where you... where you will eat... food that you wouldn't eat other places"]. It seems that the interpreter could not reorganize the segment's idea to reexpress it in Portuguese and, because of that, mistakenly added information that was not provided by the speakers' source speech.

The average length of head start was 3.4 seconds in the EG and 4.5 seconds in the CG. The values of both groups were within the acceptable range (2-5 seconds) proposed by Lee (2002), but both groups had head starts below and above this range. The largest difference between the groups is in the average percentage of head starts above 4 seconds: 19% of all head starts in the EG, against 42% in the CG. These data seem to reveal that the CG spent more time on cognitive processing than the EG and may suggest domain knowledge had an overall positive effect on EG performances.

The average number of pauses was 38 for the EG and 47 for the CG. Both figures are higher than the number found in the source speech (34). This suggests that some of the interpreters' pauses may indicate effortful processing of a difficult segment. Besides, the average results regarding pause were similar in both groups (pause length: 2.1 seconds in the EG, and 2 seconds in the CG; shortest pause: 0.4 seconds in the EG, and 0.3 seconds in the CG; longest pause: equal in both groups, i.e., 5.2 seconds; percentage of pauses longer than 3 seconds: 8% in the EG, and 4% in the CG). Overall, these results may indicate that pauses were not the most recurrent strategy used to solve a problem during the cognitive process of both groups.

The average number of meaning errors was also similar for both groups: 5 in the EG, and 6 in the CG. Such errors could have been avoided by interpreters who had domain knowledge of the interpreting session (EG). However, half of EG students used "translation" instead of "interpreting," "translate" instead of "interpret," and "types" instead of "modes" when talking about the differences between consecutive and simultaneous interpreting, while all CG students committed these errors. Such

errors may be indicative that some EG students did not acquire enough domain knowledge of simultaneous interpreting to avoid this type of error.

The average figures of logical-time sequence errors were similar in both groups: 25 in the EG, and 31 in the CG. Similar results in both groups were found for errors that changed the time sequence in the source speech (19% in the EG, and 21% in the CG) and errors showing non-compliance with the speaker's communicative intentions (13% in the EG, and 9% in the CG). These types of errors may, respectively, indicate lack of linguistic knowledge as well as cognitive overload, and reflect problems related to the target language idiomaticity and change how the target audience understands the source speech. For example, one student from EG said, “você não usa as mesmas palavras para fazer o mesmo argumento” [you don't use the same words to make the same argument] as her rendition for “using different sentences and different words to make the same point”. The participant was too “literal” (i.e., she tried to use the same formal correspondents to the exact words used by the speaker) and did not think of how the target audience would understand, or receive, the text delivered.

In 36% of EG errors, and in 21% of CG errors, the participant broke the logical relations between sentences, thereby causing discontinuities in the target speech. These errors generated sentences difficult to understand. This was an unexpected result for EG participants, since they had assumedly received theoretical and practical training and should know what strategies they could use to avoid creating this type of discontinuity in the target speech. However, this was an expected result for the CG because in several segments the students omitted a whole sentence, even compromising the text comprehension in some of these segments, instead of producing an unfinished sentence. For example, a CG participant said, “Então, qual tipo de pessoa gostaria de ser um intérprete. É... Muitas coisas acontecem que... O estresse” [So, what kind of person would like to be an interpreter... Mmm... Many things happen that... The stress”] as her rendition for “So, what kind of person wants

to be an interpreter. Well, it's people who like the stress, the excitement in interpreting." This sample points to no connections between the sentences, and the target listeners would probably be at odds over understanding it.

The figures for errors breaking the logical relations within a sentence were different in the two groups: 9% in the EG, and 35% in the CG. This finding seems to indicate that EG students knew how to establish a logical sequence within a sentence but had trouble in doing the same across sentences. The opposite happened with CG students. One example from a CG participant is "o falante vai falar... e o intérprete vai anotar e depois... ele vai... fa... o falante vai fazer uma pausa" ["the speaker will speak... and the interpreter will take notes and then... he will... spe... the speaker will make a pause..."] as his interpreting of "the speaker speaks for a few minutes and the interpreter takes notes and then the speaker stops and the interpreter gives an interpretation of what they said." The participant had trouble in connecting the parts that formed the sentence, thus creating a sentence difficult for the listener to understand. This result seems to corroborate that domain knowledge, more specifically procedural knowledge, helped EG students produce more comprehensible speeches than the ones produced by CG students.

Finally, the percentage of segments which changed the message of the source speech was high in both groups (48% for the EG, and 61% for the CG), but higher for the CG. For example, an EG participant said, "os tradutores são pessoas muito precisas, muito cuidadosas" ["the translators are very accurate, very careful people] as her interpreting of "translation appeals to people who are thorough, who like to be careful." The source speech message was that translation attracts people who enjoy being thorough and careful, rather than such characteristics are present in all translators. Once again, the findings were as expected for the CG, but not as much for the EG, who might not have mastered enough domain knowledge of interpreting to perform an interpreting task that did not change the source message.

5. Final remarks

The general objective of this article was to analyze the role of domain knowledge in the performance in and understanding of simultaneous interpreting tasks. Two specific objectives were established to accomplish this, namely: 1) to assess whether students' beliefs about simultaneous interpreting changed after they had assumedly acquired theoretical and practical training to perform simultaneous interpreting tasks; and 2) to assess whether domain knowledge had an impact on the cognitive effort of translation students during a simultaneous interpreting session. The initial hypotheses were that 1) there are differences between the beliefs about simultaneous interpreting held by students before and after receiving theoretical and practical training in simultaneous interpreting; and 2) domain knowledge acquired through formal training has a positive impact in decreasing the cognitive effort of translation students during a simultaneous interpreting session.

The first hypothesis was partially confirmed. The EG's answers to the questionnaire seem to indicate that some beliefs changed, while others did not. It seems that 24 hours of simultaneous interpreting as engaged by the participants are not enough to completely change some beliefs. Nonetheless, it is surprising that students in the fourth or in the sixth semester of an undergraduate program in Translation still believe that a good interpreter is someone with a special gift. This seems to indicate that much more efforts should be done during the program to change students' conceptions about interpreting (e.g., more courses about interpreting).

Another belief that seems to have changed is about the importance of domain knowledge to the interpreters' performances. EG students' percentage of agreement to this belief was higher in the second questionnaire than in the first. It seems to indicate they understood the importance of preparing themselves before an interpreting session through the study of content related to the session topic. An unexpected, albeit

positive, result was that even the fourth semester students (CG) already believed that preparation plays an important role in interpreting.

It is worth pointing out that there are not right or wrong answers about students' beliefs. Following Esqueda and Oliveira (2013), the aim of applying questionnaires was to identify the beliefs and reflect on the impacts they may have over the translators' training process. The present findings reinforce what Esqueda and Oliveira (2013), Rodrigues (2004) and Pagano (2000) contend: training plays an important role in changing students' beliefs, and consequently, in changing how they will act as professional translators/interpreters after graduating. The results meet Pagano's (2000, p. 27) assertion that "instruction makes the student aware of the theoretical factors and principles on which a successful translation rests."¹³

The second hypothesis, that cognitive effort made by students during a simultaneous interpreting session when they did not have any theoretical and practical training to do so is different from that made by students who assumedly had it, was partially confirmed. The performance delivered by the EG, after assumedly acquiring domain knowledge, was better than the performance delivered by the CG. However, such performance seems to indicate that the training in simultaneous interpreting in the said program is positive as a first contact with the field but is insufficient for one to adequately perform as a simultaneous interpreter.

Students' declarative knowledge of simultaneous interpreting was identified through the questionnaires. The results showed that it changed after they had assumedly acquired some domain knowledge of this topic. The results also revealed the students believed linguistic and domain knowledge of the session theme may influence the quality of the interpreters' performance. Most of them also agreed to the idea that domain knowledge of simultaneous interpreting could help interpreters

¹³ Our translation to: "A instrução torna o aluno consciente dos fatores e princípios teóricos em que se apoia uma tradução bem-sucedida". (PAGANO, 2000, p. 27).

solve interpreting problems. It is worth emphasizing that “quality cannot be assessed in absolute terms: it has to be handled from many different angles, not only the communicative event, naturally, but also [in the light of] the information in the source speech and its value as a speech of its own” (TISELIUS; JENSET, 2011, p. 273).

Interestingly, students within the same group had distinct performances, i.e., the groups were not homogeneous. However, the findings also revealed that EG students were better at prioritizing the more important idea units over the less important ones, and the EG produced texts more easily understandable to the target audience than the CG, considering the omissions and logical-time sequence errors. This performance is closer to that described by Liu, Scharllert and Carroll (2004), who stated that professional interpreters separate better essential from secondary idea units than students. The present study did not deal with professional interpreters, but those students who had more domain knowledge of simultaneous interpreting could perform this separation better than students who did not.

In addition, the EG presented less overlapping of markers of cognitive effort than the CG and knew how to establish logical sequences within sentences but had trouble in doing the same across sentences. The group with higher domain knowledge also was the one who enunciated more sentences from their beginnings. All these findings seem to show that domain knowledge, more specifically procedural knowledge, helped the EG produce a more intelligible speech than the CG. Nevertheless, the EG also delivered problematic segments, with several occurrences of meaning errors, a high percentage of head starts longer than 4 seconds, and several occurrences of discontinuities (unfinished sentences) throughout the target speech, which were not expected from them. All this evidence seems to indicate EG students did not have sufficient procedural knowledge of interpreting strategies. They tried to use some of them, like omissions and shorter moments of silence (pauses and head starts), but this ended up in errors in several moments.

As a conclusion, EG students' declarative knowledge and procedural knowledge seem to have improved with training. However, the knowledge acquired was insufficient to help them find interpreting strategies to avoid a high level of cognitive effort, which ended up in several errors and problematic target segments.

As for its limitation, this research is exploratory and provides results that cannot be generalized, especially considering the number of participants, their heterogeneous profiles, and their major in Translation, rather than in Interpreting. The present results can only indicate directions for further studies and awaken the interest of other researchers in this field.

Another limitation of the study is in the analysis of interpreting strategies and the methods used to measure cognitive effort. The literature presents several strategies, which are sometimes unclear: different authors speak of the same strategy but using different terms and different reference values (LI, 2003). Also, the methods used to measure markers are susceptible to mistakes by the researchers, especially when it comes to pauses and head starts, which were measured in milliseconds, and the classification of data, which were prone to some level of interpretation.

Further studies could explore the present data to tap into the influence of domain knowledge over anticipation, and the overlapping of different markers of cognitive effort. They could also address the impact of domain knowledge on markers of cognitive effort regarding fluency, such as filled pauses, hesitations, repetitions and false starts. Another suggestion is a fine-grained analysis of the output and an analysis of phonological measures (e.g., intonation, prosody).

All in all, this study may contribute to training and professional performance of future simultaneous interpreters. It empirically sets out to show interpreters should have not only linguistic knowledge, but also domain knowledge (declarative and procedural) to deliver a fluent, intelligible target speech. Thus, interpreters should be provided with previous information about the subject matter to be interpreted and

seek constant improvement. New, further or improved knowledge (of interpreting itself and of the subject matter to be interpreted) may change their beliefs and help them find better interpreting strategies, make better deliveries and make less cognitive effort during a working session. Needless to say, interpreter's trainers should seek also constant improvement of their teaching strategies, aiming at working with students not only on procedural knowledge, but also on students' beliefs and conceptions at the beginning and ending of their courses.

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