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COGNITIVE SEGMENTATION OF TRANSLATORS IN TRAINING: OBSERVATION OF THE TRANSLATION BEHAVIOUR OF GERMAN STUDENTS

SEGMENTAÇÃO COGNITIVA DE TRADUTORES EM FORMAÇÃO: OBSERVAÇÃO DE COMPORTAMENTO TRADUTÓRIO DE ESTUDANTES ALEMÃES

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Abstract: The project *Investigating the translation competence of apprentices in training: data collection and contrasting analysis of research results at German and Brazilian university* (PVB10375-2019) sought to contribute to studies on translation competence (PACTE, 2003, 2005, 2008). From August 2019 to July 2020, the data collected in Germany in 2018 (Leipnitz & Pickbrenner, 2020) were systematized and compared with first results of the longitudinal study carried out in the Translation Course at UFPB in Brazil (Liparini Campos et al., 2015; Liparini Campos & Leipnitz, 2017; Liparini Campos et al., 2017). This paper presents an analysis of the

cognitive segmentation process of German students in carrying out a translation task, organized for applied research in 2018. Data collection in Leipzig was attended by 23 subjects that translated a short technical-scientific text in the abstract format. In this, 05 students translated from English into German, the same text used in the study carried out in Brazil in 2014. Translog recorded the translation process and the steps presented here correspond to: 1) analysis of the text segmentation; 2) classification of the segments in Word, Syntagma, Clause, Clausal Complex, Transentential or Non-Syntactic Segment, according to Dragsted (2004), Rodrigues (2009), and Pimentel Neto and Liparini Campos (2017); 3) analysis of the average size of the segments produced; 4) comparison with the segmentation results of Brazilian students. The initial hypothesis that suggests similar cognitive processing among German and Brazilian students in the beginning of Translation training, was confirmed. Similar behaviours were observed by the apprentices, still attached to the source text and with more expressive cognitive segmentation in categories such as Word, Syntagma and Clause. The analysis of the cognitive segmentation of Translation apprentices was revealed to the participants of the research project as a methodological possibility in the translators training.
Keywords: Segmentation in translation. Translation process. Translation competence. Translator Training. Didactics of translation.

Resumo: *O projeto* Investigando a competência tradutória de aprendizes em formação: levantamento de dados e análise contrastiva de resultados de pesquisas em universidade alemã e brasileira *(PVB10375-2019) buscou contribuir com estudos sobre competência tradutória (PACTE, 2003, 2005, 2008). De agosto de 2019 a julho de 2020, foram sistematizados dados colhidos na Alemanha em 2018 (Leipnitz & Pickbrenner, 2020) e comparados com resultados da primeira coleta de estudo longitudinal no Curso de Tradução da UFPB (Liparini Campos et al., 2015; Liparini Campos & Leipnitz, 2017; Liparini Campos et al., 2017). Apresentam-se aqui as análises dos processos de segmentação cognitiva de estudantes alemães na realização de tarefa tradutória, organizada para a pesquisa aplicada em 2018. Participaram da coleta em Leipzig 23 sujeitos, que traduziram um texto técnico-científico curto no formato* abstract*. Cinco estudantes traduziram do inglês para o alemão o texto anteriormente utilizado na coleta no Brasil em 2014. O processo tradutório desses sujeitos foi registrado pelo Translog e as etapas aqui apresentadas correspondem a: 1) análise da segmentação do texto pelo registro das pausas; 2) classificação dos segmentos em Palavra, Sintagma, Oração, Complexo Oracional, Transentencial ou Não Sintático, de acordo com Dragsted (2004), Rodrigues (2009) e Pimentel Neto e Liparini Campos (2017); 3) análise do tamanho médio dos segmentos produzidos; 4) comparação com resultados da segmentação de estudantes brasileiros na primeira coleta na UFPB. A hipótese inicial de processamento cognitivo semelhante entre estudantes alemães e brasileiros em início de formação em Tradução foi confirmada. Observaram-se aprendizes com comportamentos tradutórios semelhantes, presos ao texto de partida e com segmentação cognitiva mais expressiva em categorias como Palavra, Sintagma e Oração. As análises da segmentação cognitiva de aprendizes de Tradução revelaram-se, aos participantes do projeto de pesquisa, como possibilidade metodológica na formação de tradutores.*
Palavras-chave: *Segmentação tradutória. Processo tradutório. Competência tradutória. Formação de tradutores. Didática da tradução.*

This text presents the work developed in the project *Investigating the translation competence of apprentices in training: data collection and contrasting analysis of research results at a German and a Brazilian university (PVB10375-2019),* which was elaborated in the Translation Course at the Federal University of Paraíba (Universidade Federal da Paraíba – UFPB). The data that supported the work on the project were generated by the research carried out in 2018 at the *Institut für Angewandte Linguistik und Translatologie* – IALT (Institute of Applied Linguistics and Translutology) at the University of Leipzig (Leipnitz & Pickbrenner, 2020). The research carried out in Germany uses theoretical and methodological guidelines for studies on translation competence developed by PACTE

research group (2003, 2005, 2008), previously adapted and applied in a longitudinal study in the Translation Course at UFPB (Liparini Campos et al., 2015; Liparini Campos & Leipnitz, 2017; Liparini Campos et al., 2017).

In the research carried out in Leipzig, the task[i] used for the testing of students corresponded to the translation of short technical-scientific texts, taken from scientific publications in the medical area. Among the 23 students who attended the research presented here, 5 had their translation process tracked, while translationg a text from English into German — their mother language. The translation activity of these 5 participants was monitored by the Translog software, and the same source text in English had been used in the first stage of the longitudinal study at the Translation Course at UFPB in 2014, which made it possible to compare the results.

The use of the Translog software during the implementation of the translation task generates, at the end, a linear protocol, which presents the textual production, accompanied by mouse and keyboard records, as well as the duration of the pauses during the process. From the record of these pauses, it is possible to segment the text to identify translated units and to verify individual translation processes.

The segmentation analysis presented here sought to investigate the translation competence of German apprentices. The results of this analysis will be contrasted through the triangulation with other data from the research in Leipzig, that is the results of questionnaires about the students' profile, their knowledge in translation, the translation difficulties they had, and the textual production of the participants — texts translated during data collection.

The segmentation process and the analysis of the generated data were guided by the theoretical framework of studies of cognitive approach in Translation Studies. Amongst the theoretical references used, it is mentioned Dragsted (2004) and Rodrigues (2009) — whose theories have characteristics that differentiate the process of cognitive segmentation of beginner and professional translators — in addition to works developed by professor and students of the Translation Course at UFPB, based on data generated by a longitudinal study developed at the university (França, 2016; Pimentel Neto & Liparini Campos, 2017, among others).

The general objective of the work presented here was to investigate the level of translation competence of German apprentices from the analysis of the "segmentation" of the target text. The specific objectives included: ● To identify the size of the segments processed

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by the subjects as a result of the pauses during the textual production; ● To identify the main types of processed segments; ● To verify the average of words per processed segment; ● To compare between the segmentation data in the translation process of the technical text at the IALT in Germany in 2018, and the results of the first collection in the Translation Course at UFPB in 2014.

The hypothesis that led to the analysis of the data during the development of the research project presupposed a cognitive segmentation on the part of German students whose behavior in terms of translating competence would resemble of an apprentice in the early stage of training, and whose target texts would be more segmented, composed primarily by a reduced number of words. Therefore, social, political and economic differences lead to presupposing distinct levels of linguistic and extra-linguistic subcompetences between the groups of German and Brazilian students, the results of the analysis of the cognitive segmentation of German students in comparison with the group investigated in Brazil confirmed the research hypothesis. In line with studies on translation competence (PACTE, 2003, 2005, 2008; Hurtado Albir, 2005), the research seems to reinforce the need for training in translation in order to develop specific subcompetences (knowledge about translation, instrumental and strategic), which must be constituted as specific objectives to be pursued by the didactics of translation.

Aiming at understanding the path taken by researchers in the UFPB scientific initiation project some important elements will be presented below. These elements are: the theoretical frameworks that guided the segmentation of the texts, systematizations and data analysis; the methodology used to observe the subjects' cognitive segmentation, from research data in Germany in 2018 (Leipnitz & Pickbrenner, 2020); the results of the analysis of the segmentation process of the group of German students; the comparison with the results presented by the Brazilian students investigated at UFPB (Liparini Campos et al., 2015; Liparini Campos & Leipnitz, 2017; Liparini Campos et al., 2017); and the future perspectives for the development of new research that guide and support teaching methodologies in translator training courses.

Cognitive Segmentation as a Tool in the Observation of the Translation Process

The Translog software allows us to observe and describe the process of producing the target text based on the translator's cognitive rhythm (Alves, 2005). The alternation between textual production and pauses during the process allows us to observe rhythmic patterns. These

patterns can be mapped by analyzing these pauses, which are related to information retrieval processes and planning strategies (Schilperhood, 1996 as mentioned in Rodrigues, 2009). According to the authors, such analyses would allow the identification of decision-making processes and the presence of translation problems. In addition, they would enable the identification of translation units (Alves, 2001; Dragsted, 2004; Rodrigues, 2009).

According to Jakobsen (2002), the observation of the translation process based on linear Translog protocols allows us to identify three phases of the textual production of the subjects investigated: orientation, drafting and revision. The orientation phase corresponds to the visualization and reading of the source text and to consultations on the issue / theme, before starting the textual production. This phase corresponds to the understanding of the source text, and it ends when the translator starts typing the source text. From this moment, the drafting phase begins, and it continues until the last period of the text is typed. In this phase, there are textual modification, correction, and deletion. There may also be revisions of translated segments. The revision phase begins at the end of the drafting phase, and it is completed when the translator considers their text finished. The research data presented here corresponds to the drafting phase. Modifications, corrections and deletions of text were considered only when there was positive textual production[ii].

Dragsted (2004) and Rodrigues (2009) analysed translation processes based on cognitive segmentation during text processing. Dragsted (2004) observed different behaviors between apprentice and professional translators, according to the type of segment processed. According to the author, apprentices tend to process the text in a more segmented way, in categories considered lower-level, with the production of more fragmented texts and segmentation with a reduced number of words, classified as Words or Phrases, performing a more analytical processing. Professional translators, on the other hand, seem to have more integrated processing, with a greater tendency to segment the text into higher level categories, producing, more frequently, segments at the level of Clause, but also segments that go beyond the clause limits, classified as Cross-sentence, which indicates a more sense-oriented processing of the text.

Rodrigues (2009) analysed the influence of Translation Memory Systems on the cognitive segmentation of professional translators, reinforcing the differences between apprentices and professionals, mentioned by Dragsted (2004). According to the researcher, apprentices tend to process shorter segments, consult dictionaries more frequently, and perform

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more literal translations. Expert translators, on the other hand, process longer segments — with less frequent consultation to the dictionary —, and produce fewer literal translations.

The PIVIC (Voluntary Institutional Program for Scientific Initiation – *Programa Institucional Voluntário de Iniciação Científica*) researchers performed the segmentation of the texts produced in the collection conducted in Germany stepping from the results of the longitudinal research carried out at UFPB (França, 2016; Pimentel Neto & Liparini Campos, 2017) — which took the methodologies and results of Dragsted (2004) and Rodrigues (2009) to longitudinally observe apprentices in three moments of their training in translation in Brazil. After the classification and counting of these segments, the researchers proceeded to a comparative analysis of the cognitive segmentation of German and Brazilian students in the beginning of their training. The methodological procedures, the results and the contrastive analysis between the two groups of apprentices are presented next.

Cognitive Segmentation of the German Apprentices

The research undertaken in Leipzig in 2018 used methodologies developed by the PACTE (2003, 2005, 2008), which were also adopted in a longitudinal study carried out at UFPB (Liparini Campos et al., 2015; Liparini Campos & Leipnitz, 2017; Liparini Campos et al., 2017). Data were collected from questionnaires, textual production and protocols generated in Translog, during the execution of a translation task. The scrutiny on the results obtained from this research would identify points to be explored in order to optimize the development of the translation competence of apprentices in translator training courses.

A total of 23 volunteer students[iii] attended the research in Germany, and translated a short technical-scientific text into their mother languages: German, Spanish, English, and Portuguese[iv]. Before carrying out the translation task, the students answered two questionnaires: translator profile, and knowledge in translation. The translation task of 11 (eleven) participants was monitored by the Translog[v] software. Afterwards, the students answered the questionnaire about translation difficulties / problems.

This work presents the results of the analysis of 05 (five) linear protocols generated in Translog. The group translated from English into German the same short technical-scientific text (177 words) used in the first stage of the research carried out at UFPB, Brazil, on the segmentation process of apprentices in translation in 2014. The segmentation process consists of dividing textual production in the interval between two pauses, which are identified in the

linear protocols generated by Translog by means of red dots, when they correspond to reduced intervals, and by recording the time between pauses, when they correspond to longer intervals (see Figure 1). The break value stipulated for the analyses is 5 seconds[vi], since lower values may be related to the translator's typing ability, which is not the focus of the research.

Profile of the Participants and the Ranking in the Segmentation of Texts

Among the 05 (five) subjects who translated from English into German using Translog, 04 (four) were between 19 and 21 years old and were in the second semester of the BA of Translation at the IALT, just 01 (one) was 50 years old, attending the sixth semester of the Portuguese - French Course at the Institute of Romanistics at the University of Leipzig[vii]. The 05 (five) participants informed they did not have professional experience as translators, and had a B2 level of knowledge in English. Some of them considered themselves competent and others, super competent in the language. Three subjects reported life experience (6 to 10 months) in other countries, and they mentioned having visited France and Belgium through exchange programs. They acquired knowledge of the foreign language in school education. Regarding the learning time, they declared more than 10 years of training in the language.

The translation task was performed in an average time of one hour, according to data from Translog. At the end of the task, the subjects answered the questionnaire on translation problems, in which they stated the level of difficulty they assigned to the text, the translation problems they came across, and the strategies used to solve them.

The protocols generated by Translog were segmented on the basis of the identification of pauses between students' textual productions. The classification, as already mentioned, followed the proposals of Dragsted (2004) and Rodrigues (2009) and the research procedures at UFPB (França, 2016; Pimentel Neto & Liparini Campos, 2017). The segments produced by the students were classified as:

– Word: segments formed by a single word that is not a verb;
– Phrase: segments composed by groups of words that make sense and do not contain verbs;
– Clause: segments that contain a single verb accompanied by a group of words that make sense (complements)[viii];
– Sentence: segments that contain more than one Clause;

– Cross-sentence: segments in which processing exceeds the limits of a Sentence, normally delimited by periods;

– Non-Syntactic: segments made up of units that do not have syntactic meaning as a whole.

As an example, Figure 1 presents segments of each classification taken from the texts observed in the research.

Figure 1

Examples of the segment classification used in the study in Leipzig in 2018

Classification of the segments	Segments in German	Translation into Portuguese
Word	•••[▼][▲]Einsamkeit,•	solidão
Phrase	•das•Fehlen•von•emotionaler•Unterstützung	a falta de suporte emocional
Clause	••wird•mit•einer•Vielzahl•	é com um grande número
Sentence	•◄◄r•verknüpfung•kommt•u◄wurde•aber•in •dieser•Str◄tudie•noch•nicht•beke◄◄legt.	como se chega a ligação, ainda não foi comprovado neste estudo
Cross-sentence	[•01:02.946][▼][▲]Soziale•Isolation•[▼][▲]die• mit•der•isolation•b◄verbundenen•Gefühle•der• Einsamkeit•zurück	1st Unit : isolamento social (corrected in the previous segment) 2nd Unit : que estão ligados a sensações de solidão
Non-Syntactic	•Wahrscheinlichkeit•einer•	probabilidade de uma

Elaboration: The authors.

The classification of segments originated from translation process allows, according to Dragsted (2004) and Rodrigues (2009), to analyse evidence of the subjects' strategic subcompetence. According to research by the authors, the translator's cognitive segmentation process does not happen automatically, but it varies according to: the type of text; the translator's experience; and the tools they use during the process. The results of the research by Dragsted (2004) and Rodrigues (2009) pointed out some characteristics of the segmentation of beginner and experienced translators. Beginner translator's tendency would be to process the text in a more segmented way, at low speed, and with long pauses between segments. Thus, they tend to process a greater number of segments at the Word / Phrase level, and their translation would present a large number of segments classified as Word, and few Cross-sentence segments. On the other hand, experienced translators tend to: (1) process the text in a more integrated manner, at high speed and with short pauses between segments; (2) process

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more segments at the level of the Clause / Sentence; (3) present fewer numbers of segments classified as Word, and a greater number of Cross-sentence segments.

Bearing in mind that the classification used as the basis for this research starts from texts produced in English and Portuguese, and that no research with segmentation of texts in German was found, many of the results were under huge discussion in the search for the most appropriate classification of the segments. Therefore, the research presented here contains specific criteria and decisions applied to the cognitive segmentation of texts produced in German.

As already mentioned, the segmentations presented herein refer only to the drafting phase (Jakobsen, 2002), since it is the phase in which most of the translation process and information processing occurs. Remarks of the orientation and revision phases will be presented in further studies.

Results and Discussion on the Cognitive Segmentation of Two Groups of Apprentices

Individual tables were organized for the data accounting, and they present the results of the segmentation of the texts. The categorizations were analysed and discussed by the research participants through the visualization of the processing by the Translog *Replay* function. For example, a fragment of the segmentation table organized by the PIVIC researchers is shown in Figure 2, for each of the 05 (five) subjects that attended the research:

Figure 2
Fragment of the segmentation table used by PIVIC researchers

Source text/ Protocol Excerpt	Segm n°	Classification	Size of the segment	Grammatical Classification	Translation/ Comments
Social Isolation has been linked to a variety of adverse health outcomes, including cardiovascular disease.					
•••....[Return][Return]••••••••• [▼][▲]Vereinsamung	4	Word	1	Noun	isolamento
[•01:13.274]•kann•mit•	5	Clause	2	Verb + prep	Pode com * Linked to the next segment
•••[▼][▲][▼][▲][▼][▲]/•isn◄li erung•aus•der•Gess◄◄◄◄◄◄ ◄◄◄◄◄◄von•der•Gess◄ellsc haft•◄[▼][▲]	6	Phrase	4	Noun+prep +art+noun	Isolamento da sociedade * placed next to Vereinsamung
•verschiedene	7	Word	1	adj	diferentes
••••••n,•negativen•	8	Word	1	adj	negativos
••••••••Beschwerden•in•Verwindung •gebracht•werden[▼][▲],•unter• Anderem•Herz–Kreislauf•K	9	Clause	9	Noun+prep+ noun+past p. verb+aux. verb +prep+adj+ noun+noun	Incômodos, entre outros, estar relacio-nado a cardiovascu-lares *unter anderem HKL before in Verbindung
••••••••••◄◄– Erkrankungenb◄◄n	10	Word	1	Noun	doenças
••••[▼][▲][▼][▲]o[▼][▲]◄a◄ [Return][▼][▲]◄a[▼][▲]◄b [▼][▲][▼][▲].•					• Review IsOlierung/ type A and delete A/Verbindung

Elaboration: The authors.

In the fragment of the segmentation table shown in Figure 2, there is, in the first column, an excerpt from the source text followed by the segments translated by one of the 05 (five) subjects. In the sequence of the columns, the following data are presented: the segments that are listed in the text, the classification for the segments, the number of words in each segment, their grammatical category, and the translation of the segment into Portuguese, followed by the comments made by researchers about the text production. The insertion of information such as grammatical category, translation and comments were an important accessory guidance to the participants that attended the PIVIC research.

Some of the difficulties in segmenting the texts produced in German were related, for example, to the interval between verbs (*Mittelfeld*). Since the main verb in constructions with modals and auxiliaries is moved to the end of the clause in German, the meaning is completed only with the conclusion of the clause. However, the research considered that the translator, when producing the modal or auxiliary verb, cognitively processed a whole of meaning — the Clause. Thus, a segment like *kann mit* [can with] — modal verb + preposition — was classified as Clause, associated with its processing to the later segment — *Beschwerden*in*Verwindung*gebracht*werden*,**unter*Anderem*Herz-Kreislauf*Erkrankungen* [be related to discomfort, including cardiovascular diseases]. *Erkrankungen* [diseases] was also considered as part of the previous segment, since it makes a whole of sense with *Herz-Kreislauf* [cardiovascular]. In German, nominal compositions like the previous one — formed by two nouns (heart + circulation), and translated into Portuguese by the adjective "cardiovascular" preceded by the noun "diseases" —, were also points of difficulty in the classification and accounting of some segments.

Having made these remarks about the complexity of the classification of textual productions in German, according to criteria established for other foreign languages, it is necessary to present the systematization of the segmentation of the 05 (five) subjects[ix] that attended the PIVIC research and discuss their results. Figure 3 below shows the sum of each category by subject, and the total of segments by category produced by the group of German students. In the last line of the table, it is shown the total of segments produced by the subject and, at the end, the total of segments produced by the group.

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Figure 3
Distribution of the segments in the categories by the group of German students of the IALT

Classification of the segments	DATA (IALT 2018)					
	D01	**D02**	**D03**	**D04**	**D05**	**TOTAL**
WORD	15	19	11	53	12	110
PHRASE	22	26	27	48	26	149
CLAUSE	13	16	11	30	17	87
SENTENCE	01	00	00	00	02	03
CROSS-SENTENCE	00	00	03	00	00	03
NON-SYNTACTIC	02	05	03	04	01	15
TOTAL OF SEGMENTS	**53**	**66**	**55**	**135**	**58**	**367**

Elaboration: The authors.

From the data in Figure 3, it is possible to verify that the segmentation occurred more frequently at the level of Word and Phrase. In the sum, 110 Words and 149 Phrases segments. A total of 87 Clauses (third category of registration in the segmentation) were processed by the 05 (five) German students. Sentence and Cross-sentence segments had only 03 occurrences each. Sentence segments were produced by only 02 of the 05 subjects (D01 and D05), and Cross-sentence segments, only by D03. It is necessary to highlight that D04 segmented more the text in comparison to the other subjects, with a different pattern from the group. He also registered diversity in the Word (53) and Phrase (48) categories, where the first classification showed to be more frequent. The other students produced a greater number of Phrases. These results will also be triangulated with other research data that may identify individual patterns of translation competence. In the Non-Syntactic category, there are a total of 15 segments, distributed among the 05 (five) subjects — D02 with the most expressive number (05 segments) and D05, with only 01 segment.

The table shown in Figure 4 was filled with the segmentation results in collection 01 at UFPB (França, 2016), considering only the production phase of the technical text. It facilitates visualization and comparison with the results of the collection segmentation at the IALT in 2018.

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Figure 4
Comparative table of segmentations at IALT in 2018 and collection 01 at UFPB in 2014

Classification of the segments	DATA (IALT 2018)						DATA (UFPB 2014)						
	D01	D02	D03	D04	D05	Total	S01	S02	S03	S04	S05	S06	Total
WORD	15	19	11	53	12	110	19	09	25	24	24	08	109
PHRASE	22	26	27	48	26	149	17	19	07	28	20	21	112
CLAUSE	13	16	11	30	17	87	13	13	01	18	15	12	74
SENTENCE	01	00	00	00	02	03	00	01	00	00	00	01	02
CROSS-SENTENCE	00	00	03	00	00	03	02	02	00	03	00	01	08
NON-SYNTACTIC	02	05	03	04	01	15	00	00	00	00	00	00	00
TOTAL OF SEGMENTS	**53**	**66**	**55**	**135**	**58**	**367**	**51**	**44**	**33**	**73**	**59**	**43**	**305**

Elaboration: The authors.

When comparing the data from the two collections, there is a similarity of distribution in the categories by the two groups. The 06 (six) subjects who attended the research in Brazil registered, in the first collection, a higher number of occurrences in the Word, Phrase, and Clause categories. Even when considering that D04 of the study in Leipzig has a much higher number of records in the three categories, the subjects of the two research (except S03 of the research at UFPB) share a higher number of occurrences in these categories, considered to be of an inferior level. In the Word category, however, 03 subjects in Brazil (S03, S04 and S05) registered a more expressive number of segments in relation to 04 subjects in Germany, except for D04 again, with different behavior from the group. In the Phrase category, S03 in Brazil stands out with a record lower than the others subjects, both regarding Brazilians and Germans, and D04 maintains a different behavior, with a much higher record. In the Clause category, again S03 from Brazil deviates from the Brazilian group, as well as D04 from the German group. Regarding the Sentence category, there is a similarity between the two groups — Brazilian and German — with only 02 subjects from each group registering low occurrence in the category (between 01 and 02 records only). Three subjects registered Cross-sentence segments at UFPB (02 and 03 records) and only one registered 03 segments of this category at the IALT. Regarding the Non-Syntactic category, there are different data, there is no record in the UFPB collection, and all the subjects at IALT have productions in this category, although not very expressive (between 1 and 5).

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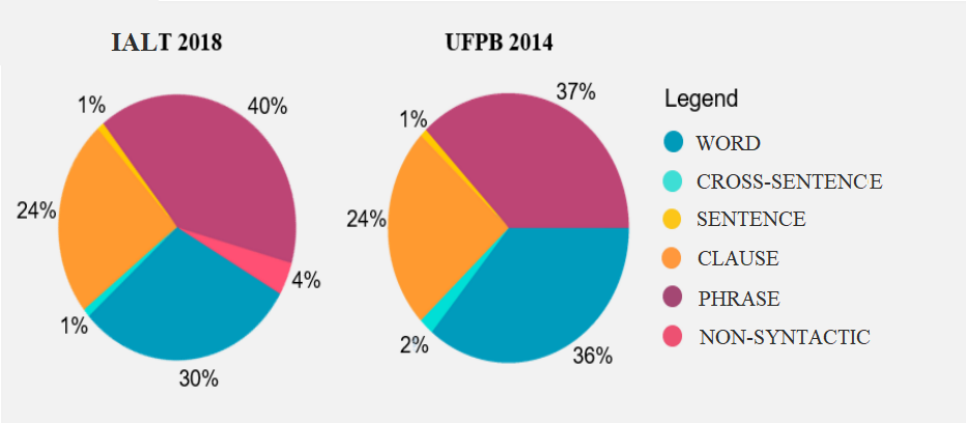
DOI: https://doi.org/10.26512/belasinfieis.v10.n2.2021.33518

Two graphs were generated (shown in Figure 5), in order to facilitate the contrastive observation of the segment classification results for the technical text in the collection in Germany, in 2018, and in the first collection in Brazil, in 2014.

Figure 5
Graphs of the segmentation of the German and Brazilian students in the translation of the technical-scientific text



Elaboration: The authors.

The comparison of the graphs (Figure 5) reinforces the identification of the highest record in the Word, Phrase and Clause categories by either Brazilian and German students, drawing attention to the Clause category, which presents the same percentage for both groups of students (24%). In the Word and Phrase categories, there are approximate records for both groups. In Brazil, there is a higher record in the Word category, 36% compared to 30% in Germany. This is reversed in the Phrase category, in which there is a higher percentage of records in the group of Germans (40%). The group of Brazilians registered 37% in this category. In the categories considered upper level, there is a reduced number of records for both groups (1% for Sentence for both groups; Cross-sentence 2% for Brazilians and 1% for Germans). The Non-Syntactic category registered 4% for the group of Germans and there was no record of this category in the group of Brazilians. The subject D04, as already mentioned, was responsible for the impact on the Word, Phrase and Clause categories of the group investigated in Germany, as the subject presented a much higher number of records. Research data in Leipzig to be further systematized will allow to deepen these analyses.

Comparing the data of the research carried out in Brazil and in Germany, they seem to corroborate with the studies developed by Dragsted (2004) and Rodrigues (2009), who observed that the size of the processed segment would identify the behavior of beginner or professional translators. The results in Germany confirm a higher occurrence of Word and

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Phrase segments, lower order categories, the same result observed with Brazilian students on the occasion of the first collection at UFPB (França, 2016). German and Brazilian students produced a smaller number of segments in the Clause category, and there was a reduced number of segments in the categories of higher level, Sentence and Cross-sentence. These results indicate that the behavior of apprentices is still attached to the source text and to a word-level translation.

In order to search for more data to analyse the profile of the subjects investigated at IALT in 2018 (Leipnitz & Pickbrenner, 2020), it was calculated the average number of words per segment produced. The inexperience of the translators would be characterized by the reduced number of words per segment. Then, the total number of words in the segments is divided by the total number of segments produced by each subject during the translation drafting phase (Jakobsen, 2002).

Figure 6
Average size of the segments, by subject, at the stage of writing the technical text of the collection at the IALT

Subjects' data (IALT)	Total number of words per segment/ total number of segments	Average size of segments per subject
D01	163 words : 53 segments	3,07
D02	160 words : 66 segments	2,42
D03	186 words : 55 segments	3,38
D04	253 words : 135 segments	1,87
D05	191 words : 58 segments	3,29
Total Average		**2,80**

Elaboration: The authors.

In Figure 6, it is possible to identify the result of the average segment size for each one of the 05 (five) subjects who attended the PIVIC research. For example, during the drafting frase, the subject D01 produced a total of 163 words segments. Taking the number of words and dividing by the total number of segments, we have the average size of the segments produced by this subject (3.07). In other words, D01 produced an average of three words in each segment. From the average of the size of the segments of each subject, the general average was generated, which was 2.8 words per segment. Despite having 3 subjects that produced 3 words-average segments (D01, D03 and D05), subjects D02 and D04 produced around 02 words per segment (2.42 and 1.87). According to Dragsted (2004), larger average size would identify lesser cognitive effort on the part of the subject, and smaller average size would identify greater cognitive effort. The average size of the segments produced by those students

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in Brazil, when translating the technical text, was 3.2 words per segment. These results demonstrate similarity in the textual production of Germans and Brazilians, characteristic performance of beginner translators.

The reduced average size of the segments observed in the group of students in Leipzig could be associated with a greater cognitive effort in the execution of the translation task. According to Dragsted (2004), this greater cognitive effort in processing could be associated with the level of difficulty of the text. To identify the degree of difficulty attributed by the subjects to the technical text used in the translation task at the IALT in 2018, information from the questionnaire on translation problems was consulted (Leipnitz & Pickbrenner, 2020). In this questionnaire, the subjects assigned scores from 01 (very easy) to 10 (very difficult) to the level of difficulty of the translated text.

All 05 (five) subjects classified the text as difficult (average 6.9). The text, which had already been used in the first stage of research at UFPB, was also considered difficult by most Brazilian students (França, 2016, p. 22)[x]. According to Dragsted (2004), a higher level of difficulty in the text would require a greater cognitive effort and would lead to the production of lower-level segments by the subjects.

Perspectives and Concluding Remarks

The investigation of the segmentation process of a group of German students aimed at observing the level of translation competence of apprentices. These data will be further triangulated with the results of the questionnaires and with the analysis of the textual production of the research subjects in Leipzig in 2018 (Leipnitz & Pickbrenner, 2020).

The classification of the cognitive segmentation of the 05 (five) German students, from the record of the pauses during the translation process, presented a greater number of lower order categories (Dragsted, 2004) such as Words and Phrases, the same result presented by the 06 (six) Brazilian students in 2014 (França, 2016). Research participants, both in Germany and in Brazil, registered the production of the Clause category; however, there was an insignificant occurrence of categories considered to be of a higher order, such as Sentence and Cross-sentence.

Although German students processed Clauses, segments of a higher order, this category had a lower number of occurrences compared to Words and Phrases, same with Brazilian students. A relativization of the category would be necessary in the segmentation in German

language, in view of the need to adapt to parameters applied to texts produced in English and Portuguese. For example, segments in the German language that contained only one verb were classified as Clause, when they corresponded to an auxiliary or modal verb accompanied by a main verb in the final position in the clause, unlike the classifications of the research in Brazil, a fact that would directly affect the accounting of that category.

The average number of words per segment for both groups — German and Brazilian — was a maximum of 03 (three). According to Dragsted (2004), this behavior is common to beginner translators, since professional translators tend to produce segments with a greater number of words.

Since a smaller number of words per segment would identify a text with a higher level of difficulty, it was sought, as performed in the research in Brazil, to verify the level of difficulty of the source text. This data was collected from the questionnaire on translation difficulties. So, it was pointed out that, like Brazilian students, Germans also classified the text as difficult.

Thus, at the end of the analysis and the comparison of the results with the research in Brazil, the initial hypothesis of the research — German students beginning training in translation would behave similarly to Brazilian students in relation to cognitive segmentation during the translation process — was confirmed. Despite the initial assumption that German students would have a higher level of knowledge in the English language and greater mastery of the abstract textual genre in the medical field, the group of respondents registered lower-level segments, as well as the Brazilian students who participated of the first collection at UFPB, with very fragmented texts and a reduced number of words per segment, at most 3 (three). Data analysis evidenced the lack of translation experience, the insecurity regarding the textual genre and the scientific vocabulary. All these data, revealed by the textual segmentation in lower order levels, is a result shared by the two groups of apprentices in the beginning of formation.

Regarding the possibility that the difference between the level of knowledge in the English language between Germans and Brazilians could be reflected in differences in the cognitive segmentation, it was found that this has not been the case, despite considering different teaching structures and political-geographical factors that could facilitate the development of linguistic and extra-linguistic subcompetences of the group of German students, for example. The similarity in the cognitive segmentation of Germans and Brazilians,

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at an early stage in translation training, regardless of different levels of linguistic and extralinguistic training, seems to emphasize the need for translation training to prioritize the development of specific translator subcompetences (knowledge about translation, instrumental and strategic), considering that the linguistic and extra-linguistic subcompetences are developed and shared by other qualifications (Hurtado Albir, 2005).

The results also lead to the relativization of knowledge about the mother language, in translation training. The reflection, based on the cognitive processing in a foreign language, leads to a comparison with the structures of the mother language, also identifying the need for the development of instrumental and strategic subcompetences for text production in the mother language. Likewise, the psychophysiological components need to be put into perspective when collecting and using unknown software by the participants, such as the use of Translog in the collection in Leipzig, for example.

The characteristics presented by the subjects that attended the PIVIC research suggest a strategic subcompetence that is still underdeveloped. But, as already mentioned, there is still a lot of research data from Leipzig, 2018, (Leipnitz & Pickbrenner, 2020) to be analysed. Future research, which may look at the length of breaks and their influence on the translation process, will be able to more accurately identify the level of translation competence of German students.

In addition to the triangulation of research data in Leipzig (Leipnitz & Pickbrenner, 2020), a second collection in Germany would allow a longitudinal observation and evaluation of the time of training in translation for the continuous development of the translation competence of the investigated group. The results of the study carried out at the Translation Course at UFPB led to the reorganization of the curriculum structure, the new *Projeto Pedagógico do Curso* – PPC (Pedagogical Project for the Course), implemented since 2016 (Assis et al., 2018).

The observations and challenges faced by the researchers during the scientific initiation project at UFPB, as well as the results of their analyses, reflections and categorizations, based on data from the cognitive segmentation process of two groups of apprentices in translation into languages with such diverse structures — Portuguese and German — had a great impact on the training of students and teachers of the translation course. The reflection on processes common to apprentices in comparison with the behavior of professionals pointed out the researchers to new methodological possibilities for teaching-learning in translation courses.

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[i] The translation task is understood here as "a work unit in the classroom, representative of the translation practice, which is intentionally directed to the learning of translation and is designed for a specific purpose, structure and sequence of work" (Hurtado Albir, 1999, p. 56).

[ii] In this research, only the addition of text in the translation was considered positive textual production.

[iii] The procedures for data collection, the profile of the subjects, as well as initial results of the research are available in Leipnitz and Pickbrenner (2020).

[iv] The breadth of the spectrum of languages involved in the translation process in research in Germany aimed at including a larger number of participants and providing opportunities for a contrasting analysis of the results.

[v] Restriction problems for installing software in the laboratories of the University of Leipzig prevented the whole group of participants from use of Translog.

[vi] The establishment of a 5-second pause time follows the guidelines of previous studies, developed by researchers such as Alves (2005), who sought to establish rhythmic patterns for the duration of pauses in a Translog environment. In Ferreira's research (2010, p. 36), the author cites Jensen (2001), who divided the pauses into two groups: pauses of up to 3 seconds, related to the typing speed and the subject's motor coordination, and pauses of 3 to 5 seconds, which would indicate cognitive effort.

[vii] The data of this subject were not disregarded in the analysis of cognitive segmentation, although s/he has a different training, in comparison to the others. The student does not present different behavior from the group, thus not compromising the results. In future data triangulation, this conduct may be reassessed.

[viii] In this research, segments consisting of only one verbal form were also classified as Clause. This decision, in line with the structural differences of the German language, understands that, by segmenting the verbal form, the student cognitively processed a segment of greater meaning, which would include some complement.
[ix] The 05 (five) subjects of the research in Germany are identified as D01 to D05.
[x] It should be noted that the degree of difficulty attributed to the text by the research subjects corresponds to a subjective indicator and would not necessarily coincide with the degree of reading difficulty previously stipulated when choosing the source text. However, when selecting the technical-scientific text for research in Brazil, the Flesch Kincaid Reading Ease indicator was used to calculate the level of difficulty of the text (See Flesh, R. The art of readable writing. Harper, 1974), and the result classified the text as difficult. The same text was used in the translation task in Leipzig.

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