Literalization in the self-revision process of novice and experienced biomedical translators

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This paper explores decision-making in translation focusing on the self-revision process of novice and experienced translators of biomedical content in the English to European Portuguese language pair. Adopting process- and product-oriented methods, an experiment was designed to study thirty translations of a 244-word instructional text about a medical device intended for health professionals. The data elicited from fifteen novice translators and fifteen experienced translators included keylogging and screen-recording data. These data were triangulated and analyzed to describe the translation solutions in the interim and final versions in response to problematic translation units and to test if, during the self-revision process, novice and experienced translators tend to proceed from more literal versions to less literal ones, or vice versa, in biomedical translation. Contrary to expectations, the analysis points towards a literalization phenomenon in the translators' processes. The data also indicates that the tendency to proceed from less literal versions to more literal ones is more pronounced in novice translators than in experienced translators. The findings reported here shed new light on the self-revision processes of novice and experienced translators and their relationship with prevailing translation norms, and enable us to better understand the practices in place in professional biomedical translation.

Keywords: self-revision, literal translation hypothesis, experienced translators, translation process research, biomedical translation

1. Introduction and research objectives

Translation is assumed to be governed by norms shared within a specific community. These norms inform what is considered appropriate and inappropriate behavior in a certain context (Toury 2012: 63). A translator's success is often linked

to his or her competence to navigate through existing alternative and competing norms, knowing what norms are applicable and not applicable to a particular context (e.g., target culture, language and text-type), and understanding when, how, and why such norms should be applied.

Descriptive studies of translation norms do not usually adopt process-oriented methods to investigate the underlying decision-making processes that occur during translation. However, adoption of these approaches can provide a fresh perspective into how translators negotiate alternative and sometimes conflicting norms when drafting their final versions. In this study, process-oriented methods are used to capture the unfolding of the translation process, primarily focusing on what happens when these translators write and rewrite textual solutions to problematic translation units during self-revision.

Self-revision[1] is a commonly-used notion in translation, in both academia and the industry, and yet it is difficult to define precisely what happens during self-revision. Commonly assumed to be one of the essential steps in the translation process, few studies have investigated self-revision in a systematic way combining product and process-oriented studies in medical or biomedical translation.[2] A notable exception is Alves and Vale's (2011) study on the drafting and self-revision of instructions of a blood sugar meter from English and German into Brazilian Portuguese, applying the LITTERAE annotation and search system.

When it comes to self-revision, "[d]ifferent people do the job quite differently", as observed by Mossop (2019: 191). Self-revision may take place at an identifiable, distinct moment, sometimes even hours or days after the translation phase. However, these are not the processes that this study investigates. This study looks at self-revision as a text production process that is not "confined to a separate or redrafting phase" (Shih 2007: 296), since what translation observation has shown us is that some translators translate-by-revising (Mossop 2019: 192) and in their case it is not possible or even desirable to differentiate between the drafting phase and the self-revision phase.

This process provides a great opportunity to study decision-making, which is precisely what this study is interested in. In other words, the unfolding of translation solutions from interim versions to the final version. These interim versions,

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1. There are several competing terms and definitions around the concept of revision, as already documented in Robert, Ureel, Remael and Terryn (2017, p.3), Drugan (2013, p.79) and Robert (2008, p.3), among others. For a thorough review of the literature on the topic, see Robert (2008). To avoid confusion, the term self-revision is used in this paper to mean the translator's own revision as opposed to a revision done by a third party or other revision, following Mossop (2014, 2016, 2019).

2. An example of a study investigating intermediate versions of translations in a systematic way from outside medical translation is Serbina, Hintzen, Niemietz and Neumann (2017).

the intermediate solutions discarded by the translator during the decision-making process that do not surface in the target text, are rarely accessible to a researcher analyzing the product. Yet by comparing the interim version with the final version, a researcher can examine and map the move from a more literal version to a less literal one, or vice-versa, and better understand "the constraints to which translators choose to subject themselves, and of the interdependencies and the relative force of them as constraints on the act" (Toury 2012: 218).

In light of the above, this paper reports on a study which examines the self-revision process of novice and experienced translators in the English to European Portuguese language pair. Fifteen novice translators and fifteen experienced translators were asked to translate a 244-word biomedical text intended for health professionals. A biomedical text was chosen because the most common text-types selected in process-research studies are taken from newspapers, popular science and travel literature, according to Saldanha and O'Brien (2013: 116 (ebook version)). "While these are legitimate text types for translation," the authors added and we agree, "we cannot build more sophisticated process models on evidence from newspaper texts, popular science and travel literature alone" (2013: 116 (ebook version)).

The data elicited in the experiment included keylogging and screen-recording data. These data were triangulated and analyzed to describe the translation solutions in the interim and final versions in response to problematic translation units. In other words, to test the hypothesis that during the self-revision process, novice and experienced translators tend to move from more literal versions to less literal ones in biomedical translation. To understand the differences between novice and experienced translators, this study further tests the sub-hypothesis that, when comparing novice with experienced translators' processes, experienced translators show a more pronounced tendency to move from more literal versions to less literal ones.

Prior to focusing on the data analysis, the following section is dedicated to a literature review of the literal translation hypothesis. This theoretical discussion is followed by the methodology and analysis sections. In the concluding remarks, possible explanations are suggested in relation to risk management and prevailing norms.

2.   Literal translation hypothesis

Studied from different empirical perspectives, literal translation has been a prolific research topic driving the use of multiple methods in the same single study or set of studies (Halverson 2015).

Research on this phenomenon has been especially fruitful in process-oriented studies. Referred to by several researchers as a default translation, literal translation has been interpreted as a strategy that reduces the cognitive load and frees the working memory (Halverson 2015:8; Kotze 2021:117). Following this line of thought, studies on this topic focused on different angles ranging from default translation (e.g., Balling, Hvelplund, & Sjørup 2014; Tirkkonen-Condit, Mäkisalo, & Immonen 2008), cognitive effort (e.g., Schaeffer & Carl 2014), monitor model (e.g., Carl & Dragsted 2012; Tirkkonen-Condit 2005), to automatization and conscious processing (e.g., Schaeffer & Carl 2013; Schaeffer, Dragsted, Hvelplund, Balling, & Carl 2016). For a detailed discussion of the hypothesis and the concept of literal translation, or why the alternative term default translation is less problematic for some authors, see Halverson (2015).

From another empirical perspective, the investigation of literal translation in interim solutions has been described as a source of valuable and insightful information to empirically examine the hypothesis that translators proceed from identical-meaning formal correspondences to not-quite-identical meanings or to structural and semantic shifts only when the first are not available (Ivir 1981:58; Toury 2012:225–226). The same principle is at the basis of Chesterman's literal translation hypothesis, defined as the tendency to proceed from more literal versions to less literal ones during the translation process (Chesterman 2011:26; see also Halverson 2015:5–6).

Also called *deliteralization* (Chesterman 2011:27), the literal translation hypothesis has been tested directly or indirectly by several scholars in different language pairs and text types using interim solution analysis (e.g., Munday 2013; Toury 1995, 2012), think-aloud protocols (e.g., Borg 2017; Englund Dimitrova 2005), and keystroke and gaze data analysis (e.g., Carl & Dragsted 2012; Schaeffer & Carl 2014).

Englund Dimitrova (2005:121), for instance, in her study on expertise and explicitation from Russian into Swedish, combined think-aloud protocols, keystroke logging analysis, and interim solutions analysis. With this multimethod approach, the author observed that professional translators tend to translate short chunks of text which when revised are rendered less literally. She argues that the way translators use literal translation is a matter of expertise, since it seems there is a tendency for professionals to use literal translation as a processing strategy, moving from more literal to less literal solutions. Literal translation is here interpreted as a significant step in the translation process, "an intermediate step", that allows translators "to process larger units, since writing down a part of a sentence in the TL liberates STM capacity for the processing of further parts of

the sentence" (2005: 232–233).[3] This author also suggests that an important aspect of professional competence and expertise is the way in which translators deal with literal translations: "in order to minimize cognitive effort, but also to apply appropriate procedures for evaluation and, if necessary, revision" (2005: 234).

At the basis of the Literal Translation Hypothesis is the assumption that the cognitive process tends to be influenced in the first stages by the formal features of the source text (Chesterman 2011: 26). One of the earliest and most influential studies that is often cited in connection to this is that of Ivir (1981: 58) who described this influence of the formal features of the source text in the following way:

> The translator begins his search for translation equivalence from formal correspondence, and it is only when the identical-meaning formal correspondence is either not available or not able to ensure equivalence that he resorts to formal correspondents with not-quite-identical meanings or to structural and semantic shifts which destroy formal correspondence altogether. But even in the latter case he makes use of formal correspondence as a check on meaning – to know what he is doing, so to speak.

Later, Toury (1995: 275; 2012: 225), when discussing the possible implications of analyzing interim versions to test theoretical hypotheses about the translation act, recovers Ivir's above passage. Toury is here interested in "tak[ing] a cursory look at the *interdependencies* of various constraints and at their *relative force*, which is as close as one can get to establishing the norms which governed this particular act of translating" (Toury 2012: 227, emphasis in the original).

Analyzing the interim solutions, Toury reconstructs the self-revision process from a series of drafts of the Hebrew translation of Hamlet's monologue "To be or not to be" by Avraham Shlonsky (1946) confirming that this translator moved from a more source-oriented version to a more target-oriented one: "one can easily show how, from one stage to the next, the translation gets closer to satisfying an array of target-dominated constraints according to the translator's own concept--the one shared with the culture within and for which he was operating" (Toury 2012: 234).

On this basis, this study sets out to test if, during the translation process, English to European Portuguese translators of biomedical content move from more literal to less literal versions. Following on from the work of Englund Dimitrova (2005), translation processes of novice translators will be compared to those of experienced translators to further understand if the tendency to move

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3. STM is the abbreviation for Short Term Memory.

from more literal versions to less literal ones is less predominant in novice translators, or vice-versa.

3.   Methods and materials

This experiment was conducted as part of a larger empirical research project on biomedical translation from English to European Portuguese which included, among others, collecting product and process data of novice and experienced translators while translating an instructional text about a medical device.[4] The present paper reports on the analysis of part of this data to study the self-revision process of the participant translators as observed in the experiment carried out between June 2017 and January 2018. To pre-test the materials and instruments, a pilot study was conducted between December 2015 and January 2016 with three novice translators and three experienced translators. The lessons learnt from the pilot study were implemented in the experiment described in the following sections.

3.1   Participants

There are 30 participants in this experiment: 15 novice translators and 15 experienced translators. The novices' group included translators with up to two years of full-time experience. The majority held higher education degrees in translation from Portuguese universities and had in addition completed at least one year of a master's program in translation at a Portuguese university ($n = 13$). All reported having experience with medical and biomedical translation. The experienced group included translators with work experience ranging from eleven to twenty-nine years. Most of these translators (twelve) held a higher education degree in translation and were specialized in either medical translation or related areas, or had experience translating medical and biomedical content. All of the participants were native speakers of European Portuguese, and English was one of their source languages.

Some of the participants are personal acquaintances and agreed to participate. The remaining participants volunteered in response to a call for participants posted on dedicated Facebook pages for professionals and student associations or after being contacted by e-mail following a selection of appropriate profiles

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4. This experiment was conducted as part of a PhD research carried out in *co-tutelle* at University of Lisbon and Ghent University. For the description and context of the whole research project, see Valdez (2019).

on Proz.com and the websites of the two Portuguese Translator Associations (APTRAD and APT).[5] With respect to novice translators, several staff members of Portuguese universities with higher education degrees in translation were contacted by e-mail and asked to provide contact details of translators who fit the profile. There was no compensation for participating.

3.2   Translation task and elicitation material

The task consisted of translating a short 244-word biomedical text from English to European Portuguese: a package insert with the description, indications, warnings, precautions, and instructions for use of a medical device.[6] The text was authentic but slightly manipulated to remove references to product names.

The translators were sent the translation brief by e-mail, along with the informed consent and the source text. The participants were instructed to translate bearing in mind that if it were a real situation, the translation would be published in a leaflet, printed on paper and published online for distribution by an international biopharmaceutical company. The intended audience were health professionals. In addition, the client had not sent any resources or additional information other than the text itself.

Translations were carried out with access to paper and online documentation sources (at the discretion of the participant) and no time pressure was introduced. In order to ensure ecological validity, the participants were asked to perform the task at their work or study place. However, one experienced translator preferred to perform the task at my office.

All data were treated anonymously, which meant that the participants' identities were not known to the researcher during the analysis. To this end, the participants were assigned reference numbers and, later, fictitious names for the drafting of the report.

3.3   Data collection methods

The text was translated using the keylogging software Translog-II to record all keystrokes, mouse clicks and time intervals allowing the flow of the translation

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5. APTRAD is the abbreviation for Associação de Profissionais de Tradução e de Interpretação (Portuguese Association of Translators and Interpreters), and APT is the abbreviation for Associação Portuguesa de Tradutores (Portuguese Association of Translators).

6. A medical device, ranging from a pad to an MRI machine, is any instrument or product intended to be used specifically for medical diagnosis or treatment (European Parliament 2007, pp. 23–24; see WHO 2021).

process to be observed (Carl 2012: 2). The onscreen data not captured with Translog were recorded with the software Flashback by Blueberry Software. In order to attain a more comprehensible and significant insight into the translation process, keylogging and screen-recording data collection methods were combined in order to ensure data triangulation (Saldanha & O'Brien 2013: 83 (ebook version)).

The tools used in the data collection, even if common in process-oriented studies, are not part of translators' typical workflow. Therefore, it should be assumed that participants were continually aware that their performance was being recorded and that this can have potential effects on the data. In spite of this, these elicitation techniques are considered methods with high ecological validity (see Englund Dimitrova 2005: 75).

3.4   Methodology for data analysis

The self-revision process was reconstructed triangulating the Translog keylogging data with the screen-recording data. To analyze the self-revisions from a product perspective, the problematic translation units were first identified (Section 3.4.1.). This was followed by the identification and classification of the first sequential written text (first interim version) and all posterior changes made to the problematic translation units until reaching a target text. The classification adopted was adapted from Chesterman (2016) (Section 3.4.2.).

3.4.1   Identification of problematic translation units in the process data

For this study, the units of analysis are the problematic translation units. Instead of assuming what is problematic for the translator on the basis of a source text analysis, the problematic translation unit is "identified on the basis of cognitive processes observable (indirectly) in a set of data" (Dragsted 2004: 32). In order to identify these candidates of problematic translation units, we built on Krings' (1986: 121) proposal of problem indicators and following adaptations of Göpferich (2010a: 116–118; 2010b: 8), and Englund Dimitrova and Tiselius (2014).[7]

Not all of Krings' indicators were considered relevant and additional indicators were assumed to be relevant for our keylogging and screen-recording data resulting in 3 primary and 4 secondary indicators (see Table 1). For instance, Göpferich (2010a: 117) and Krings (1986) consider "gaps in the target text resulting from not knowing how to translate certain source-text units" to be primary

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7. Krings (1986) reports on an experimental study of German language students translating a text intro their first language or vice-versa based on think-aloud protocols and handwritten target texts.

problem indicators. For our data, this indicator did not properly describe the captured translation process in the keylogging files and in the screen-recording files and hence problem indicators 2, 3, and 7 were added to distinguish between alternative translation solutions, postponed decisions, interim versions and omissions. Krings (1986) also includes other secondary problem indicators which were not considered applicable for this study (Göpferich 2010a): underlining the source text since, in the present study, the translations were conducted on a computer; revisions in the target text, which for the purposes of this paper are included in the definition of an interim version; and think-aloud data, which was not elicited for this study and hence is not considered relevant, including the participants' reflections on the function of the target text and other similar issues, verbalizations of negative evaluations of target-text units by the translator, vocalized non-lexical phenomena such as sighing, and the inability to think of an equivalent.

Table 1. Relevant primary and secondary problem indicators (based on Krings 1986)

Primary indicators	Secondary indicators
1. consultation of documentation	4. interim version
2. writing alternative translation solutions	5. pause of, at least, 1 second
3. postponed decisions	6. omission
	7. non-translation

More concretely, the phenomena that were considered primary problem indicators were:

1.   consultation of any documentation external to the source as, for example, dictionaries, databases, translation memories, machine translation software
2.   writing alternative translation solutions referring to when the translator postpones their decision by writing several possible translation solutions, often separated by a forward slash ('/')
3.   postponed decisions through the use of punctuation marks which signal doubt such as question marks or suspension points

The phenomena that were considered secondary problem indicators were:

4.   an interim version referring to a first version of a translated segment that is changed once or as many times as needed until reaching the final version
5.   a pause of, at least, 1 second
6.   omission, which may indicate omission as a conscious translation solution or a problematic area to be resolved at a later stage

7. non-translation, which may indicate a loan as a conscious translation solution or a problematic area to be resolved at a later stage

A problem is identified when at least one primary problem indicator or two secondary problem indicators are found in the process data following Krings (1986).

Table 2 and Table 3 illustrate the distinction between alternative translation solutions, postponed decisions, and interim versions.

Table 2 provides an example of an alternative translation solution and of a postponed decision from the keylogging file of the novice translator Graça. On the left, the keylogging data shows that Graça used a forward slash to signal she was not sure at that moment if she should opt for "impermeável" or "resistente". This is interpreted as alternative translation solutions. By looking at the final target text we can see that she opted in the end for "impermeável". We can also see on the left that she added a question mark next to the word "barreira" signaling a postponed decision. This decision was not changed in a sequential self-revision as we can see in the final target text.

Table 2. Draft data, segment 3 of Novice Translator Graça

	Draft 1	Final TT
Segment3	O••Penso•com•Compressa•Não•Aderente••é• um•pens•• ◄so•impermeável••/resistente•à• a◄água•••••••e•com•uma•barreira?•antiviral• e•antibacteriana.	O Penso de Película com Compressa Não Aderente é um penso impermeável, com uma barreira antiviral e antibacteriana.

Table 3 provides an example of an interim version from the keylogging file of the novice translator Luísa. In this example, we can see that Luísa writes with hardly any pauses. After finishing writing the whole sentence, she stops and, after a short pause, replaces the word "traumas" with "danos."

Table 3. Draft data, segment 14 of Novice Translator Luísa

	Draft 1	Final TT
Segment 14	Não•esticar••o•penso•duante•a•aplicação, •visto•que•a•tensão•pode•causar•traumas•na•pele.•←← ←←←←←←←◄◄◄◄◄dano•	Não esticar o penso duante a aplicação, visto que a tensão pode causar danos na pele.

The data were thus analyzed on the basis of the following process:

1. Comparing the keylogging file with the screenrecording file to identify and extract potentially problematic units and corresponding solutions based on the previously described indicators (see Table 1).
2. Logging in a separate file the first interim solution and the target version for each problematic unit.
3. Classifying the solutions in the interim versions and target texts based on the categorization described in the next section.

3.4.2   Classification of the interim versions and target texts

To test the literal translation hypothesis, it was not enough to identify the problematic translation units. We also had to identify the cases of literal translation in the interim versions and the target texts in response to translation problems. With this in mind, and having first identified the problematic units, the first interim version[8] and the final version were paired with the corresponding source text and the solutions were classified. These were categorized adopting and adapting Chesterman's (2016) proposal of thirty syntactic, semantic and pragmatic translation solution types (which he called "strategies"[9] at the time of writing). For a review of this proposal see Chesterman (2016) and for a review of the conceptual background of literal translation see Chesterman (2011: 24–25).

Based on Chesterman's proposal, the identified cases of literal translation were categorized as:

1. *syntactic or structural calque*: In a syntactic or structural calque, the translator opts to copy[10] the source structure. This translation solution type is often called literal or word for word translation and it is considered a grammatical target language unit. Examples:
   ST: Press the dressing into place.
   TT: Pressionar o adesivo no local. [Anabela, NT]
   TT: Pressione o adesivo no local. [Bárbara, NT]
         [Gloss: *Press the dressing on the place/site.*]

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8. As a methodological decision, only the first version of a translation unit was considered.

9. Recall that Chesterman's typology uses the term strategies for local changes. In the update section of the 2016 edition of *Memes of Translation*, Chesterman, after reading Gambier's (2016) entry, recognizes the terminological confusion (see 2016, Chapter 4). Even though Chesterman's typology was adopted and adapted for the analysis of the corpus, usage of the term follows my own choice and is based on Pym (2017).

10. Pym (2017, p. 3) names this solution type the "copying structure," defining it as "Syntactic or compositional structures are brought across from one language into another."

2. *lexical calque:* In a lexical calque, the translator opts for the target word ortho-
   graphically closest to the source and corresponding broadly to the semantic
   meaning of the source. Example:
   ST: The dressing <u>consists of a</u> non-adherent, absorbent pad …
   TT: O penso <u>consiste numa</u> almofada absorvente, mas não aderente …
        [Bárbara, NT]
        [Gloss: *The dressing <u>consists of one</u> cushion absorbent but non-adherent*
        …]

3. *false friends:* Translators also opt for target units which resemble the form of
   the source unit, but which have a different meaning. This is commonly known
   as false friends or *faux amis*. This translation solution type is not considered
   by Chesterman (2016: 85–112). Examples:
   ST: Open package and remove <u>sterile</u> dressing.
   TT: Abra a embalagem e retire o penso <u>estéril</u>. [Bárbara, Graça, Nelson,
        Odete, NT]
        [Gloss: *Open package and remove <u>sterile</u> dressing.*]
   TT: Abra a embalagem e remova o invólucro <u>estéril</u>. [Julieta, NT]
        [Gloss: *Open package and remove <u>sterile</u> casing.*]

"Sterile" is here translated as "estéril" (meaning infertile) instead of "esterilizado"
(meaning sterilized). The use of "estéril" as a synonym of "esterilizado" has
become very common to the point that on the Infarmed[11] website the word
"estéril" appears 875 times, "esterilizado" eighty-seven times, and "esterilizada"
146 times.[12]

4.   Data analysis

Focusing only on literal translation, this section analyzes the cases of syntactic
calque, lexical calque and false friends identified in the first interim version
and the target text as a response to problematic translation units. The data are
divided per translator group, that is novice translators (4.1.) and experienced
translators (4.2.).

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11. Infarmed – the National Authority of Medicines and Health Products – is the Portuguese
agency responsible for the evaluation, authorization, regulation and control of human medi-
cines and health products. Its website is http://www.infarmed.pt.

12. The search was conducted on October 25, 2017.

4.1 Novice translators

Table 4 shows the number and relative proportion of syntactic calques, lexical calques and false friends done by each novice translator in the first interim version.

Table 4. Literal translations in the first interim version (categories, number and relative proportion) per novice translator. Row percentages

	Syntactic calque (%)	Lexical calque (%)	False friend (%)	Total each participant (%)
Anabela	2 (100)	0	0	2 (100)
Bárbara	0	0	0	0 (100)
Carolina	0	1 (100)	0	1 (100)
Dora	1 (100)	0	0	1 (100)
Elzira	9 (100)	0	0	9 (100)
Felícia	4 (36)	7 (64)	0	11 (100)
Graça	0	1 (100)	0	1 (100)
Hermínia	7 (78)	2 (22)	0	9 (100)
Iolanda	1 (14)	5 (71)	1 (14)	7 (100)
Julieta	6 (35)	8 (47)	3 (18)	17 (100)
Luísa	7 (88)	0	1 (13)	8 (100)
Manuel	0	2 (100)	0	2 (100)
Nelson	4 (33)	8 (67)	0	12 (100)
Odete	2 (29)	4 (57)	1 (14)	7 (100)
Pedro	2 (100)	0	0	2 (100)
Total each category	**45 (51)**	**38 (43)**	**6 (7)**	**89 (100)**

It can be seen from the data in Table 4 that all participants, except for Bárbara, used literal translation in their first interim version. The variation between the translators is considerable, though. At one end, Bárbara's logs show no cases of literal translation. At the opposite end, 17 cases of literal translation were identified in Julieta's logs. At global level, syntactic calque represents the largest group, followed closely by lexical calques; these two categories together form more than 90% of the cases of literal translation. There are very few cases of false friends among the interim versions (less than 10%).

Table 5 provides the number and relative proportion of syntactic calques, lexical calques and false friends created by each novice translator in the target text. This table shows some similarities to the data in the previous table (Table 4). The translators continued to opt to solve problematic translation units by translating literally. All translators, even Bárbara, employed predominantly syntactic and lexical calque. Overall, and at individual level, the use of lexical and syntactic calque does not differ meaningfully. False friends, as in the interim versions, constitute the smallest group. Nevertheless, the variation between translators continues to be significant: Carolina with 9 cases of literal translation, and Hermínia and Luísa with 43 each.

Table 5. Literal translations in the target text (categories, number and relative proportion) per novice translator. Row percentage

	Syntactic calque (%)	Lexical calque (%)	False friend (%)	Total each participant (%)
Anabela	5 (45)	5 (45)	1 (9)	11 (100)
Bárbara	5 (42)	7 (58)	0	12 (100)
Carolina	2 (22)	5 (56)	2 (22)	9 (100)
Dora	2 (15)	9 (69)	2 (15)	13 (100)
Elzira	15 (54)	12 (43)	1 (4)	28 (100)
Felícia	6 (46)	7 (54)	0	13 (100)
Graça	9 (36)	14 (56)	2 (8)	25 (100)
Hermínia	23 (53)	20 (46)	0	43 (100)
Iolanda	4 (18)	14 (64)	4 (18)	22 (100)
Julieta	12 (43)	13 (46)	3 (11)	28 (100)
Luísa	28 (65)	13 (30)	2 (5)	43 (100)
Manuel	12 (44)	14 (52)	1 (4)	27 (100)
Nelson	14 (41)	20 (59)	0	34 (100)
Odete	12 (44)	10 (37)	5 (19)	27 (100)
Pedro	16 (57)	11 (39)	1 (4)	28 (100)
Total each category	**165 (45)**	**174 (48)**	**24 (7)**	**363 (100)**

When comparing the data from Table 5 on the use of literal translation in the target text with data from the previous Table 4 on interim versions, a clear trend emerges. While self-revising, these novice translators proceeded from less literal versions to more literal ones, with no exceptions. While in the first interim

versions, a total of 89 cases of literal translation were identified, 363 cases were identified in the target texts. This is surprising. Contrary to expectations, these novice translators used self-revision to move closer to the source text, falsifying our initial hypothesis.

The increase is also seen across the vast majority of categories at individual level: in all target texts there is a higher number of syntactic calques and false friends, both at overall and at individual level. The same can be said for lexical calques except for one translator. The analysis of Felícia's logs shows that the number of cases of lexical calque remains unchanged in the interim and target texts (7 each).

4.2   Experienced translators

Table 6 shows the distribution of the different categories of literal translation (syntactic calques, lexical calques and false friends) in the first interim version per experienced translator.

Table 6. Literal translations in the first interim version (categories, number and relative proportion) per experienced translator. Row percentage

	Syntactic calque (%)	Lexical calque (%)	False friend (%)	Total each participant (%)
Amélia	9 (60)	5 (33)	1 (7)	15 (100)
Beatriz	12 (52)	10 (43)	1 (4)	23 (100)
Catarina	10 (50)	10 (50)	0	20 (100)
Débora	3 (27)	8 (73)	0	11 (100)
Eva	17 (47)	17 (47)	2 (6)	36 (100)
Filipa	17 (44)	20 (51)	2 (5)	39 (100)
Gonçalo	29 (49)	29 (49)	1 (2)	59 (100)
Helga	10 (37)	16 (59)	1 (4)	27 (100)
Ivone	13 (43)	17 (57)	0	30 (100)
Josélia	9 (43)	12 (57)	0	21 (100)
Lúcio	23 (49)	24 (51)	0	47 (100)
Maria	13 (50)	13 (50)	0	26 (100)
Nádia	24 (49)	24 (49)	1 (2)	49 (100)
Orlando	26 (49)	26 (49)	1 (2)	53 (100)
Pilar	36 (50)	35 (49)	1 (1)	72 (100)
Total each category	**251 (48)**	**266 (50)**	**11 (2)**	**528 (100)**

As shown in Table 6, literal translations were identified in the first interim version, of which lexical calque and syntactic calque are the largest groups. This result is similar to that of novice translators. From this table, we can also see that the variation between experienced translators is significant. While Débora's logs show 11 cases of literal translation, Pilar's logs show 72 cases.

When comparing the data from novice translators with data from experienced translators (Table 6 and Table 4), we can see that, surprisingly, experienced translators' logs show a considerably higher number of cases of literal translation in the first interim version in comparison to novice translators: a total of 528 cases versus 89. This result is somewhat counterintuitive. One might have expected that novice translators would have used literal translation more often in response to problematic units in the first interim version. After all, previous studies have reported that individuals with little experience in translation tend to replace source language words with target language words as a predominant strategy (Plońska 2014: 70; Płońska 2016: 279).

Table 7 presents the distribution of the different categories of literal translation for each experienced translator in the target text.

Table 7. Literal translations in the target text (categories, number and relative proportion) per experienced translator. Row percentage

	Syntactic calque (%)	Lexical calque (%)	False friend (%)	Total each participant (%)
Amélia	11 (52)	9 (43)	1 (5)	21 (100)
Beatriz	22 (58)	14 (37)	2 (5)	38 (100)
Catarina	13 (54)	11 (46)	0	24 (100)
Débora	6 (40)	9 (60)	0	15 (100)
Eva	10 (53)	8 (42)	1 (5)	19 (100)
Filipa	16 (44)	18 (50)	2 (6)	36 (100)
Gonçalo	53 (50)	53 (50)	0	106 (100)
Helga	13 (34)	23 (61)	2 (5)	38 (100)
Ivone	23 (38)	36 (59)	2 (3)	61 (100)
Josélia	17 (46)	20 (54)	0	37 (100)
Lúcio	27 (49)	28 (51)	0	55 (100)
Maria	15 (50)	15 (50)	0	30 (100)
Nádia	28 (50)	28 (50)	0	56 (100)
Orlando	58 (49)	58 (49)	2 (2)	118 (100)
Pilar	40 (50)	39 (49)	1 (1)	80 (100)
Total each category	**352 (48)**	**369 (50)**	**13 (2)**	**734 (100)**

From Table 7, we can see that the identified number of cases of literal translation in the target texts in response to translation problems varies considerably as with novice translators. Interestingly, Débora is once again the translator with the lowest number of literal translations (15). However, the highest number does not belong to Pilar, but to Orlando. As in the first interim versions, the most frequent categories are lexical and syntactic calques and the distribution of these categories is very similar.

Comparing the first interim versions with the target texts of the experienced translators, there is a clear tendency to move from less literal versions to more literal ones for all but one individual. The exception is Filipa, who proceeded from a slightly more literal version to a less literal one.

Overall, these results indicate that, during the translation process, the participating translators--both novice and experienced--tended to proceed from less literal versions to more literal ones, falsifying the initial hypothesis. When comparing novice to experienced translators, it also becomes apparent from the data that the novice translators show a more pronounced tendency to move from less literal versions to more literal ones. The data show a percentage increase of 308% in the case of novice translators in comparison to 39% in the case of experienced translators.

5.   Concluding remarks

This paper reported on a study designed to test the literal translation hypothesis. The triangulation of process-oriented methods, keylogging and screen recording, allowed for an analysis of the first interim version and the target text from a product perspective.

Based on the literature, the initial hypotheses were that (1) during the self-revision process, both novice and experienced translators tend to move from more literal versions to less literal ones in biomedical translation, and (2) experienced translators show a more pronounced tendency to move from more literal versions to less literal ones.

Contrary to expectations, however, the data suggest a literalization phenomenon in the novice and experienced translators' processes. Of 30 translators, 29 proceeded in a literalizing direction, that is from less to more literal. This finding is contrary to previous studies which have suggested that translators deliteralize (see Chesterman 2011: 27).

The results also show clear differences between novice and experienced translators that are surprising and revealing. First, experienced translators' interim versions show a significantly higher number of cases of literal translation than that

of novice translators. Second, and perhaps connected to the above, novice translators show a clearly more pronounced tendency to move from less literal versions to more literal ones. From the analysis of the data, for these participating translators and under the conditions of this study's experiment, one of the aims of the self-revision was to move closer to the source text and source language. Contrary to what happens in Englund Dimitrova's study, for instance, translators do not "work consistently to" "remove structures which they deem to be too similar or close to those found in the SL and the ST" (Englund Dimitrova 2005:118). These translators choose the precise opposite.

A possible explanation for these results may be related to the domain of the source text. Biomedical texts may be a relevant variable that explains why in some cases translators may proceed from less literal versions to more literal ones. The difficulty of the subject matter together with the potential impact on patients' health may be behind this literalization phenomenon. In an attempt to avoid the risk of changing the source message and potentially harming the patient, translators literalize when self-revising. This literalization found in the data from the translators may be interpreted as a pre-emptive strike, a defensive stance by the translators who believe they are safer when they stay closer to the authority of the source text by means of a literal translation. For these translators, it may be too risky to deviate from the source text. As suggested by Bei Hu (2020:32), risk management may explain such a tendency: "The translator adheres to a prevailing norm because that is what others typically do, and hence it is a safe choice; the motivation underlying a translator's choice of norm-breaking derives a real risk (or a reward) perceived in a given situation."

Another possible explanation, closely connected to the above, may be related to the prevailing norm and translators' shared beliefs and expectations. Translators' shared beliefs about what the relationship between the source and target contexts should be like (adhering predominantly to the norms realized in the source text or dominant in the target language and culture, Toury 2012:79–81) and their expectations about what the reviser and the reader expects from them ("expectations of expectations", Hermans 1999:52) may be relevant variables that contribute to the literalization phenomenon. This is particularly significant especially if considering that there is evidence to assume a tendency towards source-oriented norms in translation from English to European Portuguese. Previous studies have suggested that literal translation favors source-oriented strategies, for example: the translation of forms of address in *Robinson Crusoe* (Rosa 2000) and the use of loan words in published translations of fictional texts (Frankenberg-Garcia 2005), among others. Given the study's limitations, however, is not possible to confirm these possible explanations nor to explore other potential reasons.

Further work is needed to understand the findings in this report, and to better understand:

– Under what conditions do we find a tendency towards literalization in self-revision (see Chesterman 2011: 34)?
– To what extent were the English to European Portuguese language pair, the directionality and/or the text-type and subject (i.e., an instructional text of a medical device) relevant factors?

Therefore, we believe that further research could focus on testing the literal translation hypothesis under similar conditions with different, highly specialized texts within medical and biomedical translation. It could also be particularly useful to combine the methodology of this study with a participant-oriented method (i.e., questionnaires, interviews, focus groups) to elicit translators' beliefs and expectations and shed further light on the constraints that translators face.

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