

## Translators' 'End-Revision' Processing Patterns and Maxims: A Think-Aloud Protocol Study

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### Abstract

This project investigates translators' end-revision process by means of think-aloud protocols. It aims to investigate translators' revision processing patterns and maxims, particularly after their first drafts have been produced (i.e. end-revision). Data suggests that translators manage their time and efforts rather similarly by concentrating mostly on producing their first drafts. Yet, two patterns emerge after the first drafts. One group of translators is found to have a second peak in terms of their processing time and efforts, particularly after a break. The other group of translators is found to simply glance through their drafts without much processing efforts. On the one hand, translators are found to read and process their TT in its own right and handle revision problems as they go along in the drafting phase. On the other hand, they also actively search for potential problems in their TT with potential translation/revision maxims in mind in the end-revision phase. The most prominent type of revision being made is found to be at the lexical level, confirming results from previous studies on revision. In addition, translators are also found to process their drafts in longer chunks without backtracking in later phases of revision.

*Keywords:* Translation revision, think-aloud protocols, processing patterns, revision maxims, end-revision, cognitive translation process.

## 1. Introduction

Cognitively oriented research has enjoyed increasing interests in Translation Studies in recent years. Major publications include the Copenhagen Studies in Language Series (Göpferich et al., 2008; Göpferich et al., 2009; Mees et al, 2009), *Translation and Cognition* (Shreve & Angeline, 2010), *Methods and Strategies of Process Research* (Alvstad et al, 2011) and *Cognitive Exploration of Translation* (O'Brien, 2011). These volumes display a diversity of new approaches to the study of translation process. We are seeing studies embracing a combination of data collection methods, such as key logging software, screen recording software and eye tracking software. Such new approaches or, rather, data collection methods offer a wealth of statistical and numerical records that enable researchers to re-play translators' real-time eye movements and/or keyboard activities on-screen. Yet, it seems that researchers using such new approaches are faced with the same old dilemmas as their predecessors in translation process research, if not even more so, in the sense that developing effective means of analysing such an abundance and variety of raw data is pivotal to the potential implications of such studies. In other words, these new approaches require systematic and robust analytical frameworks so that more reliable findings from individual studies can be yielded, compared and drawn upon for generalisation and for further hypothesis testing.

The present study represents a research project using a customary data collection method, i.e. think-aloud protocols, in translation process research. It can be seen as the second part of a previous study on translators' perceived (self-) revision procedures and behaviours (Shih, 2006). However, in contrast to the earlier study, when translators were merely asked to report what they do or how they perceive revision, in the present study, they were also asked to translate and revise a piece of work. It is to be noted that subjects in this study were from the same cohort of translators who were interviewed in the earlier study (Shih, 2006). Twelve of them agreed to perform the translation and revision after the interviews. Thanks to this, translators' perception of revision and their actual revision behaviours can be compared and contrasted. It is important to point out here that the present study primarily focuses on describing translators' re-drafting revision behaviours. This is often termed "end-revision" by scholars (e.g. Alves et al, 2010; Jakobsen, 2002, p. 193; Jakobsen 2003, p. 80), which is in contrast to "on-line revision", i.e. revision done while producing the first draft. The present study aims to investigate potential processing patterns regarding translators' time and efforts spent in different phases of "end-revision". This is a unique line of approach since to the best of my knowledge, there are no studies to date specifically investigating how translators manage their time and efforts in different "end-revision" phases. A second aim of the present study is to identify the types of revision changes being made or checked-for (these are termed, "revision checked-for items" in the present study) in the "end-revision" phases and how this may be linked to their revision maxims. In the following, I am going to review a number of recent studies in translation process research that address "end-revision".

Englund Dimitrova (2005) used think-aloud protocols (TAP) and a key logging software, called ScriptLog to record evidence of her subjects' translation process. Nine translators with various degrees of experiences were asked to think aloud while translating a short piece from Russian into Swedish using ScriptLog. The translation process was divided into three phases for investigation: the pre-writing phase, the writing phase and the post-writing phase, based on Hayes et al's (1987) writing model.

Three of Englund Dimitrova's main findings in the post-writing phase, i.e. the end-revision phase, are particularly relevant to the present study and will be looked into in detail here. The first finding is related to "task definition" (again a term borrowed from Hayes et al's writing model), the second is the number and types of revision actually made and the third is the relative allocation of time spent in each phase. "Task definition" indicates the goal or plan that a translator may have set in revising their translation (Englund Dimitrova 2005: 106). Her data show that subjects often make planning statements. For instance, some translators remarked that they needed a paper print-out of the TT to enable them to revise at ease. Others stressed the need to let the text rest before revising it. However, three out of the four professional translators said that they did not normally leave their draft aside before revising it (ibid: 137). This result tallies with those of Shih's (2006) interview study where the majority of translators claimed not to be able to put their drafts away (for long). One other interesting finding is that a few of her translators had specific goals in mind in each of the sub-phases of the post-writing process. But on the whole, Englund Dimitrova concludes that a discrepancy is found between the goals or plans translators expressed in TAPs and what they actually do. This is also what the present study intends to examine, i.e. whether there is a gap between translators perceived revision maxims and their actual revision checked-for items.

In terms of what kinds of revision changes are made and the relative proportion of these revision changes, Englund Dimitrova (ibid) categorises revision changes into six types:

- 1) Syntactic revision: structural changes, re-shuffling word orders, etc.
- 2) Lexical revision: simple exchange of one word for a synonym.
- 3) Morphological revision: e.g. nouns are changed into verbs.
- 4) Content revision: additions or omission in the content but not necessarily in relation to the ST.
- 5) Orthographic revision: typographical or punctuation revision.
- 6) Other: unclear category.

Regarding the relative frequencies of these revision categories, lexical revision was found to be the most frequent category (almost 50%) among all subjects. The second most frequent category is syntactic revision. In fact, these two categories amount to almost 70% of all revision changes. However, the number of syntactic revision changes appears higher in the writing phase than the post-writing phase. This prompts Englund Dimitrova (2005) to conclude that in the writing phase, translators tend to focus more on getting the TT syntactical structures right, whereas in the post-writing phase they focus more on getting the lexical items within these syntactical structures right.

Englund Dimitrova (ibid) observes that a relatively large proportion of time was spent in the post-writing phase among all her subjects, irrespective of their years of professional experience. In fact, several of her subjects have up to five sub-phases (five drafts) in their post-writing phase. A similar finding was reported by Jääskeläinen (1999: 122) that one translator spent considerably more time on the post-writing phase. These findings serve as an inspiration for the present study, which seeks to establish what translators actually do and how they manage their time and processing efforts in their end-revision phases even though they often claim not to have much time to revise.

In Alves and Vale's (2011) study, three sets of data were collected by means of Translog (key logging software), Camtasia (on screen recording software) and direct observation, although only the Translog data were analysed. Twelve translators were asked to translate two correlated instruction manuals. Six of them were asked to translate from English into Brazilian Portuguese and the other six from German to Brazilian Portuguese. All the translators were allowed on-line

documentations resources and no time limit was imposed. The study aimed to “investigate prototypical characteristics of the drafting and revision phases of the translation process” (ibid: 105), and was based on a previous study by the same researchers (Alves and Vale 2009) in which translators' drafting and revision patterns were analysed in terms of their micro and macro translation units (TUs). The concept of micro TUs was developed primarily on the basis of one of the most prominent features of Translog data, which is the measurement of pauses between each keyboard activity. Hence, a micro TU is defined as “a translation unit [that] begins with a pause that is registered by key logging and evolves in a continuous production phase until it is interrupted by another pause.” (Alves et al 2010: 129), and “A macro TU is defined as a collection of micro TUs that comprises all the interim text productions that follow the translator's focus on the same ST segment from the first tentative rendering to the final output that appears in the TT.” (ibid) Their 2011 paper's main research findings are that macro TUs (MTU) can be divided into three categories.

- MTUs containing micro units which are processed solely during the drafting phase (P1 type)
- MTUs containing micro units which are processed once in the drafting phase and finalised in the revision phase (P2 type)
- MTUs containing micro units which are processed during the drafting phase and taken up again during the revision phase (P3 type)

(ibid: 105)

More interestingly, Alves and Vale's analysis indicates a hierarchical structure of these three types of macro TUs in the sense that the P1 type is the most prominent and frequently occurring type, P2 the second and P3 the least. This suggests that most revision text segments (i.e. micro TUs) are handled in the on-line drafting phase rather than in the end-revision phase per se. Another very interesting finding of the study is that these twelve translators can be categorised according to four types of profiles: drafters, revisers, recursive drafters/revisers and non-recursive drafters/revisers. Drafters are translators that revise their TTs six times more in the drafting phase than in the revision phase whereas revisers are translators that revise six times more in the revision phase than in the drafting phase. Drafters/revisers are translators that have not made six times more revision either in drafting phase or in the revision phase (Alves & Vales, 2011, p. 115). It is not made clear by Alves and Vale (ibid) why “six times more” is chosen as a threshold for distinguishing these profiles; therefore it may be difficult to compare their results with other studies. Nevertheless, it is interesting to note that potentially, some translators revise more in the drafting phase than in the end-revision phase and vice versa. This potentially contradicts the finding in Englund Dimitrova's (2005) study where translators (irrespective of their experiences) were found to spend substantial amount of time in the post-writing phase. It will be interesting to find out whether this is the case in the present study.

Antunović and Pavlović's (2011) study looked at ten student translators' self-revision process from their L2 and their L3 respectively. Translog was used to capture their translation/revision performances. Their analysis focuses on two aspects: the distribution of their self-revision (or more precisely the amount of time spent) in each phases, and the type and quantity of self-revision both from L2 and from L3. Their findings suggest that there is considerable within-subject similarity in both of these aspects when translating from L2 and L3. In other words, the amount of time spent in each phase, i.e. pre-writing, writing and post-writing may indeed be related to individual subjects' habitual behaviours rather than language directions. Similarly, language directions do not seem to make a significant difference in terms of what type

of revision actions these subjects take. In fact, most subjects were found to make revision changes on both the lexical and syntactical levels. This corresponds to Englund Dimitrova's (2005) findings as discussed earlier, even though Englund Dimitrova indicated that syntactical changes were more prominent in the writing phase than in the post-writing phase. Again, it will be interesting to find out whether lexical and/syntactical changes are dominant revision changes in the present study.

## 2. The Study

### 2.1 Subject recruitment and experimental design

Twelve subjects recruited for the present study all have professional translation experience either working full-time or part-time for at least one year in Taiwan. They were asked to translate a piece of short text, which will be described in section 2.2, from English into Chinese (the subjects' mother tongue). However, due to technical reasons (e.g. poor quality recording), only ten subjects' protocols were transcribed and analysed. In order to obtain revision data after the first draft or run-through, subjects were asked to have a break for approximately 30 minutes after they finished producing their first drafts. This is to mimic translators' natural working conditions as translators may have a short break after working on a piece of translation intensively. This break is crucial in the experimental design partly because of the potential fatigue the translators may experience as a result of thinking-aloud, but more importantly, this break serves as a divider between the drafting phase and the end-revision phase. This means that the experimental design imposes subjects to revise at least once in the end-revision phase even though they have the freedom to decide how many times and for how long they actually revise their translation.

### 2.2 The text

The experimental text translated by subjects in the present study is a short extract (approximately 180 words) from a book, called, *Jacobson's Organ*. This book deals with human's sense of smell from a semi-scientific perspective. It is chosen for two reasons. First of all, it is written in plain English for the general public. It does not contain any specialist terminology; therefore, no technical knowledge is required to understand its content. This is an important consideration since the influence of genres or topicality is not a focus of this study. In addition, the chosen extract is short to prevent subjects getting too tired in the duration of their task; yet it contains a number of parallel structures and long sentences, which potentially prompt translators to revise.

### 2.3 Data analysis

The raw think-aloud protocol data were analysed in three ways. First, a relative measure of time for individual translators to complete each (revision) run-through was recorded. Then, translators' "patterns of movement" were logged and analysed. "Patterns of movement" is an innovative analytic instrument adapted from Gerloff's (1988) study. This forms a basis for the main quantitative analysis of the present study, details of which will be offered in 2.3.1. Finally, Shih's (2006) translators' perceived revision checked-for items were used as a point of departure to analyse types of revision changes being made or checked-for.

#### 2.3.1 Analytic instrument: patterns of movement

As mentioned above, Gerloff's (1988) "patterns of movement" was adapted for use in the present study. According to Gerloff (ibid), whenever a text segment (either a ST segment or TT segment) is being verbalised by translators, it indicates that this text segment is being processed. Gerloff used continuous lines to record each of these instances of processing as they occurred in her protocol data. This means that she was able to trace where and when a text segment is being

processed particularly intensively and also to trace where translators decide to back-track or refer to an earlier ST/TT segment.

For the purpose of the present study, several adjustments are made to Gerloff's coding system. First of all, in Gerloff's study, wavy lines indicated ST processing and straight lines indicated target text processing. These lines were joined together in her analysis. However, in order to measure these lines quantitatively, I used straight lines throughout my analysis but differentiated verbalisations of ST segments and TT segments in different colours. In addition to this, each line was numbered for ease of quantifying the frequency or intensity of the processing. A brief explanation of what constitutes processing is described here. This is linked to what Ericsson and Simon (1993) call "level 1 verbalisation". According to Ericsson and Simon (ibid), level 1 verbalisations indicate information stored in the short-term memory or working memory that is in linguistic form and hence can be directly verbalised. Level 2 verbalisations indicate information stored in the short-term memory or working memory that is not in linguistic form and hence has to be encoded into linguistic forms so that they can be verbalised. In order to quantify translators' processing efforts, I consider an occurrence of a level 1 text segment as a processing line. Table 1 provides an example of this.

**Table 1: An extract of Laurie's 1<sup>st</sup> run-through lining patterns**

|  |   |
|--|---|
| Raw protocol data                                | <ul style="list-style-type: none"> <li>• Provide the single most powerful link to our distant origins.</li> <li>• 這句話它要說的是 (Back translation: This sentence wants to say that)</li> <li>• 嗅覺讓我們和最原始的人類有了強力的連結(Back translation: Smell makes us have a strong connection with the most primitive humans.)</li> <li>• 所以應該是說 (Back translation: So it is supposed to say )</li> <li>• [嗅覺]讓我們和最原始的人類 (Back translation: [smell] makes us with the most primitive humans)</li> <li>• 或遠古時代的人類 (Back translation: Or humans in the ancient era. )</li> <li>• distant origins</li> </ul>   |
| Coding of processing lines in relation to the ST | <p>. . providing the single most powerful link to our distant origins.</p> <p>1. </p> <p>2. </p> <p>3. </p> <p style="text-align: right;">4. </p> <p style="text-align: right;">5. </p> |
|  |   |

(Extracted from Laurie's 1<sup>st</sup> run-through)

Here, Laurie (pseudo-name) was translating the ST clause, "..., providing the single most powerful link to our distant origins." She started by verbalising this exact ST segment. This piece of verbalisation was coded in black as a ST processing line. She then began to render this ST segment into her TT: "*Smell makes us have a strong connection with the most primitive humans*" (*back translation*). This was coded in grey as a TT processing line. All of these colour blocks are numbered for ease of quantifying them.

## 2.4 Findings

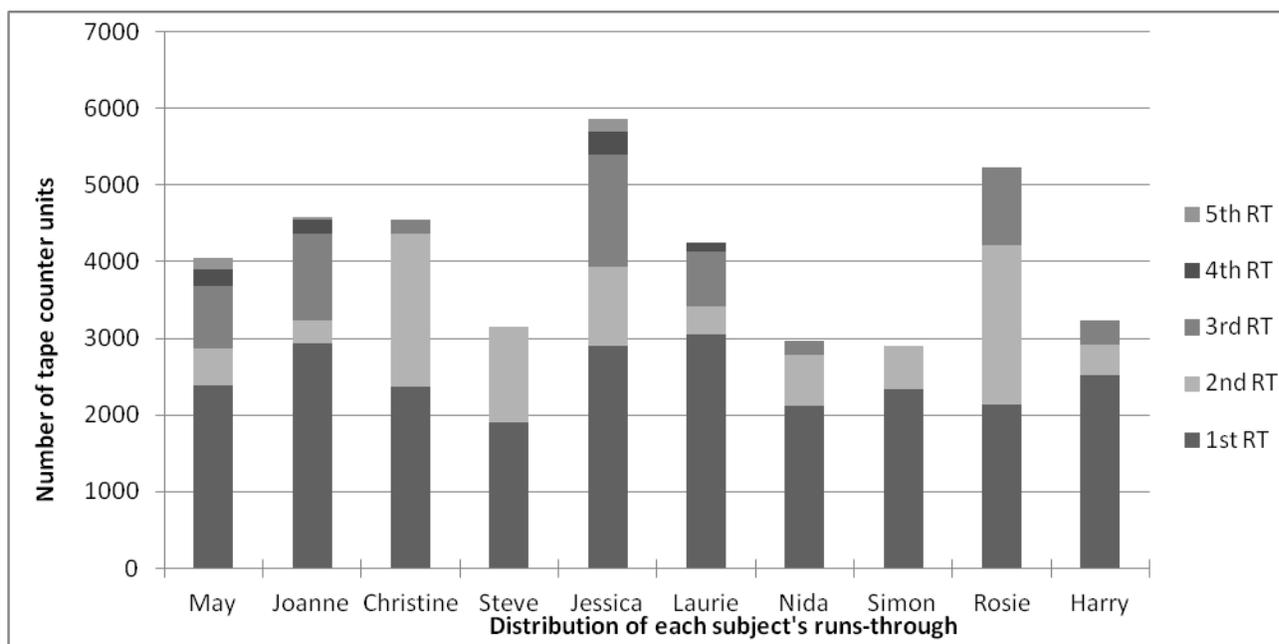
### 2.4.1 Processing patterns

In the present study, the general revision processing patterns are mainly measured through 1) the relative revision time spent on each run-through; 2) the processing lines. Results of these two measurements are provided below.

### 2.4.2 The revision time

Each run-through of each translator's protocols was tape-counted (via 'tape-counter' function on a recorder). This means that an approximate amount of time spent on each run-through can be obtained and compared between subjects. An approximate real-time equivalent of 100 tape-counter units is about 12 minutes. Figure 1 shows the overall results of this measure.

**Figure 1 Translators' revision time in runs-through (RT)**



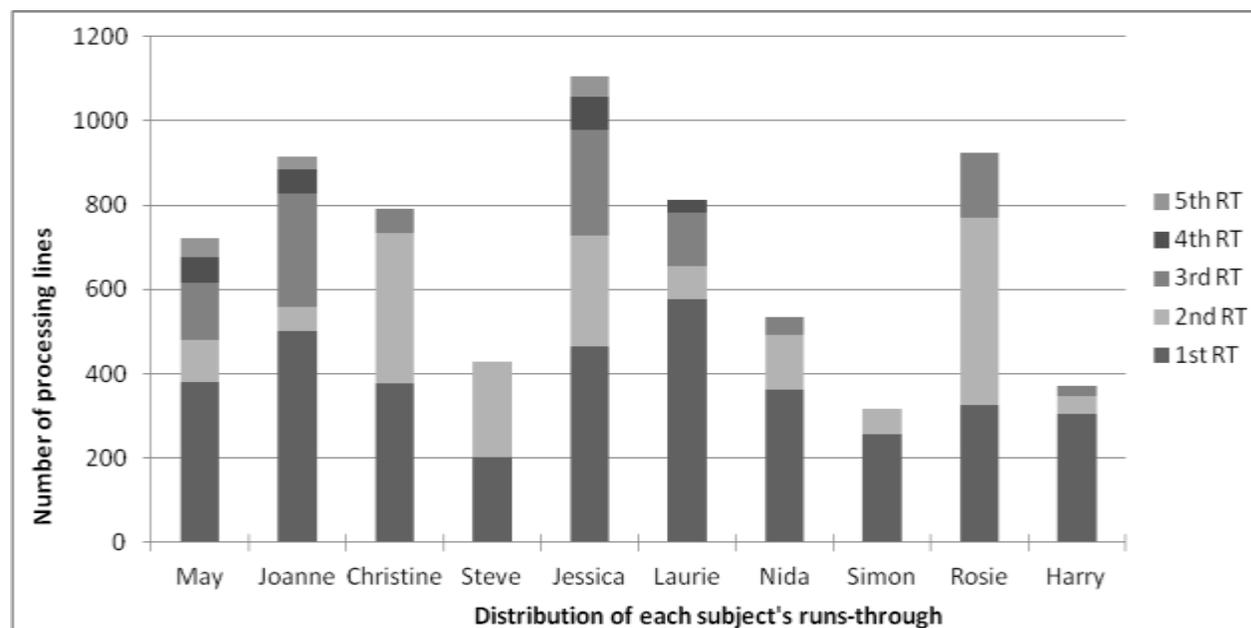
The X axis indicates the runs-through done by each translator. The Y axis indicates the number of tape-counter units recorded in each run-through. Interesting patterns can be found in this figure. First of all, all the translators spent the longest amount of time on their first run-through. For translators who chose to have four or more runs-through, there seems to be a clearer pattern; that is, second peaks emerge in a later run-through other than the first. Crucially, all these second peaks were found to occur right after translators chose to have a break in their end-revision process. It indicates that translators tend to spend more time on revising their drafts after having a break. It is as if the run-through after the break has become another first run-through. It seems

that when translators decide to go through their drafts four times or more, they manage their time and efforts in rather similar fashion.

### 2.4.3 The processing lines

Figure 2 shows the total numbers of processing lines in each run-through that each translator verbalised.

**Figure 2** *Translators' processing lines in runs-through (RT)*



Two main features are found in terms of translators' processing lines. One type of translators (e.g. Simon, Nida, Harry) tend to have a heavily processed first run-through and all the later runs-through are quick glances of the TT. A second type of translators (e.g. Joanne, Christine, Rosie, Laurie, May) tend to have a second peak in terms of processing lines in later runs-through. A logical reason behind these findings is that since when translators spend more time on a run-through, there are likely to be more processing lines involved in that particular run-through. However, there are exceptions. For example, in Steve's case, the processing lines in his second and also last run-through are in fact slightly higher than those in his first run-through. Even though Steve had more processing lines in his second run-through, he spent considerably less time on it than his first run-through. This calls for a closer examination of Steve's revision protocols, which will be offered later.

By examining within-subject processing lines, two interesting features emerge. First of all, translators tend to backtrack more frequently in earlier runs-through and less so in later ones. The overall picture actually shows that processing lines are longer and linear in later runs-through whereas in earlier runs-through, processing lines are relatively short and fragmented. The second feature of the processing line concerns the numbers of processing lines that are direct references to the ST. To take Christine as a typical example, her numbers of ST and TT processing lines are shown in table 2.

**Table 2 Christine's number of processing lines: ST vs. TT**

|                             | Number of ST processing lines | Number of TT processing lines | Total number processing lines |
|-----------------------------|-------------------------------|-------------------------------|-------------------------------|
| 1 <sup>st</sup> run-through | 130                           | 246                           | 376                           |
| 2 <sup>nd</sup> run-through | 58                            | 300                           | 358                           |
| 3 <sup>rd</sup> run-through | 8                             | 49                            | 57                            |

From the table above, it can be seen that there is a sharp contrast between the number of ST processing lines and the TT processing lines. This is especially evident in the 2<sup>nd</sup> run-through. In Shih's (2006) interview study, most translators claimed that they do not usually refer back to the ST unless they find a problem in the translation while revising. This statement largely coincides with my finding here as shown in the numbers of ST processing lines in table 2. In fact, the number of ST processing lines generally diminishes in later runs-through. Again there is an exception in Steve's case, which we will have a closer look in the following.

**Table 3. Steve's number of processing lines: ST vs. TT**

|                             | Number of ST processing lines | Number of TT processing lines | Total number of processing lines |
|-----------------------------|-------------------------------|-------------------------------|----------------------------------|
| 1 <sup>st</sup> run-through | 75                            | 127                           | 202                              |
| 2 <sup>nd</sup> run-through | 71                            | 155                           | 226                              |

As seen in table 3, Steve's second run-through has roughly similar numbers of processing lines as his first run-through. On closer inspection, Steve is found to compare every ST sentence with its corresponding TT sentence in his second run-through. It should be noted that Steve only had 2 runs-through in total. Essentially, he was comparing the entire ST with its TT in his only revision run-through. This obviously changes dynamics in terms of the number of his processing lines. This explains why, unlike other translators, the numbers of processing lines in Steve's second run-through is actually higher than in his first run-through.

Moreover, there is yet another pattern in terms of the processing lines in each run-through; that is, the more the translator revises, the longer the processing lines become in later runs-through. It is especially evident for translators who chose to have three or more runs-through that they were able to process their TT in extended chunks without stopping or back-tracking in their later runs-through. My data suggest that the more the translator revises, the more s/he is able to process the text on a more holistic and contextual level. This resembles Jones's (2011, p. 127) findings in poetry translation where "translators' scope of attention was widening from analytic to wholist..." towards later runs-through.

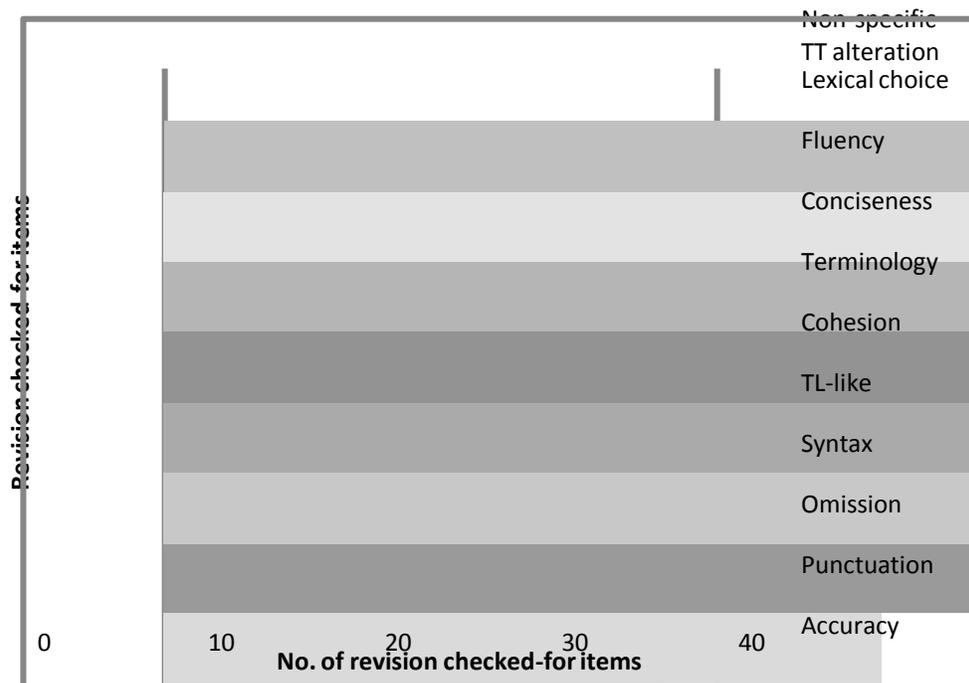
To sum up, in the present study, translators have a tendency to process their drafts more intensively in earlier runs-through than in later ones even though there are second peaks in the run-through after breaks. In other words, the intensity of processing is not necessarily found to

be exclusive to the first run-through. It is also found that ST is referred to and processed more in earlier drafts. In later drafts, translators are able to process their text more holistically and in longer chunks without backtracking to a previous TT segment or stopping to refer back to a ST segment.

#### 2.4.4 Revision maxims

“Revision maxim” is a term adapted from Mondahl and Jensen's (1996) “translation maxim”. Revision maxims can be implicit, explicit, procedural or declarative knowledge/measure that translators adopt in their work. They are a kind of translators' know-how, in our case, in the revision process and can either be consciously employed or talked about by translators. To make this term operational, we define it as revision checked-for items reported by translators as discussed in Shih's (2006) interview study. These revision checked-for items are used as a basic taxonomy to code the protocol data. Before presenting the coding results, a few coding criteria should be made clear. First of all, as a rule of thumb, I code revision changes that are actually written down in the draft. This means that translators' meta-cognitive auto-corrections that occur while reading and/or orally rendering the ST in the protocols are not included in the coding. However, when a translator checks a TT segment with clear intension of making changes but eventually decides to keep the original TT rendering, this is still counted as a revision checked-for point/item. Figure 3 shows the varieties and distribution of revision checked-for items in the protocol data.

**Figure 3** *Varieties and distribution of revision checked-for item*



Nineteen out of the Twenty-two revision checked-for items reported by translators in Shih's (2006) interview study can be identified in the protocol data. There are only a few exceptions, such as, 'layout', 'grasping the main idea/gist' and 'numbers/dates'. However, this is probably due to the experimental conditions where the text being translated is relatively short with neither complicated gist to grasp nor implications for layouts or numbers and dates.

Even so, there are a few newly coded items based on the protocol data. They are: 'non-specific TT alteration', 'lexical choice', 'collocation', and 'comprehension'. The most prominent of

which is the category, 'non-specific TT alteration', which amounts to 14.5% of the total numbers of revision checked-for items in the protocol data. As the name suggests, 'non-specific TT alteration' indicates TT revision that is not explicitly related to a particular ST lexical item or segment. It does not have a dominant feature that makes it link to other revision items either. An example is given below.

- 他第一個植物研究對象是拉普蘭 (Back translation: His first plant studying subject is Lapland)
- 拉普蘭所有的開花植物 (Back translation: Lapland's every flowering plant.)
- 全部的 所有的比較好聽 (Back translation: All or . . . Every sounds better.)

(Excerpt taken from Laurie's 3<sup>rd</sup> run-through)

In this example, the translator was making a decision between 'every' and 'all'. It is interesting to note that this revision change is very trivial. In fact, 'non-specific TT alteration' can often be characterised in terms of its triviality. Whether the translator chooses to render either 'every' or 'all', does not make much differences in term of TT quality. And, yet, this is the most frequently found checked-for items in translators' end-revision process. In other words, our translators seem to spend substantial amount of efforts in seemingly-trivial revision changes.

'Lexical choice' is the second most common checked-for item in the protocol data, amounting to 9.8% of the total number of revision items. It indicates a choice between two or more lexical items that are explicitly referring back to a ST lexical segment in the protocol data. Here, explicitly referring to a ST lexical item is particularly important since this is what differentiates between 'non-specific TT alteration' and 'lexical choice'. An example is given below.

- 是由心思細密的瑞典人開始 (Back translation: ..is beginning with an attentive-minded Swede.)
- 'Tidy-minded' 整齊的心思 不會吧 嚴格的心思 嚴密 (Back translation: 'Tidy-minded'. Orderly mind. No... Strict mind. Strictly careful...)
- 心思嚴密的心思 'Tidy-minded' 心思有條不紊 (Back translation: Strictly careful..mind. 'Tidy-minded'. Mind that is in precise order.)
- 不對 現在是嚴密 好就這樣 心思嚴密的瑞典人開始 (lexical choice) (Back translation: No... Now it's strictly careful. Okay. That's it. Beginning with a strictly careful-minded Swede.)

(Excerpt taken from Christine's 2<sup>nd</sup> run-through)

In the example above, it is not difficult to see that Christine was pondering how to better render a particular ST lexical item, 'tidy-minded'. This finding tallies with previous studies, (Jones, 2011; Dimitrova, 2005; Antunović & Pavlović, 2011) where the most frequently found revision checked-for items are at the lexical level. In fact, when taking into account the 'non-specific TT alteration', which represents trivial TT alternation and often occurs at the lexical level, the majority of end-revision changes found in the present study can be seen as lexical choices. This interesting point will be discussed further in section 3.

### 3. Discussion & Conclusion

One of the most important findings in the present study lies in translator' revision processing patterns. First of all, it was found that the majority of translators spend the most of their time and efforts on their first run-through/draft. This tallies with previous studies on translation revision (e.g. Alves & Vale, 2011) where the drafting phase is found to be the most labour-intensive in terms of processing effort. However, in the present study, we also found that

after the first run-through, two patterns emerge. The first one involves a second peak in the run-through right after translators take their breaks. In other words, apart from the first run-through, most translators put in substantial revision efforts in the run-through after their break. The second pattern involves translators also processing their first draft most intensively, but after the initial hard work, both their time and effort spent on later runs-through diminish. In other words, these translators simply glance through the TT in later runs-through. This study demonstrates that the timing of translators' breaks seem to have a profound effect on their overall processing efforts in end-revision. However, the question remains why most translators manage their time and effort, particularly after a break, rather similarly in end-revision. One possible reason is because after a break, translators are able to regain their concentration to process their TT more intensively. It is as if the break acts as a form of 'cognitive refreshment' for translators (Hansen, 2008, p. 263). This implies that it is very important for translators to have a break during their self-revision process. Yet, on the other hand, the break is also a much needed drawer-time which enables translators to defamiliarise themselves from the ST so that they can come back to revise their TT more critically. It is worth mentioning here that although two types of end-revision processing patterns emerge in this study, I do not claim that they cover all the possible processing patterns. It may well be that these are two types of idiosyncratic end-revision processing profiles among many, just as previous studies (Antunović & Pavlović, 2011; Immonen, 2011) have shown that individual variations are one of the features of translators' revision behaviours.

To consolidate my findings with previous studies, it can be said that translators' revision processing patterns found in the present study echo some of Alves and Vale's (2011) findings regarding the hierarchy of macro translation units (TUs), in spite of their very different data sources and analytical instruments. As a reminder, Alves and Vale's study was based on their Translog data whereas the present study is based on my TAP data. This is because first of all Alves and Vale (ibid) find that the most frequent MTUs (P1 type) appear solely in the drafting phase. In other words, most revision changes occur in the on-line drafting phase rather than in the end-revision phase. This finding resembles that of the present study because the highest numbers of processing lines and the longest amount of time are both found in most translators' first runs-through. In terms of translator's revision profiles, it is difficult to compare my results with those of Alves and Vale (2011) since the present study examines various runs-through of end-revisions whereas Alves and Vale look at the revision phase as a whole. However, Alves and Vale's findings regarding translators' revision profile (e.g. revisers vs drafters) may help explain the two patterns I have identified in the present study. That is, apart from the first processing peak in the first run-through, some translators tend to have a second peak in a later run-through. To put it in another way, subject translators in the present study who have a second processing peak may be more of a "reviser" type. In other words, they are inclined to revise more in the end-revision phase. Subject translators that do not have second peak and often have shorter and fewer runs-through may be more of a "drafter" type and be inclined to revise more at the drafting phase.

One other finding regarding the processing patterns is that the more the translator revises, the more s/he operates on longer chunks of text. It seems that the more the translator revises, the more familiar s/he is with the TT and the less problematic the TT appears to be; hence, the more expert the translator seems to become in relation to the TT. On this note, it is very interesting to compare findings of the present study with those of professional/more-experienced translators' behaviours. Our translators' processing patterns in later runs-through can be seen to bear some

resemblance to those of professional or more experienced translators (Gerloff, 1988; Jääskeläinen, 1989) where they are able to process texts in longer chunks and make more holistic or textual choices in translation.

Apart from this, it is also found that in terms of ST referrals, translators tend to make fewer ST referrals in later runs-through. This finding confirms those of Shih's (2006) study that most translators do not refer back to the ST unless it is deemed as necessary.

My findings regarding revision checked-for items / revision maxims is that translators' revision efforts frequently linger around TT lexical choices, be they explicitly referred to a ST segment or not. This directly confirms Englund Dimitrova (2005) and Jones (2011) findings that lexical choices are one of the most prominent features in revision process. It seems that for translators a lexical item or a word is still the most basic and probably the simplest unit of text to be picked up and altered in end-revision. After all, approaching other more abstract changes at this later phase, e.g. syntactical changes, language consistency, fluency, etc, may not be very desirable since they require a lot more cognitive efforts than tackling single lexical items. Having said that, it may well be that most syntactical changes are taken care of earlier in the drafting stage (Englund Dimitrova, 2005). The fact that translators are found to spend a significant amount of time and efforts in tackling seemingly trivial lexical choices may potentially have important pedagogical implications. This is because for professional translators, what really matters is not how they can improve their TT in revision but what needs to be improved (Mossop, 2001). This is especially important when it comes to "other-revision" rather than "self-revision" (Mossop, 2001), where translators act as revisers to implement quality control procedures in large organisations (Arthern, 1983, 1987, 1991). This is because when a translator revises another translator's work, s/he often needs to have a justifiable reason to alter the TT rather than purely based on his/her own personal preference of a trivial lexical choice. According to Séquinot (1991, p. 86), "...the way most students seem to improve is to incorporate what is taught in class in their revision strategies...". If this is the case and given the potential pedagogical implications of the present study, it reinforces a need to develop a systematic pedagogical plan or even curriculum (Hansen, 2008) that incorporate what is known about end-revision so that better practices can be brought into trainee translators' translation process.

Many future research directions can be recommended from this research project. For example, different language combinations and different data collection methods can be employed in parallel to the present research project so that end-revision phenomena can be examined further. In addition, it will be very interesting to see future research projects focussing on single variables, such as ST genre (specialist text), time constraints, or even the use of translation memory tools and investigating how such variables may have an impact on translators' end-revision processes.

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