

Investigating problem-solving strategies of translation trainees with high and low levels of self-efficacy

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Translatology adopts psychological and cognitive approaches to study the complex processes underlying translational phenomena. As such, it deals with both translations and the translators who produce them. The present study uses think-aloud protocols and keystroke logging to explore the impact of affective factors such as self-efficacy beliefs on the selection and application of translation problem-solving strategies by a group of trainee translators completing a translation task. Four translation trainees completed a Translation Self-efficacy Questionnaire. Participants with both high and low self-efficacy rankings were asked to translate a text using the Translog keylogger while simultaneously verbalizing their mental processes. Analysis of the verbal protocols indicated considerable differences within the group regarding the cognitive and metacognitive strategies that they chose to employ. The results suggested that low self-efficacy leads subjects to spend too much time translating, due to repeated attempts at production and extensive revision. Implications of the findings for translator training are discussed.

Keywords: self-efficacy, problem-solving strategies, Think Aloud, keystroke logging, metacognition

1. Introduction

Acquiring a language is a very human phenomenon and, indeed, “language and self are [...] closely bound” (Cohen & North 1989, 61). The complex psychological processes underlying language learning and use take place within an individual context and so could be influenced by factors such as self-efficacy (Piechurska-

Kuciel 2013). Self-efficacy theory explains the origin, structure and function of individuals' perceptions of their abilities and how such beliefs can affect other social and psychological processes. Research into the effects of self-efficacy on individual behavior and performance has been an important objective for psychologists and practitioners because of the significant role of affective variables in human life.

Translation is related to other language activities like reading, writing, listening and speaking while, at the same time, it seems to be distinctive—involving, for instance significant problem-solving. Translators confront multiple constraints and difficulties when translating; obstacles can arise at various levels and at different stages in the process (Darwish 1999). Overcoming those obstacles requires tapping into potent decision-making and effective problem-solving strategies. Thus, translation is often viewed as a higher-order cognitive task with affective, attitudinal, cognitive and emotional components (Angelone 2010; Tirkkonen-Condit & Laukkanen 1996; Hansen 2003).

As a case in point, PACTE's (2003) translation competence model encompasses five subcompetences, among which the *strategic* subcompetence is of utmost importance. This subcompetence enables effective problem solving and establishes links between the other subcompetences. All subcompetences, including the strategic one, are also connected to the psycho-physiological component, reflecting the individual's cognitive, behavioral and psychomotor resources. If we assume self-efficacy is part of the psycho-physiological component, then we can presume that it might have an influence on the efficacy of problem-solving strategies.

A large number of studies describe the effect of self-efficacy on achievement in a number of skill areas. Wigfield (1994), looked at the effect of self-efficacy on math and English achievement. Wong (2005) examined the relationship between self-efficacy and language learning strategies among ESL pre-service teachers. Ghonsooly & Elahy (2010) investigated the connection between self-efficacy and FL reading achievement. EFL listening, general English achievement and metacognition have also been studied with respect to self-efficacy (Chen 2007; Rahimi & Abedini 2009; Ghonsooly et al. 2012, 2014). However, to the authors' best knowledge, only a few investigations discuss the relationship of self-efficacy and translation (e.g., Bolaños 2014; Jiménez et al. 2014; Lee 2014).

This paper focuses specifically on the influence of student translators' self-efficacy perceptions on the kind of strategies they employ to solve problems that emerge in translation practice. This study proposes the following research questions: (1) What are the translation strategies of efficacious and non-efficacious translation trainees? (2) How does translation trainees' sense of self-efficacy affect their application and selection of problem-solving strategies when translating?

2. Literature review

2.1 Self-efficacy

Self-efficacy is the principal notion of Bandura's social cognitive theory, who defines it as "the belief in one's capabilities to organize and execute the courses of action required to manage prospective situations" (1994, 2). According to his theory, three main factors determine individuals' actions: behavioral, personal, and environmental. They create an "integrated causal system" influencing one another in an interdependent manner (1999, 24).

Self-efficacy perceptions are developed from four sources, grounded in "information conveyed enactively, vicariously, socially and psychologically" (Bandura 1993, 145). A perception of mastery, a strengthened sense of efficacy, can be enhanced by one's own successes or undermined by failure. Self-efficacy can also be connected to vicarious experience. We observe others succeeding at a task and we are motivated to model our behavior after theirs and strive to achieve the same level of success. Self-efficacy can have social origins involving exposure to judgments or appraisal offered by others. Such judgments can strengthen or weaken perceptions of self-efficacy (1997). Verbal or written appraisals of skill can mobilize greater effort and perseverance or engender self-doubt and a focus on personal deficiencies in the face of difficulties (1995). And finally, physiological and emotional states, including anxiety, stress, and mood can influence efficacy beliefs. They may act to promote or facilitate self-efficacy or hinder it (1995).

Self-efficacy is influenced by cognitive, motivational, affective, and selective processes. These processes "usually operate in concert rather than on their own" (Bandura 1997, 116). The social cognitive theory assumes that human behavior is intentional and deliberate, regulated by "forethought embodying cognized goals" (1993, 118). Cognitive processes, in this regard, are concerned with the range of experiences people choose to obtain, the information they extract from that deliberate experience and the rules or heuristics they develop to interpret it. Self-efficacy beliefs are based largely on perceptions of one's own accumulated goal-seeking experience (1992).

Motivational processes influence self-efficacy because they "determine the goals people set for themselves, how much effort they expend, how long they persevere in the face of difficulties, and their resilience to failures" (Bandura 1995, 8). Affective processes act to filter individuals' perceptions of their capabilities. Perceived self-efficacy not only exercises control over stressors in anxiety arousals, but also predicts behavior in a more reliable manner than anxiety arousal (1993). And finally, perceived self-efficacy can influence what activities are selected to experience; low self-efficacy can lead individuals to avoid "activities and environ-

ments they believe exceed their coping capabilities” (1995, 10). Conversely, high estimations of self-efficacy can move individuals to consciously select activities where they feel confident of success.

Bernhardt (1997, cited in Rahimi & Abedini, 2009) suggests that highly self-efficacious people envision problems as challenges to overcome, are deeply involved in problem-solving activities, show serious commitment to task completion, ascribe their achievements to their abilities and efforts, and recover quickly from defeats and dissatisfactions. In contrast, individuals with a weak sense of self-efficacy envision tasks to be beyond their capabilities, shun taxing and difficult situations, focus on personal setbacks and negative outcomes, attribute their difficulties to a lack of personal ability and quickly lose confidence.

Much of the current literature on self-efficacy pays particular attention to educational research, mainly concerning self-regulation and academic motivation (Pintrich & Schunk 1996). Generally, these self-efficacy researchers have addressed three main areas: (1) the relation between self-efficacy perceptions and academic major and career choices (Lent & Hackett 1987); (2) the efficacy beliefs of teachers and their instructional practices (Ashton & Webb 1986; Ross 1992); and (3) students’ self-efficacy beliefs and their motivation, academic performance and achievement (Schunk 1991; Zimmerman, et al. 1992; Pajares 1996).

In translation studies, the role of the self-efficacy construct has only recently been taken into consideration. Jiménez et al. (2014) empirically explored the influence of self-efficacy on interpreting performance in a number of interpreting trainees with different degrees of second-language proficiency. They found that—provided that they possessed high linguistic competence—self-efficacy affected their performance. Lee (2014) developed and validated a highly reliable interpreting self-efficacy scale for undergraduate students majoring in consecutive interpreting. Bolaños (2014) examined the relevance of self-efficacy construct to translation process-oriented research. Her findings suggest that self-efficacy had a positive correlation with

proficient source language reading comprehension, tolerance of ambiguity, participants’ perceptions of meeting the necessary requirements to become professional translators, their ability to find background documentary information and to determine when to stop searching for a solution for a translation problem.

(Bolaños 2014, 212)

2.2 Translation problem solving strategies

Translation strategies have been viewed quite variously in translation studies, probably because of different conceptualizations of what they entail. Some researchers have described translation strategy as “a set of internal cognitive pro-

cedures [...] to account for observed patterns of behavior” (Kail & Bisanz 1982, 240) or “translators’ potentially conscious plans for solving concrete translation problems in the framework of a concrete translation task” (Krings 1986, 18). The idiosyncratic nature of translation strategies employed by translators could be another reason for such a diversity of opinions.

Different typologies have been applied to translation strategies. Krings (1986) classified them into comprehension, equivalent retrieval, equivalent monitoring, decision-making, and reduction strategies. Gerloff’s (1986) categorization appears to be more complex, comprising problem identification, linguistic analysis, storage and retrieval, general search and selection, text inferencing and reasoning, text contextualization, and task monitoring. Mondahl & Jensen (1996) distinguished production from evaluation strategies, further decomposing each into achievement and reduction or adequacy and acceptability strategies respectively. Séguinot (1996) identified four strategy types, namely interpersonal, search, inferencing, and monitoring strategies. Jääskeläinen (1993) distinguished between global and local strategies.

These variations in the categories of translation strategies indicate their multidimensional nature and the many contextual factors that determine their application in context. In Darwish’s (1999) opinion, the translation process is fraught with multiple constraints influencing translation quality alongside translators’ choices and decisions. Accordingly, the purpose of any strategy in a translation activity would be to direct and obviate these difficulties. Lörscher (1992) suggests that translation strategies are initiated when a problem is identified and that they terminate when the problem is solved or determined to be insoluble. What is apparent from this sketchy survey of these categories is the critical role translation strategies play in enabling the completion of stalled translation tasks. Their crucial role is to allow the task to complete by providing a means to generate alternative solutions to any given problem locus and choose one of them. Furthermore, problem-solving and decision-making in translation sometimes correspond to each other, because the boundary between them is invariably unclear (Wilss 1994).

2.3 Process-oriented translation studies

Since the introduction of process-oriented translation studies, the field has witnessed a dramatic growth in the volume of publication (e.g., Jääskeläinen & Tirkkonen-Condit 2000, Alves 2003, Shreve & Angelone 2010, Schwieter & Ferreira 2017). Most studies focus on what happens in the mind of translators during translating under laboratory conditions. As Jääskeläinen (2012) put it, conceptualizing the human mind is a requisite for conceptualizing translation. The process-oriented approach in cognitive translology (Muñoz 2010), for instance, allows

an evaluation of cognitive processes in translation and the psychological experiences translators undergo during their translation performance. Studies have focused on a wide range of topics, and recently many new areas of research have emerged, including research on ambiguity tolerance (Tirkkonen-Condit 2000; Angelone 2010), emotional stability and coping strategies (Bontempo & Napier 2011), and translators' personalities (Hubscher-Davidson 2009). Investigations of translator self-efficacy are now part of the expanded horizon of translation process studies.

Research into translation processes also employs a number of methodological perspectives, many of them borrowed from psychology and the cognitive sciences. One such method is *thinking aloud*, which examines the processes of translation using the verbalizations of study participants during task performance, and is better known for the transcripts of the sessions (*think-aloud protocols*, TAPs). The method was widely used in translation studies as a way of gaining access to translators' internal mental processes, under the assumption that it can reveal cognitive states such as feelings, thoughts, and motives that are generally not observable. For example, Séguinot (1991) selected two groups of translation trainees at different levels of proficiency to translate two similar texts while employing TAPs. French and English native speakers translated two advertisements from French into English. The outcome showed that English speakers translating into their L1 employed more efficient monitoring and revising strategies, and their translations were more textually-oriented, whereas the other group used more lexically-oriented strategies.

The expanding range of process studies has driven the need for technological innovation, resulting in novel methods of data gathering like keystroke logging, eyetracking, and neural imaging (Shreve & Angelone 2010). Such technological developments have deepened our understanding of the different translation stages (Dragsted 2010), provided greater objectivity than was previously possible (Hansen 2010), and enhanced the methodological power of process research (Shreve & Angelone 2010).

Keystroke logging, in particular, has had tremendous impact on the field. Keystroke logging software—such as Jakobsen & Schou's (1999) Translog—is currently an important tool for recording the details of text production processes like keystrokes, deletions, pauses, corrections, and mouse movements, as well as pause number, position, and length. Its application in translation research has been widely acknowledged. For example, Dragsted (2010) utilized keystroke logging and eye tracking in her research into the way professionals and students coordinate source language comprehension and target language production processes. Her results showed different processing patterns, including a more integrated coordination of comprehension and production among professionals, and more

sequential coordination among students. As Dragsted's study illustrates, the advent of these technologies has also made multimethod approaches and the triangulation of research findings possible—namely the application of two or more methodologies within an inquiry to enrich the quality, validity, and reliability of the joint results (Shreve & Angelone 2010).

2.4 Metacognition, cognition, translation

Metacognition is a psychological construct coined by Flavell (1971), who defined it as “knowledge and cognition about cognitive phenomena.” That is, knowledge about when and how to use, control, monitor, and assess cognitive tasks like writing, reading, remembering, interpreting, listening, problem-solving, and so forth. Metacognition has two components: metacognitive knowledge and metacognitive experiences. The former generally refers to one's conceptions and beliefs about tasks, purposes, abilities, and includes knowing how, when, and why to do things. The latter is “any conscious cognitive or affective experience that accompany and pertain to any intellectual enterprise” (906). Metacognitive experiences generally provide feedback through monitoring the applied strategies, examining their success, and finally evaluating the result.

Ideally, while reading and comprehending a source text, translators produce a version of the target text in their mind easily and automatically (Dragsted 2010). However, under certain conditions metacognition becomes more relevant. This can happen when a translation difficulty is encountered and the translator lacks the resources, such as declarative or procedural knowledge, to solve the problem. In other words, metacognition deals with active control over the cognitive processing of the translation and is used to support problem-solving activities (Shreve 2009). As Angelone (2010, 17) put it, “the translation task is essentially a chain of decision-making activities relying on multiple, interconnected sequences of problem-solving behavior for successful task completion.” These sequences include source language comprehension, source language-target language transfer of meaning, and target language text production.

Despite the proliferation of research into the cognitive aspects of translation, few attempts have been made to delve into the uncharted territory of metacognition in translation using multiple methods. A set of studies conducted by Shreve (2009) and Angelone (2010) provide a better understanding of the role of metacognition in translation. Angelone (2010) probed the problem-solving behavior of professional and student translators, investigating the metacognitive phenomenon of uncertainty management using TAPs and screen recording. Employing both verbal (e.g., repeating a word or sentence from ST out loud; making remarks aloud about the difficulty of the translation) and non-verbal indi-

cators of problem-solving behavior (e.g., looking up a word in a dictionary or pausing while keyboarding), he built a novel three-part model of the problem-solving process namely *problem recognition*, *solution proposal* and *solution evaluation*. In our study, we combined keystroke logging and verbal protocols in order to better understand the nature and influence of translator self-efficacy and to enable triangulation of our results.

3. Methodology

We designed and validated a Translation Self-efficacy Questionnaire, with 30 items arranged on a 5-point Likert scale. Scale items were selected based on Bandura's self-efficacy theory. An early version of the questionnaire was designed with the assistance of two translation specialists in order to refine and clarify the scale. A total of 76 undergraduate and graduate Iranian university students majoring in translation studies were selected based on convenience sampling. Aged from 22 to 36, the sample comprised 19 male (25%), 54 female (71%), and 3 undeclared informants (3.9%). All participants had Persian as L1. They had already completed various translation courses, including translation theory, practical translation workshops and the like.

The participants were briefly informed about the content and purpose of the study; they were assured of the confidentiality of their responses, and then asked to complete the self-efficacy questionnaire. For each item in the questionnaire, respondents were to indicate a number between 5 (highest) and 1 (lowest). The total score for each respondent was calculated by adding the scores of all questions. Cronbach's alpha was applied to assess the reliability of the questions, and it yielded a coefficient of 0.87.

Based on their scores, participants were distributed in two groups. To this end, the mean score was computed and the individuals with scores above the mean were classified high-efficacious while those with scores below the mean were classified as low-efficacious. Two students from each of these two groups then volunteered to participate in the study.

A 259-word text in English was chosen from the text *Translation from English: For advanced students* (Cartledge 1974; see Appendix). The text was deliberately chosen so as to be difficult for the participants, since we wanted to prompt them to verbalize the problems they encountered. The task had to be difficult enough to influence or engage the participants' self-efficacy.

To gather process data, the Translog II software, updated by Carl (2012), was installed on a laptop. Then the text to be translated was uploaded into the software and all the necessary settings were adjusted. Besides keystroke logging, the think-

aloud method was applied to enhance the depth of elicited data. This experimental procedure requires verbalization concurrent with task performance; certain information is required to be reported by the participant out loud. Before starting, the situation and the purpose of the study were explained to the participants. They were asked to translate the source text into their L1 (Persian) while simultaneously verbally reporting what was going through their minds. Participants were allowed to use any available dictionaries and were assured that there was no time pressure.

TAPs were recorded using a tape recorder. The experiment was conducted during several sessions in a calm office at the Ferdowsi University of Mashhad. To analyze TAPs, we first transcribed the verbal data into protocols. Next, the data was encoded, i.e., we decomposed it into segments at sentence, phrase, or word levels. The second step involved axial coding whereby we tried to find relations between the segments and give each relation a name. In the last step, we selected a core category to include the subcategories (Dornyei 2007).

4. Results

4.1 Keylogging results

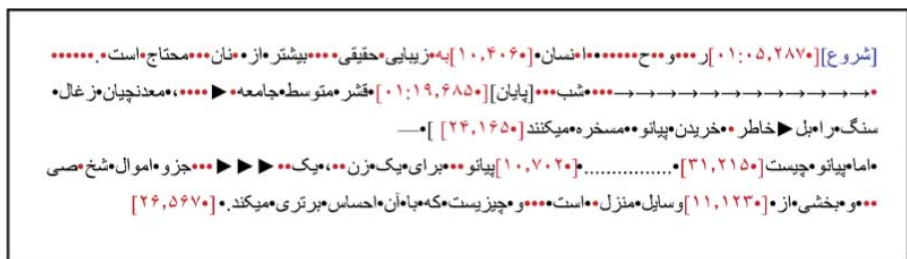
In the session, the participants were asked to read the source text (ST) on the upper half of the screen and write the target text (TT) in the lower part. The log files were registered, making it possible to replay the session for preliminary analysis using the Translog-II supervisor feature. The supervisor produced descriptive statistics, a linear view of the translation activity, and a graph of pause plots. Table 1 exhibits the statistical data estimated from the performance of two groups of participants in the study. The low-efficacious group (LE) spent more time translating, compared to the high-efficacious group (HE). The LE group also had more total user events and text production events (as measured by the number of key-strokes used to add new text). The LE group edited their translations much more than the HE group. The number of user events per minute was also larger for the LE group. Conversely, the amount of text production per minute was higher for the HE group than the LE group.

Figure 1 shows a linear view of Translog II. It presents a stretch of one participant's key and mouse activities in chronological order and maps them out by means of symbols. In the linear view, the dots and numbers in brackets indicate pauses and their duration. Translog allows the value of what is recognized as a pause to be set for each session. We set the pause value at 01.000 second. The symbol ► denotes any deletion or backspace movement and → indicates a forward cursor movement.

Table 1. The statistics and mean scores calculated from the translog files of four participants

	HE 1	HE 2	LE 1	LE 2	Mean HE	Mean LE
total user events	1987	1973	2803	3145	1980	2974
text production	1768	2312	2312	1904	1689	2108
text deletions	55	237	337	377	146	357
user events per minute	51.60	21.44	47.33	35.48	36.545	41.405
text production per minute	45.92	17.54	39.04	21.48	31.73	30.26
duration	38:30.344	01:31:47	59:13:329	01:28:38	01:05	01:13

*HE: high-efficacious trainee; LE: low-efficacious trainee

**Figure 1.** Linear representation of part of the log data of a participant in the study

The analysis of all four linear representations in this experiment showed that the LE group had a higher level of deletion and backspace activity. Moreover, the calculated average number of pauses in the square brackets was considerably higher for the LE group than the HE group. Pause plots are also displayed in Translog-II replay mode as a 2D graph and offer information complementary to that of the linear view. The horizontal X-axis relates to keyboard activities, while the vertical Y-axis indicates the accumulation of pauses in seconds. Figure 2 displays a section of a translation session.

The graphs of the sessions by the four participants were compared. The mean pauses from the beginning to the end of the performance of the HE group ranged from approximately zero up to 3700 pauses in seconds, whereas for the LE participants (Figure 3) the mean pauses were from 1125 to 4350 pauses in seconds. The initial pause before typing began was near zero for the HE participants, while LE participants took more time to begin text production.

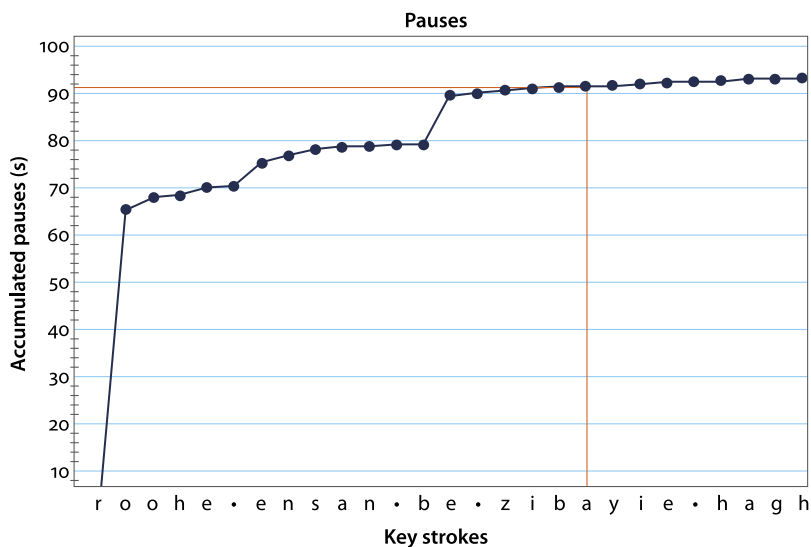


Figure 2. Screen shot of the pause plot of a HE participant

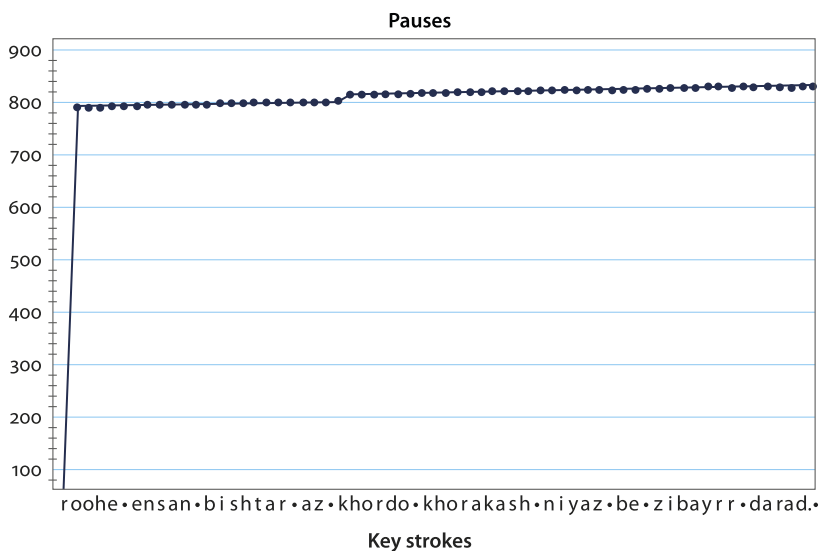


Figure 3. Screen shot of the pause plot of a LE participant

4.2 TAP results

Analysis of the verbal protocols showed that participants employed a total of 28 discrete translation strategies. The frequency of each strategy was calculated. Table 2 lists all 28 strategies with their definitions.

Table 2. The strategies applied in the study and their definitions

Translation strategy	Code	Operational definition
text reading	TR	preliminary reading of the ST
review reading	RR	reading the ST in general
subvocalization	S	trying to get the meaning of an unknown vocabulary item by an initial slow decoding process followed by rising and falling intonations or vice versa
repeating to get meaning	RGM	retrieving or guessing the meaning of a problematic item of vocabulary from long term memory by repeating it to oneself usually in a low voice
word identification based on phonological similarity	WIPS	trying to get the meaning of an unknown lexical item by comparing it to its closest possible neighbor which bears some phonological similarity less often accompanied by a self-directed question
reprocessing ST	R ST	repeated return to the ST for understanding
syntactic analysis	SA	parsing a problematic syntactic structure ranging from phrasal to sentential structures with the purpose of making a comprehensible interpretation of the text
guessing meaning	GM	guessing the meaning of a segment in the ST from context
inferencing	I	coming to understand the meaning of a linguistic item by surrounding information
self-directed questions	SDQ	questions posed to oneself accompanied by rising intonation with the purpose of clarifying a problem in comprehension
researcher-directed questions	RDQ	resorting to the researcher to get either clarification or confirmation
target equivalent search	TES	understanding a target word by seeking an appropriate word equivalent in the first language
rough translation	RT	tentative or approximate translation of a word or phrase
problem assertion at word level	PAWL	expressing problem with a word, either directly or indirectly
problem assertion at phrase level	PAPL	expressing problem with a phrase, either directly or indirectly
problem assertion at sentence level	PASL	expressing problem with a sentence, either directly or indirectly
temporary skipping	TES	postponing translating a segment in the ST in order to get the meaning from the rest of the text
total skipping	TOS	skipping a section of the text to translate
note taking	NT	writing down something on a paper to remember or constructing the main idea

Translation strategy	Code	Operational definition
dictionary checking	DC	referring to a dictionary to look up the meaning of an unknown item of vocabulary
watchers	W	keeping an unfamiliar item of vocabulary in mind to be tackled later on by getting help from information coming later in the text
paraphrasing	P	a full account of a target sentence rendered in first language
translation evaluation	TE	assessing the accuracy of a translation at the word, phrase, and sentence level
critical analysis	CA	expressing an appraisal based on careful analytical evaluation
editing	E	final revision of a word, phrase, or sentence
reprocessing TT	R TT	rereading the translated text to reach a final decision about its accuracy
translation confirmation	TCo	confirming the accuracy of a translation (words like: ok, ha)
final checking	FC	ultimate examination of the translation

The observed strategies were then classed into two core categories, cognitive and metacognitive. The cognitive strategies were divided into the subcategories *comprehension* and *production*. Metacognitive strategies were classified into *planning*, *monitoring*, and *evaluating* subcategories. Planning denotes a choice of strategy and the effective use of resources. Awareness of comprehension and task performance relates to monitoring. And evaluating means the ultimate examination of the product and its effectiveness. Figure 4 displays the core categories and their subcategories.

Both groups read the ST to improve comprehension (*reprocessing ST*) and the TT in order to revise it for quality (*reprocessing TT*). Both groups were involved in the ST nearly to a similar extent, but the LE participants used *reprocessing TT* more often than the HE participants did. When the use of strategies by the high- and low-efficacious groups were compared, no significant difference in comprehension strategies emerged except for the strategy of *syntactic analysis*. Both groups were nearly identical in employing *review reading*, *text reading*, *subvocalization* and *inferencing*. Slight differences were found in the use of the strategies of *guessing meaning*, *reprocessing st*, and *word identification based on phonological similarity*. The LE group relied on dictionaries more, but the HE group tried to resort to their long term memory by repeating a segment to grasp its meaning.

With respect to production strategies (*rough translation*, *paraphrasing*, and *total skipping*) the high-efficacious group devoted somewhat more time to *rough translation*. In translating, they initially utilized a tentative or approximate

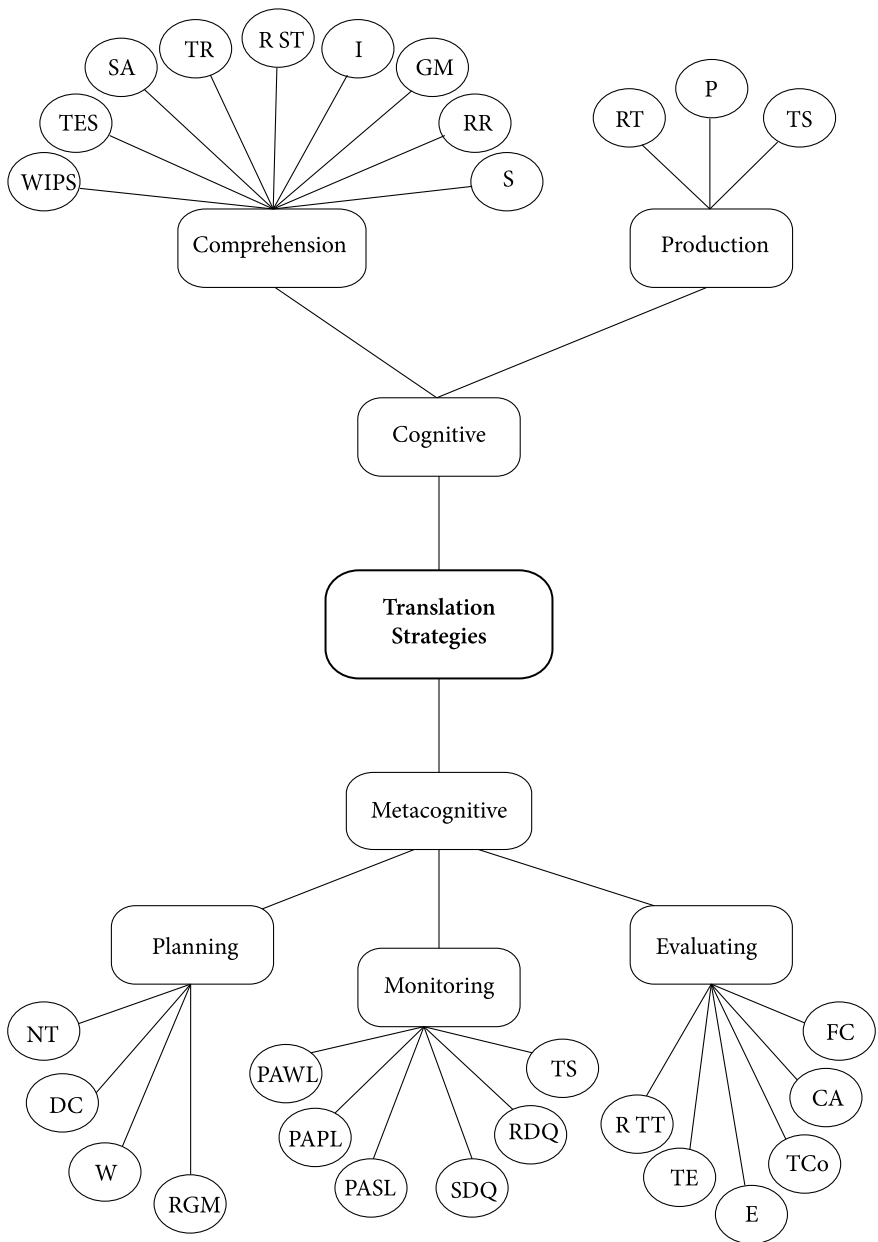


Figure 4. Translation strategies with core categories and subcategories

approach to render a segment like a word or phrase. The high- and low-efficacious participants were similar in the use of *paraphrasing* and *total skipping*.

However, with respect to metacognitive strategies, differences were noted with respect to the *problem assertion at sentence level* and *editing* strategies. While there was no significant difference at phrase or word levels, the LE trainees apparently faced more difficulties at sentence level, e.g., with long or complicated sentences. *Editing* was also more frequent for the LE group. Another interesting result was with the other skipping category. Sometimes, a translator abandoned a text segment either transitorily, coming back to complete it later (*temporary skipping*, TES). This occurred more frequently in the HE than the LE group. Reasons for skipping might include postponing decision making in the hope that information in the remainder of the text might point to a solution to the problem.

The two groups were identical in seeking immediate help from the researcher, but the number of questions the HE group addressed to themselves was greater than the LE group. Another significant difference concerned *critical analysis*—in the evaluating subcategory, within metacognitive strategies. *Critical analysis* describes cases where participants made value judgments beyond assessing the translation, e.g., they questioned not only the ST correlation with the TT but also the ST quality. The LE group even assessed the end product twice as much as the other group. Last but not least, the LE participants commented on their opinion about the accuracy of their translation more often (e.g., ha, etc).

5. Discussion

The verbal reports and keylogging results point that self-efficacy played a role in problem solving and decision making. Evidence from editing strategies, from keyboard movements such as deletions and cursor positioning and verbalizations all suggested some interaction of self-efficacy with translation processes. In keylogging, the nature, duration, and frequency of pauses, deletions, and editing distinguished the HE from the LE participants. Schilperoord (1996) examined the relation between pauses length and syntactic structures in a text production and found that the more pauses there were, the more effortful the cognitive processing of the syntactic structure seemed to be. In oral communication (Butterworth 1980) and in translation process research (e.g., Dragsted 2005, O'Brien 2006), pauses are assumed to be indicators of effortful cognitive processing. When translators encounter a problem in their translation task, and their available cognitive resources are not sufficient to solve the problem, they pause. Angelone (2010) suggested that pauses or hesitations, together with deletions, cursor positioning, and repeated editing, are a diagnostic sign of uncertainty in the problem-solving process.

Uncertainty would seem to be a phenomenon that might influence high- and low-efficacious translators differently. Those who are prone to doubt the effectiveness of their performance and capabilities are perhaps more likely to exhibit behaviors indicating dissatisfaction with translation solutions. This dissatisfaction leads, for instance, to an increased number of modifications to the target text as compared to high efficacious translators. According to Angelone (2010), this sort of uncertainty and accompanying doubt might occur at the comprehension, transfer or production stages of the translation activity. Translators can be doubtful, for example, of their understanding of a sentence, of their ability to generate a solution, or evaluate whether their solution is successful.

It would seem that having skill or proficiency in a given activity must also be accompanied by some sense of confidence in that ability. Without an accurate or adequate sense of efficacy, task performance is compromised to some degree (Bandura 1997, 83). Brown (2000) maintained that no successful cognitive or affective activity is possible without self-reliance and belief in one's own capability. For instance, in our study a low-efficacious participant maintained that she kept on searching for better translation equivalents for terms in spite of her familiarity with their meaning. In contrast, a high-efficacious participant decided to make use of her previous knowledge in selecting term equivalents even though she was not entirely certain about the semantic domain. Even if both participants had the same level of skill or knowledge relevant to the task, their perceptions of that level of ability influenced their behavior. We can trace this behavioral influence particularly in keyboard and editing behavior, in measures like the time required to complete the task; on average, the LE group took longer.

We can also see the influence of self-efficacy in strategy use. For example, the LE participants showed a greater tendency to use dictionaries. That is to say, they were perhaps more unwilling to rely on their own knowledge, compared to the HE group. Employing dictionaries is not in itself problematic, as such usage can also enhance translator motivation (Araghian et al. 2018) and improve self-efficacy—for instance, by validating choices or increasing one's vocabulary. What is problematic is their unnecessary use in supporting decision-making because of a lack of belief in one's own ability to make decisions.

While both the HE and LE groups showed no remarkable difference in the comprehension strategy of *reprocessing ST*, the LE group showed a greater use of the *reprocessing TT* strategy. That is, the LE group was more prone to re-read the TT. Does re-reading of the TT beyond a certain level denote lack of confidence in the accuracy or acceptability of the TT. Since the two groups had no real differences in skill or experience, it may be that low levels of self-efficacy belief may foster the re-reading behavior. As mentioned, this may also explain why the LE group had more backward and forward cursor movements in the TT.

Additionally, the LE group asserted that they had more problems at the sentence level than the HE group. This may imply that self-efficacy estimations have a bearing on their confidence in dealing with larger translation units. In contrast, the HE participants reported fewer problems at the sentence level and appeared to try to analyze the ST syntax to make it more comprehensible. Moores et al. (2006) suggested that, as the cognitive demands of the task increase, the predictive power of self-efficacy weakens and the role of metacognition becomes more important. While the evidence only hints at this, it may be that, as the scope of the translation problem increases (sentential, textual), low efficacy individuals will become more doubtful and less likely to persevere than high efficacy ones. They might resort to more metacognitive strategies to surmount the obstacles they face. This speculation is supported by the fact that there was a considerable difference in the use of *critical analysis* by the HE group. This strategy involves assessing the translation as a whole—not just focusing on lexical, sentential or stylistic issues, but on the acceptability and accuracy of the translation.

The HE participants exercised the strategy of *repeating to get meaning* more often than the LE group. This strategy involves translators accessing memory and improving their focused attention in order to understand the ST meaning. In real terms, they trust their skills and knowledge in trying to solve problems and make decisions. There may be a relationship between high use of this strategy and a decreased usage of dictionaries.

Temporary skipping, which involves postponing the translation of an ST segment, was more frequent in the HE group. This suggests that they persevered with reading other parts of the ST, perhaps confident that they could return to solve the postponed problem after gathering more information. It might also hint at greater self-confidence in overall task awareness and planning.

High- and low-efficacious translation trainees in this study employed the primarily cognitive strategies in almost the same way during comprehension and production, with few major differences. In other words, their general cognitive behavior was similar. Thus, self-efficacy might have a smaller direct impact on the use of what we classified as cognitive strategies. It is in the metacognitive strategies where differences begin to emerge. Metacognitive strategies apply when translators find problems and feel uncertainty. It is precisely here where estimations of self-efficacy will exert their influence most readily.

On the one hand, translators' choice of translation strategies is affected by their motivation and cognition. Specifically, self-efficacy beliefs determine selection, motivation, and even information processing as well. On the other hand, experience, social context, and psychological factors exert noticeable effects on translation performance. In brief, self-efficacy and translation are clearly inter-

related and the present pilot study confirms Bolaños' (2014) results, especially regarding the role of metacognition.

There were some limitations in this study. First, even though it was a preliminary, exploratory endeavor, the participants were chosen according to convenience sampling. It was conducted with translation trainees, not professionals. The study should now proceed with larger samples and with participants with different levels of experience. Furthermore, the translation was done only from English into the participants' L1. Directionality in translation practice may play a role in the relation between affective variables like self-efficacy and the selection and application of translation strategies (Lorenzo 1999, Jakobsen 2003, Fonseca 2015); however, this may not be as much the case for professional translation (Hunziker Heeb 2016).

Using process-oriented research methods such as TAP and keylogging with students can bring about some indirect benefits to training. By observing their performance, and not only their products, translation trainees may develop a better understanding of their own translation practice. They can perhaps learn to exert greater control over their behavior, and become more aware of their own strengths and weaknesses (Kiraly 1995, Kussmaul 1995, House 2000). Of course, not all tools may yield the same effects. In a corpus-based exploratory study, Angelone (2015) investigated the discourse generated by students using self-reflection tools like integrated problem and decision reporting logs (diaries) and screen recording. The data showed that, when using translation logs, the students focused on lower level problems. However, when using screen recordings, they adopted a broader more multidimensional textual perspective on the translation process and the strategies they used.

Translation teachers who are aware of the influence of self-efficacy estimations can become better acquainted with their students' needs and potential reactions to translation problems. Knowledge of efficacy effects could be incorporated or highlighted in the curriculum. By being aware of the influence of self-efficacy beliefs, the teacher could create training contexts that could boost a sense of efficacy that actually matches a student's objective level of skill. Feedback is an important aspect of training for greater self-efficacy, and training contexts should provide ample opportunity for instructive and constructive feedback (Schunk 2008). Low-efficacy students could be given tasks that would both improve their translation-related knowledge and promote a sense of confidence and efficacy in their work.

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Appendix A paragraph of the source text

The human soul needs actual beauty even more than bread. The middle classes jeer at the collier for buying pianos—but what is the piano, often as not, but a blind reaching after beauty? To the woman it is a possession and a piece of furniture and something to feel superior about. But see the elderly colliers trying to learn to play, see them listening with queer alert faces to their daughter's execution of the piano piece she has learnt for her music examination, and you will see a blind unsatisfied craving after beauty.

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