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TERESA MARIA WŁOSOWICZ
Silesian School of Economics and Languages, Katowice

SOME APPLICATIONS OF TRANSLATION TO PSYCHOLINGUISTIC RESEARCH

The purpose of the present article is an analysis of the possible applications of translation to psycholinguistic research. It is argued that it offers valuable insights into foreign language processing, especially comprehension, the mental representation of words, the interaction of different kinds of information and, last but not least, affective states. However, the use of translation also has some limitations which should be taken into account and, if necessary, it should be combined with other research tools.

1. Introduction

The purpose of the present article is an analysis of the possible applications of translation to psycholinguistic research, especially to research on the structure and the functioning of the multilingual mental lexicon, on the interaction of languages in the bilingual or the multilingual mind and on cognitive processes which are not directly observable in language production, such as comprehension. Language processing in multilinguals is of particular interest here because, first, it is still a relatively new field of study, after years of focusing on Second Language Acquisition (SLA) and bilingualism research, second, it offers new insights into language processing and human cognition in general and, third, it may inform foreign language teaching methodology.

Undoubtedly, the translation process requires the coactivation of two languages, even though in multilinguals even more languages may be coactivated and participate in processing. At this point, it might be relevant to ask whether bilingualism and multilingualism are two distinct phenomena or two varieties of the same phenomenon.

As Hufeisen's (2000) Factor Model (Faktorenmodell) shows, the qualitative difference between L2 and L3 acquisition or learning (which Hufeisen 2000: 212 clearly distinguishes as naturalistic and formal processes respectively) is greater

than the difference between the learning or acquisition of further languages (L4, L5, etc.). Unlike a second language learner, a person learning his or her L3 already possesses a higher level of metalinguistic awareness, more foreign language learning experience and strategies specific to the learning of foreign languages. By contrast, the only additional factor in L4 acquisition or learning is the L3, which is already in place and may constitute a source of cross-linguistic influence, such as transfer or interference.

Therefore, although some phenomena may be common to bilingualism and multilingualism, others should be assumed to be specific to multilingualism and research on them should involve multilingual subjects or at least third language learners. Moreover, given L3 learners' higher level of strategic competence, they are also more likely to use language processing strategies which may be revealed by the use of translation combined with, for example, think-aloud protocols (TAPs).

In general, it may be assumed that translation gives insight into both comprehension and production, as it requires both a good comprehension of the source language text and the production of an equivalent text in the target language. As Gerloff (1987: 137) puts it, "the act of translation provides an ideal "window" on to both comprehension and production components of language use." Still, manipulating such factors as the direction of translation, the level of difficulty of the text, including the choice of vocabulary (e.g. false friends, idioms, etc.), or the subjects' proficiency in the languages involved (also at different stages of language learning if the research design requires a longitudinal study) may give access to different aspects of language processing.

In fact, a large part of psycholinguistic research is based on lexical decision tasks, including several kinds of priming (repetition priming, semantic priming, etc.), word and picture naming tasks, categorization tasks and Stroop tasks (Altarriba and Basnight-Brown 2009), which may be precise in measuring reaction times and revealing statistically significant tendencies, for example, longer reaction times can indicate passing through the L1 counterparts instead of lexicalizing concepts directly in L2 (Talamas, Kroll and Dufour 1999), but which do not reveal anything about subjects' strategies or the lexical entries that are actually activated. For instance, a longer reaction time might suggest accessing the meaning of an L2 word via its L1 equivalent, but in reality this process in a particular subject might involve, say, activating its L3 cognate before accessing the meaning, perhaps via L1 indeed. As Herwig (2001) has shown, the organization of multilingual mental lexicons can be highly idiosyncratic, so it would be a good idea to combine "conventional" psycholinguistic studies with translation tasks which involve introspection, especially TAPs. A similar point is made by Müller-Lancé (2003: 122), who based his own study on inferring the meanings of unknown words (which could, if necessary, be translated) and on word associations. According to him, psycholinguistic models "based on data such as reaction times, reading spans, artificial languages and "pseudo words"" (Müller-Lancé 2003: 122), carried out under laboratory conditions, can easily

exclude such factors as different language competences or different individual vocabularies.

The present article will thus suggest some applications of translation tasks to research on the organization and functioning of the multilingual lexicon, including the development of lexical knowledge, on the interaction of two or more grammars and the restructuring of grammatical competence, as well as on foreign language comprehension. Moreover, on the basis of earlier research it will be argued that translation combined with introspection can give access to some cognitive processes and strategies, to different types of knowledge (linguistic, pragmatic, encyclopaedic, etc.) and, finally, to affective states, such as motivation, anxiety or the subjects' satisfaction (or dissatisfaction) with their own performance. The question of possible applications of translation to foreign language teaching will also be addressed, both as the direct use of translation tasks in teaching and as the practical application of translation-based research results.

However, prior to analysing the possibilities of using translation in psycholinguistic research on multilingualism, the general organization and dynamics of multilingual systems should be taken into consideration.

2. The organization of multilingual systems

2.1. The multilingual mental lexicon

Although linguistic knowledge comprises several components, such as lexical, grammatical, pragmatic, etc. knowledge, the focus here will be on the mental lexicon because, first, lexical knowledge plays an important role in comprehension (Nation and Waring 1997) and thus also in translation and, second, since grammar is lexicalized (Singleton 2000), there is no strict division between grammar and the lexicon. At the same time, lexical entries are linked to general "encyclopaedic" knowledge, which also participates in processing (Aitchison 1994: 226) Still, the very notion of "entries" should be treated as largely metaphorical because, as Günther (1989, in Hulstijn and Tangelder 1993: 147) points out, such terms as "lexicon" and "entries" can be misleading, since they suggest that words are units arranged as in a dictionary and can be "looked up", making all their contents immediately available. Instead, the mental representations of words are not unitary, but distributed over a number of nodes.

By and large, there is considerable evidence that a multilingual's languages are neither fully separate nor fully integrated, but that they are to some extent interconnected, yet the degree of their interconnection depends on such factors as the typological distance between the languages and the learner's language experience (Singleton 2003). As Abunuwara (1992) has shown for trilingual subjects, their L1 (Arabic) and L2 (Hebrew) were stored in a semi-coordinate

way, whereas their L2 (Hebrew) and L3 (English) were stored in a coordinate way. Abunuwara (1992: 321) also states that his study has provided support for the developmental hypothesis, according to which "the method of acquisition and the experience with languages will be reflected in the quality of the connections between the representations of the bilingual's verbal systems" (Abunuwara 1992: 312-313). Indeed, there is some evidence (Woutersen 1997, in Singleton 2002: 2) that the subordinative, compound and coordinative types of bilingualism can to some extent be associated with different stages of bilingual development.

Still, if more languages are involved and if the acquisition or learning context is different, the relationships between the languages will also be different. Hence, if three foreign languages are learned in formal contexts, they may form compound or subordinative relationships with L1 and coordinate ones with one another, unless the learner establishes connections between, for example, L2 and L3 by translating between them.

Certainly, an important role in the organization of multilingual systems is played by language typology, or rather by psychotypology, that is, a learner's own perception of language distance, which may be different from that established by linguists (Kellerman 1987, Singleton 2002: 4). However, as Müller-Lancé (2003) has shown, the interconnection between a multilingual's languages can also be influenced by such factors as his or her cognitive style, teaching methods, motivation to use the languages and anxiety, especially fear of interference errors.

The internal structure of multilingual systems is thus very complex and influenced by so many factors that its investigation requires a combination of methods. Hence, studies based on measuring reaction times should be combined with introspection applied to inferencing and, in particular, to translation tasks. Simultaneously, given the importance of acquisition contexts and language experience, researchers should follow Müller-Lancé's (2003) example and supplement psycholinguistic studies with detailed questionnaires on the subjects' language biographies. Yet, the dynamic nature of multilingual systems and their evolution over time will be discussed in more detail in section 2.2.

As has been mentioned above, there is some degree of interconnection between a multilingual's languages. As Paradis (1993: 282) concludes, the hypothesis compatible with all recovery patterns in aphasia, as well as other phenomena (borrowing, code-switching, etc.) is the Subsystems hypothesis (also called the Subset hypothesis, see Herwig 2001: 116), according to which each language constitutes a subsystem of a larger system of linguistic competence. Each subsystem is susceptible to selective inhibition (Paradis 1993) and the connections between the elements of one language are stronger than those between elements of different languages (Herwig 2001).

On the basis of the Subsystems hypothesis, Herwig (2001) has proposed a model of the multilingual (or, as she calls it, plurilingual) lexicon. According to her, at the beginning of its acquisition, L2 constitutes an extension of L1: newly acquired L2 items are attached to their L1 equivalents and only with time do the

connections between L2 items become stronger, whereas those between L2 items and their L1 equivalents become weaker. As for further languages (L3, L4, etc.), they generally "start as an extension of another language" (Herwig, 2001: 117), though not necessarily L1, and they gradually become more or less independent systems. In order to account for the complexity of lexical processing, Herwig (2001: 121-123) proposes "a network model whose nodes integrate the different component aspects of lexical knowledge" (Herwig 2001: 121). Hence, a lexical item is represented as a set of nodes, each containing a particular property of it, for example, its semantic quality, semantic valency, orthographical layout, phonological layout, morphological specifications, etc.

In fact, it is possible that different aspects of word meaning are also distributed over a number of nodes. According to Beheydt (1993), every context activates nodes representing the contextually appropriate meanings, thus, for example, the sentence "The whole table was laughing" activates the meaning of "people sitting at table" within the lexical entry of "table" (Beheydt 1993: 46).

On the basis of her study, Herwig (2001: 133) concludes that her findings support Meara's (1999) hypothesis that "third language interference is a mechanism emerging from the structure of the system itself", which she explains by the fact that perceived linguistic similarity leads to the creation of strong associative connections "which are automatically triggered as activation cascades through the system" (Herwig 2001: 133). At the same time, she admits having observed individual variation which, in her view, deserves closer investigation because it might "further elucidate lexical organisation mechanisms in general" (Herwig 2001: 134).

As for the level above that of individual nodes, there seems to be general consensus that the meanings and the formal properties of words are stored in separate, albeit connected, parts of lexical entries, called lemmas and lexemes respectively (Levelt 1999: 87). Still, there must also be a conceptual level superior to that of lemmas and the semantic meanings they store. As Levelt (1999: 88) admits, not all concepts are lexical, for example, there is no single word to express the concept of a dead tree. For this reason, Levelt (1993, in de Bot, Paribakht and Wesche 1997) assumes the existence of a conceptual level which is connected to, but not identical with, the lemma level, which belongs to the lexicon. At the same time, Levelt (1999) admits that language processing is informed by extralinguistic knowledge as well, such as discourse models, situation knowledge, encyclopaedic knowledge, etc.

As de Bot, Paribakht and Wesche (1997: 312) remark, the distinction between lemmas and lexemes is evidenced by speech errors, tip-of-the-tongue phenomena and experimental paradigms, such as word and picture naming. The activation of a lemma on the basis of its conceptual specification does not always result in the retrieval of the right lexeme and the lexeme may not be retrieved as a whole either (de Bot, Paribakht and Wesche 1997: 312-313).

It can therefore be concluded that, given the complexity of the multilingual mental lexicon, translation is by no means a stable process of replacing source

language words with one-to-one target language equivalents, but the result of a complex interaction between different kinds of knowledge whose organization can be idiosyncratic and influenced by the subjects' language experience. It must also be remembered that multilingual systems are dynamic and thus language processing in them, including translation, can be highly idiosyncratic and unpredictable.

2.2. The dynamics of multilingual language processing

In general, the greater number of languages within multilingual systems also means greater complexity. It must also be remembered that, while the different languages constitute the subsets of a larger system, they influence one another and the language user's competence in each language is restructured. On the basis of a large body of research, Cook (1992) has proposed the notion of multicompetence, or "the compound state of a mind with two grammars" (Cook 1992: 557). Bilinguals consult both their mental lexicons, even during monolingual tasks, they are more creative, better at divergent thinking and have a higher level of metalinguistic awareness than monolinguals, and their grammatical competence also differs from that of the corresponding monolinguals, which is reflected in grammaticality judgements (Cook 1992). It has also been shown that multilinguals construct more powerful grammars which allow parameter setting for a wider range of parameters, even such marked ones as preposition stranding, although this also results in a greater tolerance of erroneous structures (Klein 1995).

Moreover, the development of multilingual systems is dynamic, non-linear and involves periods of accelerated growth and retardation (Herdina and Jessner 2002: 91-93). For example, if a language is not used for some time, fewer resources are devoted to maintaining it at the proficiency level attained and attrition sets in (Herdina and Jessner 2002). Consequently, studies on multilingual language development should take into account not only subjects' language learning experience, but also their history of language attrition. Certainly, studies based on translation combined with TAPs can provide access mostly to the current state of interlanguage, but some comments (for example, "I used to know this word, but now I have forgotten what it means") can indicate language attrition.

As for language growth, as opposed to attrition, it involves not only the addition of new information to the learner's linguistic knowledge, but also changes in the quality of certain types of knowledge. In the case of the mental lexicon, whose functioning is particularly relevant to translation, knowledge of foreign language vocabulary evolves in both quality and quantity. Whereas beginners often rely on lexical links between L1 and L2 items (or, in the case of multilinguals, between elements of other languages as well) and on lexical form (which results in the confusion of formally similar words, reliance on false friends, etc.), advanced learners can already lexicalize concepts in the foreign

language and increasingly rely on conceptual links, that is, links between concepts and the target language words (Talamas, Kroll and Dufour 1999).

Another important question is that of lemma information, that is, semantic and syntactic information stored in the lemmas of foreign language words. According to Jiang (2000), at the beginning of the acquisition of a new L2 word, its lexeme is filled with formal information present in the input, whereas its lemma is filled with the semantic and syntactic properties of its L1 equivalent. At this stage, if there are subtle differences in meaning or in syntactic behaviour between the L1 and the L2 equivalents, the learner is likely to commit errors based on L1 transfer (Jiang 2000: 52). With time, as the learner is exposed to more L2 input, the lemma structure is gradually filled with appropriate lemma information (Jiang 2000: 51ff).

However, as Jiang (2000: 54) remarks, it is likely that "a learner's L2 lexicon contains words that are at various stages of development." If the learner learns to use an L2 word containing L1 lemma information with considerable automaticity, he or she may not feel motivated to extract the L2 meaning or syntactic properties from context, so the word may remain fossilized at the second stage (Jiang 2000: 55).

However, new words do not necessarily have to be learned by being juxtaposed with their equivalents and establishing lexical connections to them. Some words are indeed learned from context if certain conditions are fulfilled. As de Bot, Paribakht and Wesche (1997: 317) point out, paying attention to the form of an unknown word can lead to the creation of an empty lemma structure which is then filled with information inferred from the context and from similarities between the words of different languages, especially cognates.

Moreover, multilingual language processing involves the coactivation of two or more languages, which can lead to transfer, interference or code-switching. As Williams and Hammarberg (1998) have shown, different languages play different roles within the multilingual system and, whereas one language can be the default supplier, supplying different kinds of information and participating in unintentional switches, other languages can serve specific purposes, such as editing one's utterances or eliciting help from a native speaker. Still, interlingual switches do not always respect word boundaries: Dewaele (1998: 483) has also observed interlingual blends, such as **imprinter*, from *print* and *imprimer*, which indicates that, first, the connections between lemmas and lexemes can be not only intralingual but also interlingual and, second, the retrieval of a lexeme can also involve elements (e.g. morphemes) belonging to different languages.

It can thus be assumed that the complexity of multilingual processing has an effect on translation processes, too. Still, translation involves comprehension as well as production, and both of these processes can be affected by cross-linguistic interaction.

3. Tapping the translation process

By and large, translation involves comprehending a source language text and rendering its meaning and, if possible, also its style and other features, such as its rhetorical structure, in the target language. However, it must be remembered that there are considerable differences between professional translation and informal translation, such as that carried out by language learners, although it is the latter that is particularly relevant to the present article.

In general, translation requires good comprehension because, as Beaugrande (1978: 25, in Wu 2002: 533) observes, "[t]he basis of the act of translation is not the original text, but rather the representation of the text that is eventually generated in the translator's mind." Hence, translation must be based on close reading which, as Cheong (2005) has demonstrated, permeates the translation process. Otherwise, as Herbulot (2004) argues on the basis of the Interpretive Theory (Seleskovitch and Lederer 2001), a translation based on incomplete understanding can seriously distort the meaning of the text.

In fact, Macizo and Bajo (2006) have shown that reading for repetition and reading for translation actually involve different processes. In particular, cognate status and lexical ambiguity affect on-line comprehension when subjects read sentences for translation, but not when they read them for repetition (Macizo and Bajo 2006: 25). In the case of ambiguity, maintaining multiple interpretations in working memory impaired global understanding and slowed down reaction times, which, as Macizo and Bajo (2006: 26) conclude, "is consistent with theories of translation proposing that translation involves on-line searches for matches between the lexical and syntactic entries in two languages (Gerver 1976)."

Certainly, there is a difference between the translation of single words and that of whole sentences or texts. The translation of single words is used in some experimental paradigms in order to investigate the lexicosemantic organization of bilingual and multilingual memory (de Groot and Hoeks 1995) and does yield interesting results. For example, in a study comparing Dutch (L1) – English (L2) translation production and Dutch (L1) – French (L3) translation recognition (i.e. deciding whether a particular word pair consisted of translation equivalents or not), de Groot and Hoeks (1995) have shown a large concreteness effect for translation production, supporting hypotheses of the involvement of conceptual memory, whereas for translation recognition the effect was much smaller. This indicates the development of the lexicosemantic system from word-association, observed in the case of L3, to concept mediation, observed in the case of L2 (de Groot and Hoeks 1995: 713-714). Moreover, as Kroll and Tokowicz (2001) have shown, the fact that abstract words often have several equivalents in another language influences their processing, which is indicated by longer reaction times.

However, even though experiments involving single words provide some insight into the mental lexicon, studies on multilingual language organization should be based on the processing of larger chunks of language. As Paradis

(2006) argues, neuroimaging experiments show different activation patterns when single words or sentences are used as stimuli, so the activation of single words does not indicate "where in the brain language is represented or how it is processed" (Paradis 2006: 7).

Hence, experiments involving translation seem to be a useful tool in investigating language representation and processing, as they generally consist in the translation of whole sentences or, even more frequently, texts. Still, this begs the question of what information can be revealed, how it is accessed and how representative it is of language representation and processing as such.

In general, the procedure most frequently used to reveal translation processes in the mind is concurrent verbalization, which leads to the creation of think-aloud protocols (TAPs) (e.g. Jääskelainen 1996, Kussmaul and Tirkkonen-Condit 1995). As Krings (1987: 166) points out, translation being an inherently linguistic task, it yields itself particularly well to verbalization, since the contents of working memory are in verbal form, unlike, for example, the manipulation of geometrical figures, which involves spatial representations. In fact, as Krings (1987: 166) observes, translation is often accompanied by "inner speech", reflected by translators' lip movements, even if they are not speaking. However, the verbalized information must be as close to the content of working memory as possible, since making subjects interpret their decisions distorts the data (Krings 1987: 165).

Futhermore, as Hölscher and Möhle (1987: 113ff) remark, translation constitutes a useful tool in investigating language planning in production, because the source language form and the text meaning are already given, which allows the translator to focus on the production of the target language text without planning the content.

However, verbalization also has some limitations. As Kussmaul and Tirkkonen-Condit (1995: 181) observe, an important role is played by the cognitive load. On the one hand, with increasing cognitive load, subjects "tend to stop verbalizing or they provide less complete verbalizations" (Ericsson and Simon 1980: 242, in Kussmaul and Tirkkonen-Condit 1995: 181). As their cognitive resources are depleted, they focus on the translation process itself and have no resources left for verbalization. On the other hand, highly automated routine processes are not available to verbalization either, since only "heeded information" (Ericsson and Simon 1987: 33) can be verbalized.

A further question is that of the information used in the processing: How much of it is "purely" linguistic and how much of it comes from other components of the cognitive system? According to Tirkkonen-Condit (1992), translation protocols reveal the use of textual, extratextual and linguistic knowledge. Extratextual knowledge means general world knowledge, especially professional knowledge in the field of the text (Tirkkonen-Condit 1992: 435). Although Kussmaul (1995: 15) questions her approach by stating that "there is no division between linguistic and extralinguistic knowledge", his statement should be treated with some reservations. On the one hand, one should agree with Hörmann (1981, in

Kussmaul 1995: 15) that comprehension involves the interaction of bottom-up and top-down processes, the latter of which are based on linguistic knowledge as well as on world knowledge and experience. On the other hand, one should not neglect procedural knowledge, which is often inseparable from declarative knowledge, but the need to use it may render linguistic knowledge insufficient. For example, being able to define all trigonometric functions verbally does not necessarily presuppose the ability to calculate them for a particular angle.

Finally, the role played by affective states is not negligible. As Jääskelainen (1996: 69) concludes on the basis of her TAP study, "it seems that affective factors, be they personal involvement, commitment, motivation, or attitude, play a significant role in translation as well as in other forms of human behaviour." Hence, the absence of certain data in TAPs may be due not to cognitive overload, automaticity or other processing factors, but rather to the subjects' anxiety or unwillingness to verbalize information perceived as irrelevant or incorrect (Wlosowicz 2008/2009).

In summary, the translation process involves the interaction of different types of information, much of which is directly verbalizable. This renders translation a useful tool in research on mental representations and multilingual language processing, although one should also be aware of its limitations. Some practical applications of translation to psycholinguistic research as well as to foreign language teaching will thus be presented below.

4. Practical applications of translation to psycholinguistic research

4.1. Access to cognitive processes

As has been mentioned above, translation involves both comprehension and production, including speech (and, further, writing) planning. Still, comprehension is much more difficult to investigate than production, since the former is not directly observable. Therefore, as Ringbom (2001: 66) observes, there are many more studies on foreign language production than comprehension.

Undoubtedly, observing comprehension requires revealing it by means of a productive response, from pressing a button, through answering questions, to paraphrasing and translation. Pressing a button in order to signal the comprehension of a stimulus sentence has been used in a number of psychological studies, especially on native language comprehension (see Perfetti 1999). However, in a foreign language, especially a less well mastered one (L3, L4, etc.), this procedure might be risky, because a subject's impression of understanding a sentence might not necessarily imply correct understanding, especially in the case of "deceptive transparency" (Laufer 1997: 25), such as the presence of false friends, morphologically non-transparent words (for example, *discourse*, which may be interpreted as "without direction", Laufer 1997: 25), or "synforms"

(Laufer's term referring to easily confused words, e.g. *industrial* and *industrious*). In fact, in order to reveal her subjects' comprehension of deceptively transparent words, Laufer used paraphrasing, which can be regarded as a form – though intralingual – of translation (Korning Zethsen 2007). At the same time, reaction times do not reveal many details of the comprehension process, apart from processing speed, which may, for example, indicate semantic priming.

Alternatively, the subjects might be asked questions about the text used in the experimental task. Yet, it is quite possible that, while formulating their answers, they might avoid the problematic words, so it might never come to light whether, despite a good overall understanding, for instance, they took some false friends for equivalents.

Paraphrasing is much more precise in this respect, as the subjects have to paraphrase the whole text sentence by sentence. However, it involves the same language as that of the text, which is a foreign language for the subjects. Consequently, they may have difficulty expressing their comprehension of the text or they may even take whole unanalysed chunks and insert them into the paraphrases. Therefore, translating the text into the native language, accompanied by TAPs, seems to be the best option. First, unlike pressing a button and answering questions, translation requires processing the whole text and makes the subjects at least try to understand the problematic words used in it. Second, as the native language is the most automated, its production should not cause subjects much difficulty and their verbalization might be a good reflection of their comprehension. Third, as Kern (1994) has shown, mental translation into L1 is often a natural part of foreign language comprehension and it actually facilitates that process. In particular, it relieves working memory, which would otherwise be overloaded with storing chunks of L2 (or, for that matter, L3, L4, etc.) text, and it helps subjects create a coherent mental representation of the text and thus monitor their comprehension better.

For these reasons, translation into L1, accompanied by verbalization, was adopted by the present author in the research carried out for her Ph.D. thesis on L3 comprehension in different language combinations (Wlosowicz 2008/2009) and it did reveal a large part of the subjects' comprehension processes, including unconscious operations (for instance, the coactivation of phonologically or semantically related words) and conscious reasoning strategies.

Yet, translation into L1 also has some limitations. First, it involves production, which, even in L1, can require an additional effort. As the present author's study (Wlosowicz 2008/2009) has shown, some problems in revealing the subjects' comprehension of the L3 texts were due to difficulty in finding the L1 equivalents rather than in understanding the texts as such. Second, in the case of coordinate bilinguals or languages (e.g. L1 and L3) stored in a coordinate way, finding equivalents can be a real challenge, despite a correct comprehension of the text. In such cases, translation into L1 should be supplemented with other methods, such as paraphrasing the text in L3 or translation (perhaps only of some words) into L2.

Still, translation and TAPs can be applied not only to the investigation of comprehension, but also to that of other processes, such as inferencing or gap-filling. In fact, some researchers have already used TAPs in such studies, for example, Haastrup (1987) applied them to research on inferencing and Feldmann and Stemmer (1987) – to C-test solving. However, it can be supposed that translation can yield a more detailed picture than, for example, inferring the meanings of particular words.

Other processes that can be revealed by translation include transfer, both as a strategy and an automatic process, and interference. As Heine (2004: 84-84) points out, determining the source of a particular interference error is often so difficult that is requires guessing (plausible but not necessarily correct) on the researcher's part. Thus, translation TAPs can indicate whether, for example, a particular error is the result of transfer from L1 or from L2, or whether it was a mistake or the result of a conscious strategy.

Furthermore, it must be remembered that language comprehension and production are not limited to the use of words, but they involve grammatical processing. Consequently, more attention should be paid to research on the interaction of source and target language grammars in translation and to the relationship between the grammars internalized by the subjects. For example, studies might be carried out on the use of formally but not always functionally similar structures, such as the Present Perfect tense in English and the Passé Composé in French. In such cases, the regular use of literal translation by particular subjects (especially incorrect use, for instance, translating *J'ai écrit une lettre hier* by **I have written a letter yesterday*) might indicate some transfer-based interdependence between those grammars, which would be especially interesting in the case of L2-L3 transfer if the subjects' native language, such as Polish, did not contain such structures. A study on the relationship between infinitival and gerundive subordinate clauses in English (L2) and French (L3), involving L1-L2, L1-L3 and L2-L3 translation has been carried out by the present author (Wlosowicz in preparation).

Finally, TAPs in translation can reveal the use of other sources of information and the interplay between linguistic and non-linguistic knowledge. Last but not least, it can provide some insight into affective states and their role in language processing (for example, if a subject is frustrated by his or her inability to find the correct equivalent, Wlosowicz 2008/2009).

At the same time, translation can reveal some aspects of mental representation, especially relationships between words in the mental lexicon.

4.2. Revealing the structure of the multilingual mental lexicon

As has been mentioned above, translation ability is influenced by the mental representation of a bilingual's or a multilingual's languages. Indeed, the results of the present author's L3-L1 translation and verbalization study (Wlosowicz 2008/2009) indicate that, even though there may generally be connections

between the L1 and the L3 lexicons, some words, especially ones acquired in the L3 context, seem to have no L1 equivalents and are very difficult to translate, which provides support for the importance of the acquisition context for the organisation of the mental lexicon. For example, a Polish (L1) participant living in France claimed that *logiciel* (software) had no equivalent in Polish. However, when she was told afterwards that it was called *program* or *oprogramowanie*, she immediately recognised that she knew the words, but she had acquired the French word in a French (L3) context, without forming any connection between the L1 and the L3 words. Similarly, translation has been used by Herwig (2001) to reveal the interconnections between the different languages in the multilingual lexicon.

Moreover, if subjects find it easier to translate an L3 word into L2 (for instance, *erfolgreich – successful*, in the absence of an L1 (Polish or French) equivalent) or to replace it with an L3 synonym (for example, *actually – in fact*), it may be supposed that the L3 intralingual lexical links or the interlingual ones between L2 and L3 are stronger than those between L3 and L1. Another possibility would be to hypothesize that both L2 and L3 words are linked to a common concept, which is not lexicalized in L1. However, deciding whether such translation involves lexical or conceptual links would require taking into account such factors as the subject's proficiency levels in all three languages, the acquisition context and his or her cognitive style (for example, whether he or she prefers to infer word meanings from context or to memorize them together with their equivalents in L1, or, if no L1 equivalent exists, in L2).

Furthermore, translation can reveal the connotative meanings of words and, as Wlosowicz's (2008/2009: 636) study indicates, connotations (or other pragmatic and cultural features) which differ from one language to another can even hinder comprehension in spite of lexical links between the words. For example, upon encountering the word "fourmis" (ants) used in a metaphorical sense in the French (L3) text (in which compulsive shoppers in a supermarket were compared to ants), German-speaking subjects, for whom the ant generally has positive connotations as a prototypical hard-working creature, had difficulty understanding the metaphor and commented that, even though the word could be translated as "Ameisen", it did not make sense.

At the same time, comments made during the translation gave some insight into the subjects' encyclopaedic knowledge. For example, even though the phrase *she herself had a paper to deliver* in the English (L3) text was interpreted by most subjects as referring to a written or rather printed article (due to their reliance on the basic meaning of *paper* and its connections to its Polish, French or German equivalents), those who took into consideration the context of a conference managed to infer the sense of "a presentation".

However, as the mental lexicon contains the morphosyntactic properties of words as well, translation can reveal the representation and processing of those properties. In particular, concentration on the lexical meanings of words can lead to the overlooking of such features as person, number, tense, etc. Hence, words

can be translated correctly as far as the choice of equivalents is concerned, but the tense of the text may be changed, for instance, from the past to the present (Wlosowicz 2008/2009: 651). This supports the distributed representation of lexical entries and indicates that some grammatical morphemes may be more difficult to access than the basic forms of words.

In fact, the translation of whole texts can be a much more powerful tool, because it reveals different aspects of language processing and representation beyond the level of single words. Yet, the investigation of mental representations begs the question of how they are formed and how the results can be applied to foreign language teaching.

4.3. The application of translation to foreign language teaching

As Wandruszka (1981: 21) rightly observes, translation is directly experienced multilingualism ("Übersetzen is erlebte Mehrsprachigkeit"). Among other things, it allows learners to compare languages and to find similarities and differences between them.

Even though the Grammar Translation method has no empirical support (Richards and Rodgers 1994: 5), banishing translation as such from foreign language classes is not justified either. As Richards and Rodgers (1994: 11) admit, the strict avoidance of the native language in the Direct Method often caused frustration, as teachers had to perform elaborate verbal gymnastics where translation into the native language would have been a simpler and more effective solution (Richards and Rodgers 1994: 11). Therefore, where necessary, translation into L1 should be applied in order to explain certain L2 (or L3, etc.) meanings or to illustrate certain differences.

Apart from illustrating differences in word meaning, translation can also be applied to the teaching of problematic grammatical structures. For example, word for word translation into Polish can help explain to learners the Present Perfect Tense (*I have done – mam zrobione*, which indicates the result) or the Past Perfect Tense (*if I had done – gdybym była zrobiła*, which stresses the anteriority of the action). In the case of deceptively similar structures (e.g. the Passé Composé in French does not always overlap with the English Present Perfect Tense), translation can show learners the differences in meaning and use between them.

Moreover, on the basis of Kern's (1994) observations, it might be supposed that, although translating every single word into L1 would be superfluous, some translation should be encouraged in order to facilitate foreign language comprehension. Not only would it allow learners to form more coherent mental representations of foreign texts, but it would also make them more sensitive to similarities and differences between languages.

In fact, this would increase learners' metalinguistic awareness and, by encouraging them to form interlingual connections, it would promote the creation of interconnected multilingual repertoires. Still, as de Angelis and Selinker

(2001) point out in reference to Grosjean's (1985) holistic view of bilingualism, a multilingual is not the sum of three or more monolinguals, but a speaker with a specific language configuration. Consequently, he or she should be able to manage his or her language resources (see Herdina and Jessner 2002), also by learning how to exploit the connections between languages more efficiently.

5. Conclusions

In general, the studies presented here show that the use of translation in psycholinguistic research can yield interesting insights into multilingual language organisation and processing. First, it reveals language production and comprehension processes, especially those which are not automated and are accessible to verbalisation, which allows the creation of TAPs. In particular, translation into the native language gives access to foreign language comprehension, including the recognition of words and morphemes (also grammatical morphemes, such as tense endings) as well as comprehension strategies and the use of context and general knowledge. Second, it reveals several aspects of the structure of the multilingual mental lexicon, such as the interconnections between the words of the different languages and to some extent the subjects' reliance on lexical links and formal similarity, or on the links between words and concepts. Third, apart from lexical knowledge (i.e. that of words and, in some cases, morphemes and their meanings), translation can reveal grammatical knowledge, including the knowledge of rules and their use as well as that of the morphosyntactic properties of lexical items.

Moreover, reasonable use of translation in foreign language teaching can make learners more aware of similarities and differences between languages, both at the lexical and the grammatical level. It can also be used in teaching foreign language comprehension, as it helps learners establish and monitor a more coherent mental representation of the text.

It can be concluded that translation, especially when combined with think-aloud protocols, constitutes a very useful tool in psycholinguistic research and foreign language teaching. However, it also has certain limitations which should be taken into consideration. Consequently, even though some studies can be based on translation alone, others require supplementing it with other research tools, such as questionnaires concerning the learners' language experience.

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