

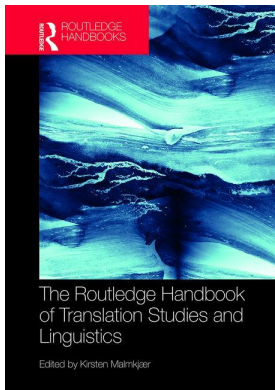
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Bilingualism, translation, and interpreting

John W. Schwieter and Aline Ferreira

Introduction

A human's ability to translate and interpret languages has intrigued linguists, philosophers, psychologists, and bilingual experts for decades. Indeed, it is a rather frequent occurrence: non-professional translation happens in everyday circumstances among bilinguals with no training (Harris 1976), and, at the same time, is carried out by a vast number of highly-qualified professional translators. In both cases, understanding and describing how bilinguals are able to produce output in one language from input in a different language has led to rich, dynamic approaches to researching translation, interpreting, and bilingualism (see Schwieter & Ferreira, 2017 for an overview). In this chapter, we will discuss some of these approaches.

Defining translation, and interpreting, competence, and bilingualism

We begin by asking the question: What is translation? Translation can be seen as an activity between languages to express the same reality (Vinay and Darbelnet 1958) although it has been defined in various ways. Hurtado Albir (2011) perhaps describes translation best by characterising it as: a textual operation, an act of communication, and a cognitive activity. As a textual activity, the meaning of the message is translated: it is not simply a matter of converting the source language into another language. In this case, translation is understood as a communication act, not a linguistic act (Seleskovitch and Lederer 1984) which occurs in a social context (Hatim and Mason 1990). According to Seleskovitch and Lederer's Interpretive Theory of Translation, translation is divided into three processes: comprehension, deverb-alisation, and re-expression (for a review, see Hurtado Albir and Alves 2009). Translation is also a cognitive activity, in which a translator performs a complex mental process that consists of comprehending the meaning of a text and subsequently formulating it using the resources found in another language, all while considering the needs of the recipient and the purpose of the translation (Hurtado Albir 2011).

We can also identify translation as a skill which involves knowing how to solve translation problems that arise in each occurrence (Hurtado Albir 2011). It is a kind of language production that can be analysed in terms of process and product (Mossop *et al.* 2005). Translation

is also viewed as a form of communication through a change of language: it is an interlingual interpretive use that can be explained by relevance principles (Gutt 1991/2000) in which what is intended to be conveyed and how it is conveyed must be adequate to a specific audience.

Although interpreting is carried out in different contexts, the most common type is conference interpreting, which encompasses consecutive (CI) and simultaneous (SI). In both cases, communication is exclusively oral. Consecutive interpreting is that which is done after the utterance is complete: the speaker makes an utterance, stops for the interpreter to translate it, and so on (Gile 2006). Although consecutive interpreting is still much in demand (Gile 2006), it has been largely replaced by simultaneous interpreting (SI), which is carried out while the delegate is speaking. This mode of interpreting is commonly used in courts and legal contexts (for a review of SI, see Seeber 2015).

The increased presence of SI has aroused interest among researchers in explaining this complex task. Studies on SI have been well informed by psycholinguistic research on how languages are processed. This resulted in simplistic descriptions of this complex task, in terms of transcoding, or a simple replacement of a language units from one language to the other (see Gile 2006 for a review).

Although the research questions investigated in Translation Studies (TS) and interpreting studies (IS) are different, they intersect with their common denominator: bi/multilingualism. A topic that has yet to be extensively discussed is the role of bilingualism in translation and interpreting, when a high level of proficiency in two languages is indispensable. In TS, the PACTE (2003) research group's model of translation competence suggests that bilingual competence, which comprises pragmatic, socio-linguistic, textual, grammatical, and lexical knowledge, is a procedural knowledge required to communicate in two languages. Along with four other competences (extra-linguistic, knowledge about translation, instrumental, and strategic plus psycho-physiological components), bilingual competence plays an important role in solving translation problems (Ferreira 2013).

Wilss (1976) defines translation competence as a union of three partial competences: receptive competence, productive competence, and super-competence. The first is related to how translators understand the target text while the second competence refers to writing abilities. The third relates to the ability to transfer messages between two different linguistic systems. Under these assumptions, as discussed by Shreve (2012, 1), "knowing how to translate" is also related to having linguistic knowledge in L1 and L2 (e.g., being *bilingual*). According to Harris and Sherwood (1978, 155), "all bilinguals are able to translate, within the limits of their mastery of the two languages; therefore translating is coextensive with bilingualism." However, this "natural translation" is different from translation competence. The former is only one aspect of bilingual competence possessed by all bilinguals, while the latter is one which professional translators have (Lörscher 2012). Professional translators can translate not only because they are bilinguals but because they are trained to efficiently transfer meanings and forms from one language into the other.

Situating bilingualism in TS and IS can help to establish a better understanding of these competences. Lörscher (2012) presents an overview of bilingualism and translation competence. One interpretation of bilingualism he offers is that an individual is *bilingual* when s/he can be considered a native speaker in both languages, in each of the respective communities, which would imply rare cases of bilingualism. A second interpretation of bilingualism is broader and assumes that a bilingual is anyone who possesses one of the four language skills (listening, reading, speaking, and writing) in two languages (Macnamara 1967), or an individual who can produce "complete meaningful utterances in the other language" (Haugen 1956). However, a more contemporary view of bilingualism occupies a

medial position between these two definitions. Based on work by Grosjean (2001), Lörcher argues that individuals are *bilingual* if they are capable of using two languages in the context of their daily lives. Competence in each context can vary with respect to the four language skills (speaking, writing, reading, and listening) and to the domain of the communication. Although the notion of bilingualism still remains complex, the fact that it is discussed by experts from various research areas (second language (L2) acquisition, psycholinguistics, sociology, psychology, international education, etc.) who use different methods to operationalise bilingualism, helps us to get closer to refining and capturing what it truly entails.

Historical perspectives

Translation activities have been conducted for some four or five thousand years (Santoyo 2006), and probably follow the consolidation of writing (Hurtado Albir 2011). As for interpreting, even though it became widespread in the post-war period, it has existed since Ancient Egypt. Santoyo (1987) refers to four periods through which translation has passed: oral translation, written translation, a reflection period, and translation theory. Hurtado Albir presents a rich review of the stages in the history of translation, from the first thoughts and manifestations on translation to modern theories which consider translation as a discipline of its own. This overview presents diverse theoretical approaches that are linguistic, textual, communicative, sociocultural, philosophical, and cognitive in nature. These approaches have been informed by topics focusing on, among others, translation processes and practical issues such as training and professional practice. Strategies, quality perception, translation competence, bi(multi)lingualism, and proficiency are a few of the variables that have been tested in scholarly venues dedicated to cognitive perspectives on translation (Ferreira and Schwieter 2015; Schwieter and Ferreira 2014a; Shreve and Angelone 2010).

Although research in TS is relatively new, the body of work that describes the translation process, translation product, and training has increased since the 1980s. Prior to this, research was based on philosophical or philological discussions in which theories were developed mainly based on experience (Orozco-Jutorán 2003). Methodologically speaking, early work consisted of corpus analyses or self-observations (Neunzig 1999). Similarly, research in IS has increased, even though it is “less mature and may be facing more fundamental questions about its identity and the way ahead” (Gile 1998, 69; see also Gambier, Gile, and Taylor 1997). In its early stages, work in IS was conducted by psychologists and educators. Perhaps one of the first publications to combine both fields was Sanz’s (1930) report on observations and interviews with conference interpreters (Pöchhacker 2009). Prior to this, however, Herbert (1952), a former interpreter during the Paris peace negotiations of 1919, published *The Interpreter’s Handbook: How to Become a Conference Interpreter*, anticipating a future for research in IS, and although research on interpreting was scarce until the 1960s, the momentum increased when experimental psychologists such as Oléron and Nanpon (1964) got involved. Soon after, several PhD dissertations were defended throughout the 1970s and 1980s.

By the time psychologists and conference interpreters began working on research on interpreting, there was also an interest in cognitive aspects of interpreting. Scientific studies were firstly carried out by psycholinguists and cognitive psychologists, but interpreting practitioners also carried out studies using methods different than those typically used in cognitive science. In the late 1980s, “practisearchers” (Gile 2015, 42) showed interest in cognitive psychology and it became apparent that there was a need for more scientific, objective studies, in light of the “speculative theorizing vs. empirical research” dichotomy (Gile 1990).

While we cannot go so far as to say that there was a shift in TS and IS towards cognitive science (Pöchhacker 2009), we also cannot deny that there were research implications for TS and IS upon the birth of community-based interpreting and the application of new technologies (e.g., remote interpreting). Because research approaches widened their scope, there has been an increase in the number of studies on a variety of topics such as memory, attentional control, performance, aptitude, teaching, history, the interpreter's role, and technology (for a review see Pöchhacker 2009). In the next section, we outline some of the key issues from research in cognitive bilingualism that have interfaced with TS and IS.

Core issues and topics

Language proficiency and directionality in translation

Several variables exploring cognitive aspects of bilingualism such as language comprehension and production, discourse processing, memory, attention, and expertise contribute to our understanding of translation and interpreting (Christoffels and De Groot 2005). Commonly, linguists are interested in processing differences between the first language (L1) and L2, and researchers in interpreting focus on competence and L2 proficiency (Gile 2015). In TS, we have seen an increased interest among psycholinguists to investigate the architecture and functionality of the bilingual memory and among translation experts to analyse both the translation processes and product.

Even though it is clear that being *proficient* is necessary in translation and interpreting, the exact definition of *proficiency* is still being debated. Defining levels of proficiency in both languages and the role of each language during translation performance might be related to how professionals carry out the task at hand (Ferreira 2013, 2014). L2 proficiency is influenced by several factors such as age of acquisition, similarity between languages, personality, motivation, L1 proficiency, and social economic status, among others (Ferreira *et al.* 2016). Most professional interpreters and translators are highly proficient in more than two languages, even though finding a perfectly-balanced bilingual is rare and, as a consequence, translators and interpreters are usually trained to translate from a passive to an active language (Hamers and Blanc 2000), or from the L2 to the L1 (Ferreira 2013), even though decoding from a passive language might impair the process required for the reconstruction of the text in the target language.

Interestingly, SI used to be carried out exclusively from the L1 into the L2 in the former Soviet Union (Seeber 2015). This practice was supported with reference to the fact that only a native speaker of the input language would be able to understand every nuance of the input, and it is clear that highly-developed language skills in both languages are crucial for translators and interpreters. However, those skills are not only related to specific aspects of language (e.g., grammar), but also to cognitive variables, verbal intelligence, general culture, and verbal-fluency factors (Carroll 1978).

Mental representations in the bilingual memory

How are is a concept that has two translation equivalents represented in the bilingual mind? Early explanations of lexical and conceptual representations in the bilingual memory entertained two possibilities: word association and concept mediation. Subsequent explanations were more developmental in nature. In Figure 16.1, we show three hypotheses about the bilingual memory and explain each below.

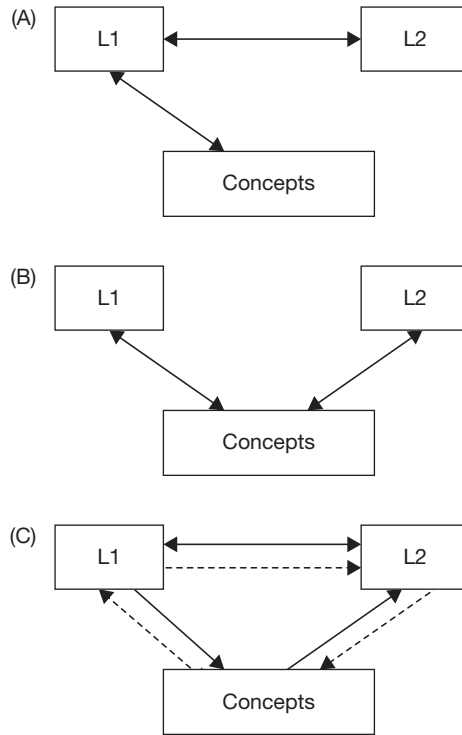


Figure 16.1 Three depictions of lexical and conceptual mediation in the bilingual memory: the word association model (A), the concept mediation hypothesis (B), and the Revised Hierarchical Model (C), adapted from Schwieter and Ferreira (2014b)

In Figure 16.1a, the word association hypothesis posits that a direct association exists between words in both languages but that access to the conceptual store must occur through L1 words. Putting it differently, according to the word association hypothesis, an L2 word is understood and produced by first retrieving its L1 word equivalent. However, other studies suggest that words in both languages may have direct access to the common conceptual store as can be seen in the concept mediation hypothesis (see Figure 16.1b). Support for the concept mediation hypothesis came from Potter *et al.* (1984) who carried out a study in which bilingual word translation performance was compared to picture naming. Results showed that it took longer to name pictures and the researchers argued that in bilingualism, access to concepts is required before a word is articulated.

Kroll and Curley (1988) tested the concept mediation hypothesis and found support for a developmental explanation in which there appeared to be a shift from reliance on word-to-word connections (at lower proficiency levels) to reliance on conceptual links (at higher proficiency levels). In order to assess whether conceptual access is influenced by the type of words to be translated or pictures to be named in both L1 and L2, the researchers predicted that the semantic organisation of the words and concepts would benefit only relatively fluent bilinguals. Results showed that more proficient participants took longer to translate the words into the L2 only when the words were of mixed categories, whereas it took longer to name pictures in the L1 when the list consisted of pictures of the same category.

As more research tested word vs. concept mediation, developmental explanations became favoured. In Kroll and Stewart's (1994) study, the researchers replicated the category interference effect from Kroll and Curley (1988) in picture naming and word translation in three experiments. In the first, participants named pictures or words only in their L1 in two conditions: in the same category (fruits, clothing, animals, etc.) or in mixed categories. Words were named faster than pictures and it took longer to name pictures in the categorised lists than in the randomised lists. In other words, picture naming was influenced by belonging to the same semantic category, but word naming was not. The researchers argued that word naming primarily reflects activity at a lexical level of processing whereas picture naming requires concept mediation. In the second experiment, participants named both pictures and words in same-category or mixed-category lists. There was no longer a category interference effect for picture naming when pictures were alternated with words. In the third experiment, instead of naming the words, participants were asked to translate them from L2 to L1 and from L1 to L2. The category interference effect occurred only when participants translated from the L1 to the L2, suggesting that L1-to-L2 and L2-to-L1 translation engage different interlanguage connections.

Kroll and Stewart's (1994) findings led to the proposal of the Revised Hierarchical Model (RHM) which captures "the developmental change in linking between L2 and L1 word forms and lexical concepts" (Pavlenko 2009, 143). The model suggests that as L2 proficiency increases, the links between L2 words and concepts become stronger, allowing for a direct link to the conceptual store and in turn, concept mediation. In some ways, we can see the RHM as a developmental merger of the word association and concept mediation models.

Cross-linguistic differences in the bilingual lexicon were described in the Distributed Feature Model (De Groot 1992, 1993), based on the conclusion that concrete words and cognates were translated faster than abstract words. Several studies (De Groot 1992, 1993; De Groot, Dannenburg, and Van Hell 1994; Kroll and Stewart 1994) have shown that while the representations of concrete words and cognates are shared across languages, abstract words share fewer semantic features. In fact, Dong, Cui, and MacWhinney's (2005) study revealed that conceptual representations of translation equivalents can be shared or partially separate for L1 and L2 and that links between words and concepts are stronger in the L1 compared to the L2, a finding also documented in translation experiments at the discourse level with proficient bilinguals (Ferreira 2013, 2014).

A dynamic view of the bilingual memory

Recently, researchers have begun to look at the architecture of the bilingual memory as a dynamic system which involves conceptual restructuring and overlapping. As seen in Figure 16.2a, the Modified Hierarchical Model (MHM; Pavlenko 2009) suggests that conceptual representations can be either: fully shared, partially overlapping, or not shared (i.e., language specific). Concepts are activated depending on the linguistic and social contexts in a two-way interaction between the mind and the environment. The model also recognises the importance of conceptual transfer, which relies on the differentiation between semantic and conceptual levels of representation. Semantic representation is related to knowledge of the number of concepts that are expressed by a specific word, and also to knowledge of the connections and relationships between words. A core element of the MHM is that the conceptual restructuring and development of linguistic categories in the target language is a main goal of bilingualism and is a gradual process.

Given that many professional translators and interpreters have knowledge of more than two languages, the Trilingual Modified Hierarchical Model (TMHM) (Benati and Schwieter

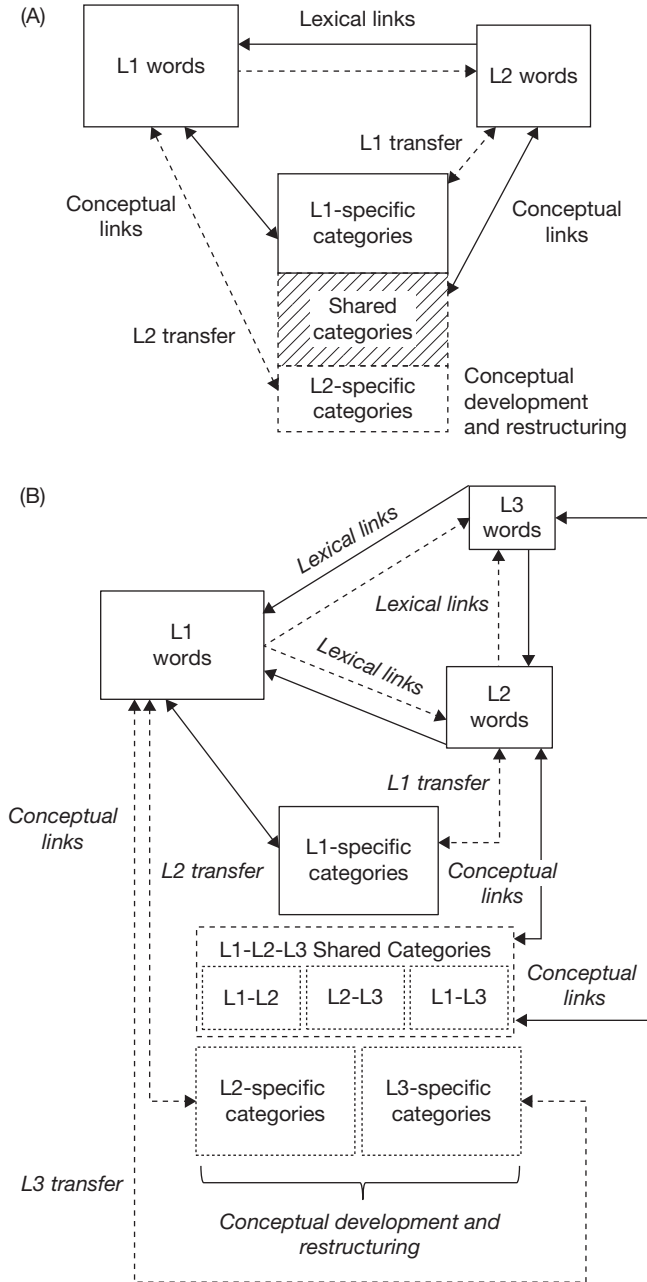


Figure 16.2 Dynamic views of bilingual and trilingual memory: the Modified Hierarchical Model (A) (Pavlenko 2009) and the Trilingual Modified Hierarchical Model (B) (Benati and Schwieter 2017)

2017), shown in Figure 16.2b, is particularly important to discuss. The addition of a third language implies that concepts can be shared between any two or all three of the languages. While maintaining the developmental strengths of the RHM, and the dynamic characteristic of conceptual overlapping and restructuring of the MHM, the TMHM proposes that the

addition of an L3 implies that lexical mediation from the L3 to the L2 and from the L3 to the L1 can occur. Although further extensions to the TMHM are being made (Libben and Schwieter, in preparation), at this point, it is based purely upon theoretical speculation and merits empirical testing to tease apart whether there is a preferred route of lexical mediation in trilingualism (as there appears to be in bilingualism) and whether this is modulated by factors such as language typology, proficiency, and cognate status.

Working memory and lexical retrieval

In studies that analyse highly-complex language tasks such as interpreting, word-level analyses are sometimes considered too basic to be taken into consideration. However, research has been well informed by looking at working memory and lexical retrieval during interpreting. Searching for the most reliable word in the target language during translation and interpreting is complex, time consuming, and vulnerable to “break down due to loss of valuable processing capacity and time” (Christoffels, De Groot, and Waldorp 2003, 202). While trying to find the appropriate translation equivalents in the target language, working memory plays a substantial role in storing and processing information.

Christoffels, De Groot, and Waldorp (2003) investigated the role of memory and lexical retrieval in interpreting. The researchers administered a reading span task and a verbal digit span task to assess working memory capacity along with a picture naming and a word translation task which estimated lexical retrieval time. The performance by untrained bilinguals on these four tasks was compared with their interpreting performance. The results demonstrated that word translation, picture naming, and working memory to a lesser degree, correlate with interpreting performance and that word translation performance and working memory capacities form “(conditionally) independent paths to SI performance” (2003, 208).

A battery of psycholinguistic tasks (picture naming, word translation, reading span, speaking span, and word span) were carried out by Christoffels, De Groot, and Kroll (2006) in a study with bilingual students, professional interpreters, and language teachers in order to compare language processing among these three populations. Results showed significant differences between bilinguals and interpreters. Interpreters outperformed bilingual students in speed and accuracy in the tasks and also on working memory capacity. They only outperformed the language teachers on the working memory tasks. The researchers argued that “working memory is an important subskill for simultaneous interpreting whereas the role of lexical retrieval may be mediated by general language proficiency” (Christoffels, De Groot, and Kroll 2006, 343).

Main research methods

Studies on translation and interpreting have employed diverse methodologies. However, language has been a critical, yet constant component in each, albeit seen from different perspectives. Word span and reading span tasks, for instance, are commonly carried out in bilingual studies and have also been used to explain differences between bilinguals’ and professional interpreters’ working memory capacities (Christoffels, De Groot, and Kroll 2006). Studies on bilingual children normally use standardised measures of receptive vocabulary such as the Peabody Picture Vocabulary Test (Dunn and Dunn 1997) and its adaptations for languages other than English (e.g., the Spanish version *Test de Vocabulario en Imágenes Peabody* by Dunn *et al.* 1986), as well as measures of productive vocabulary (Expressive One Word Picture Vocabulary Test, Brownell 2000). These tasks are normally

carried out as part of a series of tasks (e.g., language questionnaires, reading comprehension, reading fluency, etc.) and correlational analyses between vocabulary and other variables are conducted to explain variations in language and cognitive development in bilinguals (Ferreira, Schwieter, and Gile 2015).

TS and IS have been using methodologies from linguistics, literacy research, and cognitive and developmental psychology, among other disciplines, for decades. While tasks such as the Verbal Fluency Measure (Gollan, Montoya, and Werner 2002), commonly used in research on bilingualism, might not tell us much about a translator's or interpreter's language profile (Ferreira *et al.* 2016), there are a number of other tasks that have explanatory power for translation processes, across a spectrum of language learners, bilinguals, and novice and expert translators and interpreters. In the 1990s, the use of quantitative measures in TS and IS increased as psycholinguists and psychologists became interested in TS and IS (Gile 1991). Recent advancements in technology have further increased the presence of these measures. IS has particularly moved away from formal linguistic approaches (reflection, theory, and critique) towards empirical approaches (Ferreira, Schwieter, and Gile 2015). Whereas studies on bilingualism comprise a range of participant types, translation and interpreting research focuses mainly on highly proficient bi/multilinguals. Furthermore, in both TS and IS, the use of multiple data collection methods to elicit different types of data (e.g., triangulation) is a common practice that helps to strengthen the conclusions drawn from data analyses and to assure validity in research design.

SI is one of the most complex language processing tasks imaginable (Frauenfelder and Schriefers 1997). Few other language tasks combine the need to comprehend and produce speech simultaneously, and to concurrently command and control two languages. Understanding SI may be of great interest to cognitive psychologists and psycholinguists because of the demanding nature of SI in terms of online processing and control. Word translation and word- or picture-naming tasks have been used to investigate language control, suppression, and lexical retrieval. Language direction and cognate status are a few examples of variables that have been under scrutiny (Gernsbacher and Shlesinger 1997; Macizo and Bajo 2006; Ibáñez, Macizo, and Bajo 2010; Schwieter and Ferreira 2014b; among others). In these experiments, words, pictures, or sentences are randomly presented on a computer screen and participants are asked to simply name or translate what appears in front of them. Reaction time (in ms) and accuracy (in %) are usually the variables measured and analysed. In addition, it is common practice to ask participants to fill in self-rating language questionnaires and participate in tasks that measure working memory.

In research on translation processes, several methods have been employed including keystroke and mouse logging, screen recording, eye tracking, retrospection, interviews, and quality revision. Mouse and keyboard activities, pause patterns, and visual replay functions have been broadly investigated (Göpferich 2009; Ferreira 2014) using Translog (Jakobsen and Schou 1999) as a research tool. Screen recording is used to analyse how translators deal with a particular segment (editing processes, mouse clicks, etc.), to estimate the external resources relied on during a task (e.g., internet browser), and even to record facial expressions. One of the most popular softwares for screen recording is TechSmith's Camtasia Studio which has been used in a number of studies (O'Brien 2006; Göpferich, Alves, and Mees 2009; Angelone 2010).

Studies using eye-tracking technology have also gained popularity (O'Brien 2006, 2009; Pavlović 2009; Ferreira *et al.* 2016). This approach tracks eye movements and maps them onto what is displayed on a screen. This allows the researcher to analyse several aspects of fixations such as gaze time, average fixation duration, total task length, pupil dilation, etc., in

each area of interest presented on the screen (source text, target text, external support) (Ferreira *et al.* 2016). Neuroimaging techniques have also been highly useful in TS and IS through positron emission tomography (PET) (Rinne *et al.* 2000; Tommola *et al.* 2000); functional magnetic resonance imaging (fMRI) and event-related potentials (ERPs) in electroencephalography (EEG) have also been employed (Kraushaar and Lambert 1987; Gran and Fabbro 1988; Grabner *et al.* 2007).

Retrospections and think aloud protocols offer a qualitative approach to investigating translation processes. While retrospections are assumed to be less cognitively demanding and to not affect the translation process because they are carried out after the task, think aloud protocols are conducted while translators are working on the task, which slows down the translation process (Krings 2001; Jakobsen 2003). In order to assess translator profiles and to homogenise participant groups, researchers commonly gather descriptive data that detail participant characteristics (Ferreira 2013; Michael *et al.* 2014). Questionnaires such as the Language Product Evaluation Tool (LPET) can also be used to measure text quality. The LPET combines rubric- and check-list-approaches to analyse the factors that comprise translation quality (Michael *et al.* 2014). Several dimensions of quality can be evaluated such as significance, completeness, accuracy, omission of irrelevant information, organisation, and writing (Michael, Massaro, and Perlman 2009).

Regarding the quality of translation produced by bilinguals, case studies are commonly conducted, usually employing indirect observation (e.g., an analysis of audio- or video-recorded data) and interviews. Some studies also analyse descriptive data, in which certain parameters are met and coded into quantitative data and statistically analysed (Dam 2004; Szabo 2006). Overall, questionnaires, observations, tests, and individual and group interviews (face-to-face and phone) are among the most common data collection methods in measuring quality in TS and IS. Quantitative analyses are commonly carried out through descriptive, inferential, and correlational statistics, along with speech data (for audio-recorded data). Qualitative measures focus on aspects such as the role of the interpreter, specificities of each mode (community interpreting, healthcare interpreting, court interpreting, etc.), linguistic variation (discourse analysis), adaptation, and strategies.

Current debates

TS and IS have expanded in very different ways and as detailed above, many theories and models have been proposed and new research methods have been developed and improved due to the collaborative nature of TS, IS, and research on bilingualism. Technology is constantly bringing new approaches and questions to research and has changed the way translators and interpreters approach the profession. Post-editing machine translation is now a common practice that has evolved considerably since the late 1960s (see Sin-wai 2015 for a review). In SI, interpreting booths are still used, but are now equipped with video screens. Personal computers and the internet are also commonly used to access documents and terminology databases (Seeber 2015). Technology has also made remote medical interpretation a common practice, raising concerns about perceptions of quality (Locatis *et al.* 2010).

Quality is key not only in educational programmes in translation and interpreting, but also in the development of instruments for professional certifications and the creation of research methods and procedures. Models of translation quality that have attempted to explain *how* quality should be measured have not come to an agreement (e.g., in terms of reader response, acceptability, function) (see Angelelli and Jacobson 2009, for a review). Similarly, researchers in IS are still debating whether quality is related to an interpreter's performance

and/or role (Angelelli 2001), and very likely debates in bilingualism, translation, and interpreting will continue to focus on translation quality and the role of technologies in TS and IS.

High-level language proficiency is essential in cross-cultural language communication, and language education can benefit from faster and better language tools which can speed up the process of bi/multilingual communication. The way in which organisations and people interact in real time around the world has drastically changed in the last decade as a result of the use of digital technologies which have diversified and developed bilinguals' communication abilities and increased the need for interaction among translation and interpreting professionals.

Future directions

As discussed above, new technologies in instantaneous, bilingual communication emerge, research on several areas related to bilingualism, translation, and interpreting has developed. These new technologies have changed the way in which research in TS and IS is conducted. Machine translation (MT) is a cost-effective way to translate, even though it requires high-quality human revision. Because MT has improved in terms of quality and accessibility (e.g., it is free and available on many websites), it has become very popular among users and researchers. As for interpreting, the use of technologies such as VoIP (Voice or Video over Internet Protocol) and video-link for remote interpreting is up-and-coming. With regard to language learning, students benefit from search engines and access to an infinite amount of material.

Researchers have discussed how bilingual dominance and directionality in translation affect the way interpreting and translation are carried out. While it has been argued that translators and interpreters should only work into their L1 (Newmark 1988; Bros-Brann 1976), this is not realistic in many settings and is an issue for future research so that this controversial topic is not based on assumptions rather than empirical evidence (Gile 2005; Ferreira 2014). Analysing the effects of directionality in translation might shed light on the development of training strategies to rectify deficiencies in translation and interpreting tasks into a non-native language (Gile 2005).

Implications for practice

Debates have focused on the fact that translation and interpreting competences are different from bilingual competence, and that bilingual competence is an important prerequisite for translation and interpreting training. Because translating and interpreting into the L2 is a common practice, European training courses are taught on a regular basis in the L2. Technology has played an important role in these courses as they offer translation practice in several languages using MT, localisation tools, and translation memories. Technology and innovative methodologies have also helped to investigate how processing of two languages from the word to discourse level takes place. As discussed throughout the chapter, developmental theories of bilingualism have helped to explain mental representations and presented a “wealth of fruitful information that can be quite revealing for studies in translation processes” (Schwieter and Ferreira 2014b, 88). They explain oral word translation as either a lexically or conceptually mediated procedure as modulated by the translation direction and proficiency level. Studying how an L2 develops during the transformation of language learner to bilingual, translator, or interpreter – especially with innovative, new technologies – will help to refine our understanding of what it means to be bilingual and how the translation and interpreting processes cognitively function.

Further reading

Christoffels, I. and De Groot, A. 2005. "Simultaneous Interpreting: A Cognitive Perspective". In *Handbook of Bilingualism: Psycholinguistic Approaches*, edited by J. Kroll and A. De Groot, 454–479. New York: Oxford University Press.

This chapter discusses possible cognitive subskills of simultaneous interpreting and asks whether experience in interpreting is related to specific capabilities.

Gile, D. 2005. "Directionality in Conference Interpreting: A Cognitive View". In *Directionality in Interpreting. The "Retour" or the Native?*, edited by R. Godijns, and M. Hindedaël, 9–26. Ghent: Communication and Cognition.

This chapter outlines relevant factors in interpreting studies and explains how directionality and other variables explain (ir)regularities in conference interpreting.

Hurtado Albir, A. 2011. *Traducción y traductología. Introducción a la traductología*. Madrid: Cátedra.

The book is a well-compiled introduction to TS. Chapter 3 in particular brings a critical examination on how the field has evolved.

Schwieter, J. W. and Ferreira, A., eds. 2014a. *The Development of Translation Competence: Theories and Methodologies from Psycholinguistics and Cognitive Science*. Newcastle upon Tyne: Cambridge Scholars Publishing.

This book presents original studies from perspectives in psycholinguistics and cognitive science with the common goal of better understanding the development of linguistic competence that translators need to be effective professionals.

Related topics

Language disorders, interpreting, and translation; Language processing in translation.

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