

Translation Meets Cognitive Science: The Imprint of Translation on Cognitive Processing

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Abstract

Translation has played for long a supporting role in the research scenario under the wing of linguistic and literary studies. More recently, the theoretical and methodological concerns arisen by process research have given translation an additional role in cognitive science. The interest in the cognitive aspects of translation has led scholars to turn to disciplines such as cognitive linguistics, psycholinguistics or even neurology in search of innovative approaches and research methods. This paper reviews current issues in translation studies, presenting readers with a variety of empirical studies that may contribute to enlarging our knowledge of translation. The intention is to show that the joined work of disciplines from cognitive science may have an influential say, not only in defining the factors that guide the translation process and condition the translator's work, but also in describing the potential impact that translation research has on communication and language processing.

1. On the complexity of translation

The pervasiveness of translation in modern globalised world is indisputable. In the current multilingual world, translation has become a profitable window to the language and culture of neighbouring countries, commercial partners and political allies. Furthermore, under US social influence and the prevalence of English as the international language par excellence, translation has become the master key to access the products of the entertainment and media industry. But despite its ubiquity and social relevance, translation remains a mystery for both researchers and practitioners. The reason why translation is such a conundrum lies, to a great extent, in the intrinsic complexity of a task in which all the characteristic problems of studying only one language are at least doubled—or most likely squared—when two languages come into play. Problems are squared, rather than doubled, because language is not the only element at stake in translation; beyond language constraints, translators' decisions are restrained, among other things, by the prevailing norms in a given society and the limitations imposed by translators' own cognitive abilities and personality traits.

The evolution from the perception of translation as a merely linguistic activity to that of a complex cognitive task is reflected in the scholarly metaphors adopted to describe it. Once identical equivalence to the original text was admitted impossible to attain, deviations from it were often equalled to an act of treachery (Italian *traduttore, traditore*), infidelity (French *les belles infidèles*) or distortion (Hungarian *fordítás: ferdítés*). More recently, the recognition of the role played by cognitive factors has brought translation closer to other highly demanding tasks that require high cognitive effort (e.g. translation as a puzzle or a problem-solving activity) or even fine sensory-motor abilities (e.g. translation as juggling). But regardless of the element

chosen for the comparison, all these metaphors are grounded in the complexity of a task that is rather tricky and extremely hard to master.

Even now —and despite recent advances in translation process research—, the cognitive mechanisms underlying translation are a mystery that remains mostly unsolved. Researchers have started to peep timidly at the impact of translation on human cognitive systems and further insight has been gained into professional translators' working routines and the problems hindering a quality service. But a patent proof of the undisclosed secrets that are still out of the scholars' reach is the fact that fully automatic translation is not possible yet, at least with a similar standard to that elaborated by humans. And this is so despite the enormous scientific advances undergone by humanity. We are able to send humans to space, we have robots that can play chess, serve coffee and even attempt to learn baby language by interacting with humans; nevertheless, to date we have not achieved a program that allows us to produce a perfect translation by simply pressing one key on a computer keyboard. And the question is: How is this possible? Why have we not managed yet to build a simple scanning-like device able to read a text and a few minutes later deliver an edited, faultless translation? What is so remarkably difficult about translation?

2. Translation as mental simulation

Much of the blame for the unfeasibility of fully edited automatic translation lies in the nature of cognition and meaning construction as fundamentally embodied, situated and dynamic phenomena. The statement that meaning is embodied means that it is grounded in the way human beings use our bodies to interact with the world. From this point of view, when speakers construct meaning in the process of understanding language, what they are actually doing is mentally simulating actions and perceptions as would have been performed in the external world. This has been called the *Embodied Simulation Hypothesis*.

There are now many experiments showing that simulation is central in the comprehension of language (e.g. Stanfield and Zwan 2001; Zwan et al. 2002). Some have demonstrated, for example, that participants recognise objects faster when their perceptual characteristics (e.g. their shape or orientation) agree with the ones described in sentences they had previously read. Thus, they recognise an eagle with open wings faster after reading a sentence that evokes a congruent shape by implying the eagle is flying (e.g. *The ranger saw the eagle in the sky*), but they recognise one with closed wings faster after reading a sentence that describes it in the nest (e.g. *The ranger saw the eagle in the nest*). These results support the Embodied Simulation Hypothesis, since they indicate that when constructing meaning, speakers may activate visual information that may not be explicitly formulated, but is nevertheless evoked in their mental simulation of the scene. Orientation also plays a similar role, leading participants to recognise objects faster when their orientation matches the one implied in sentences. Thus, participants identify a picture of a nail being horizontally hammered into a surface faster after reading a sentence that implies a congruent orientation (e.g. *He hammered the nail into the wall*) than when the sentence evokes a different position of the nail (e.g. *He hammered the nail into the floor*).

Accepting that meaning centrally involves the activation of perceptual, motor, and even of social, and affective knowledge has weighty consequences for communication in general and for translation in particular. For it is easy to understand that when interlocutors cannot activate the same knowledge —as is frequently the case in translation—, communication problems

arise. In the process of translation, the translator is the main cognizer in charge of constructing meaning from mental simulation. They must reconstruct the meaning of the original communication act and convey it to the audience of the translated text in such a way—that is, finding the right linguistic labels—that allows them to reconstruct it by themselves. But this process of mental simulation is extremely complex and translators find themselves constrained by many different factors, which must also be integrated into their conceptualisation process, such as the restrictions of the textual context, those of the working environment, or the prevailing norms from the cultural and the historical context. All this information becomes part of translators' mental experience filtered through their own capacities, such as their knowledge base, ideological preferences, individual idiosyncrasies and personality traits, to mention just a few.

Obviously, describing and explaining such a multi-faceted panorama requires the adoption of an interdisciplinary approach able to render translation scholars assistance from as many fields as possible. This need explains why translation scholars have recently turned to other disciplines in search of innovative approaches and research methods. The present paper aims at illustrating some of the central questions that translation studies have attempted to answer with the help of other cognitive science disciplines. Focus will be placed here on the two disciplines that have played a most active role in translation, exploring language processing and bilingualism from a cognitive perspective: cognitive linguistics and psycholinguistics. Rather than providing an exhaustive catalogue of potential questions, the intention is to exemplify different research options and experimental work that may contribute to enlarging our knowledge, not only of translation, but also of communication and language processing in general terms.

3. The impact of translation on comprehension

One of the pivotal questions for translation studies revolves around the impact of translation on comprehension. The assumption is that identification of the features that distinguish reading for translation from merely comprehensive reading will serve to characterise translation processes. Psycholinguistic work on translation can undoubtedly shed relevant light on the influence that translation exerts on comprehension processes. Most psycholinguistic studies have looked at the cognitive processes that underlie language processing in translation focusing primarily at the level of lexical access and representation (e.g. de Groot 1992; de Groot et al. 1994). Although there are a few studies that have widened the context to the level of the sentence (e.g. van Hell and de Groot 2008; Macizo and Bajo 2005), or even to that of whole texts (e.g. Hatzidaki and Pothos 2008),ⁱ findings from this type of work are still insufficient and have limited bearing for an activity where—as is the case in translation—units are not processed in isolation and where working units are typically larger than a word.

Despite the experimental advantages of working with isolated words, translation scholars have been mostly interested in how translators comprehend full texts. They have therefore turned to psycholinguistic work on reading processes in search of answers and experimental tools. The reading process has been successfully analysed by using an eye tracker to measure the amount of cognitive effort employed on the basis of participants' eye movements. This type of analysis is grounded in the eye-to mind hypothesis, which postulates that eye movements reflect thought processes. Participants' eye-movements are therefore

analysed as indicative of cognitive effort in terms of variables such as number of fixations, fixation duration or total gaze time duration. By monitoring eye movements and measuring the length of fixations, researchers have demonstrated that changes in the duration of fixations are determined by the characteristics of the text and the cognitive processes involved. For instance, studies have revealed that the more difficult reading becomes, the longer eye fixations are; there is also evidence showing that longer and less familiar words lead to longer pauses or fixations than shorter and more familiar words (e.g. De Luca et al. 2002, Prado et al. 2007).

Other questions relating to the impact that translation has on comprehension are the influence that different purposes and tasks also exert on the process and the issues of how translators distribute their attention between comprehension of the source text (henceforth ST) and production of the target text (TT). Jakobsen and Jensen (2008) is a classic example of this type of study. They compared their participants' eye movements across 4 different tasks: reading for comprehension, reading in preparation for translating, reading while speaking a translation and reading while typing a translation. Their findings revealed increasing cognitive effort across the four tasks reflected in longer duration and more fixations. The fact that reading for translating required higher cognitive effort than reading for comprehension provided evidence in favour of a horizontal view of translation processing in which extraction of meaning and reformulation occur on the fly. In line with theories of mental simulation, when translators read the ST, they are simultaneously constructing meaning and finding the right linguistic labels in the TL to allow reconstruction in that language. Reading while speaking a translation required more time and fixations because translators had to articulate meaning at the same time as reading the text. And reading while typing demanded the highest levels of cognitive effort because written translation involves disruptive reading, with frequent transitions between source and target texts. On the whole, their results showed that the purpose of a task has an impact on the level of cognitive effort involved in comprehension. Translating imposes higher cognitive demands on comprehension, for meaning is simultaneously constructed and reformulated into a different language.

More recently, Alves et al. (2011) performed another experiment following Jakobsen and Jensen's design, but introducing an additional condition that involved variation in the rhetorical structure and topic of the texts. More interesting that the actual results reported was their account of the difficulties detected for comparability across experimental studies using eye tracking. Their results revealed the need for a more thorough analysis of intervening variables overlooked in previous studies, both in terms of the participants' profile and their perception of task or text complexity, and in relation to differences in the configuration of eye-trackers to filter eye-gaze data. Moreover, their findings also questioned the validity of task time as a relevant variable to measure cognitive effort in modalities that—as is the case in sight translation— demand subsequent and consequent outputs. Data like these are positively of valuable use not only for translation studies, but also for other disciplines using similar research methods and instruments.

4. The translation of metaphorical language

Another major question in translation studies has orbited around the translation of metaphorical language vs. literal language. Most of the current research on metaphor takes as its starting point the theory of cognitive metaphor, which posits that metaphor is not a figure of speech, but a basic resource for thought processes and one of the basic principles of human

cognition. One of the most important features of conceptual metaphor theory is also its emphasis on the embodied nature of meaning. The underlying principle is that we use physical experiences and understanding of concrete domains to conceptualise knowledge of more abstract domains. Thus, when stating that “*economy is not growing*” or that we are “*wasting our time*” or “*feeling our lives are going nowhere*”, we are actually using typical examples of the metaphors economy is a plant, time is money and life is a journey, in which the abstract domains of economy, time and life are conceptualised in terms of the more concrete ones of plants, money and journeys.

Regarding the processing of metaphorical language, evidence —at least in neurological experiments with fMRs— does not seem to be conclusive. Although there is psycholinguistic evidence against a difference in processing effort between literal and metaphorical language (e.g. Inhoff et al. 1984), most recent evidence (e.g. Bambini et al. 2011) has pointed to differences in brain activation patterns between metaphorical and non-metaphorical language, particularly in the case of novel metaphors. Moreover, some studies have argued that even when differences are found between metaphorical and non-metaphorical language, these are generally due to task demands, rather than to metaphorical language per se (Yang et al. 2009). Assuming the task performed plays a relevant role in the processing of metaphorical language, translation can be suggested as a promising candidate for further research.

For translation scholars the main concern has been to determine the degree of difficulty involved in translating metaphor in terms of the translation strategies used (e.g. Dagut 1976, Samaniego 1996, Schäffner 2004, Van den Broeck 1981). But to date there are only a few studies that have explored the translation of metaphorical language in terms of the processing effort invested. Sjørup (2011), for instance, used an eye-tracker to measure the processing effort invested in translating metaphorical texts. The translation strategies identified in her study coincided with those most frequently established in the literature, namely, metaphor translated by the same metaphor, by a different metaphor and by paraphrase. Results from the analysis showed that literal translation was the most frequent strategy followed by paraphrase. Moreover, regarding gaze time as indicative of processing effort, she claimed that translation by paraphrase seemed to demand higher cognitive effort, since the total gaze time spent on metaphorical passages was longer in the text with the highest percentage of paraphrase. Overall, her study provided evidence suggesting that the frequency and applicability of the metaphorical image in the target language seems to play a role in the cognitive effort invested in translating metaphors.

But apart from reported differences in cognitive processing, a question of particular interest for translation studies is related to the impact that metaphorical language may have on certain communicative and cultural contexts. Cognitive linguistics is certainly one of the areas that can contribute most actively to analysing metaphorical language in translation. Although most work in cognitive linguistics has focused on a single language or adopted a contrastive perspective (e.g. Stefanowitsch 2004; Stefanowitsch and Gries 2006), studies have demonstrated that the study of metaphorical language in specialised contexts can be used to define the assumptions, beliefs and worldview of a given culture on the topic under discussion (e.g. economy, politics, law, etc.). The implications of this type of work for translation are clear, since differences in how source and target audiences conceptualise a given topic are likely to result in translation problems.

Rojo (2011) provides evidence in this direction by illustrating some of the differences detected in the metaphorical patterns of the terms “*crisis*” and “*recession*” in English and in Spanish. The study revealed certain differences in the metaphorical conceptualisation of each

term that should be taken into account in translation. An analysis of the different metaphors found for the two terms allowed us to define five different types of roles played in the metaphorical patterns under study: animate entity, inanimate entity, agent force, influencing entity and natural force. Data generally revealed a more animate nature of *crisis* in contrast with the more inanimate character of *recession*. And this inanimate character was even more prominent in the case of Spanish “*recesión*”, mainly conceived as a location or container, which one goes into and out of. More interestingly, this difference seemed to exist even when language was not involved, suggesting results had further relevance than that found in the corpus of analysis used. From data obtained in the corpus analysis, an experiment was designed in which a number of Spanish participants were asked to classify images as associated to “*crisis*” or “*recesión*”. Results showed that speakers associated “*crisis*” with more animated events (mainly natural disasters or animals), while they related “*recesión*” to more inanimate images (depicting mainly locations or objects).

But if research from cognitive linguistics has a say in translation studies, the opposite also holds true. Work on the translation of metaphor can also contribute to unveiling the impact that translation may have on target contexts. For example, Samaniego (2013) has shown that the literal translation of metaphor seems to be the favoured strategy in English-to-Spanish translations of newspapers articles (52% of cases), even when there is a target language equivalent available and despite involving the creation of a novel image for the target audience. But more interesting than the type of translation strategy or procedure used, is the effect that the translator’s choice has on the target context. For the truth of the matter is that by resorting to literal translations of metaphors that are novel for the target audience —and regardless of whether they do it intentionally or not—, translators may be in fact enlarging the target conceptual world and contributing to intercultural standardisation of culture-specific items and cognitive patterns.

5. The emotional impact of translation

The potential impact of a translation on a given audience has been a constant in translation studies, from Vermeer’s (1989/2004) focus on target-side purpose (or *Skopos*) to most recent reception studies and their focus on how a given audience receives a certain translation. However, despite the generalised acknowledgment of its importance, few experimental attempts have been made in translation studies to empirically measure the impact of translation. The most obvious reason lies in the elusive and complex nature of a concept that is very difficult to define in terms of a measurable set of variables. One approach to this issue has related impact to emotions; but measuring the emotional impact of translation is no straightforward task either, since emotions are also a multi-componential phenomenon that escapes an easy definition.

Proof of the intricate nature of emotions, are the existing discrepancies in psychological studies relating to the inclusion or exclusion of cognition in the emotional process. But despite differences, most comprehensive definitions include five components that describe the coordination of systems involved during an emotional episode: the cognitive, neuro-physiological, motivational, motor expression and subjective feeling components (Scherer 2005). Each of these components or subsystems involves the use of different methods to measure the impact of emotions. The cognitive and subjective feeling components have been frequently explored by using questionnaires that provide data on participants’ evaluation of

events and on their subjective experience of the emotional state once it has occurred (Rottenberg, Ray and Gross, 2007; Schorr, 2001). The motor expression component has been analysed by measuring the facial expressions and body movements that accompany an emotional state (McManis et al. 2011). And the neuro-physiological component has been researched by focusing on some of the bodily symptoms associated to an emotional experience. The study of this component has typically involved the measurement of galvanic skin response (Weins et al., 2003), heart rate (Appelhans and Luecken 2006) and cortisol levels (Sudheimer, 2009).

The issue of the emotional impact of a translation has been a question frequently neglected in translation studies, most probably because it involved psychological and physiological factors that initially seemed to be beyond the reach of translation scholars. But the 'interdisciplinary turn' undertaken by translation studies in recent years has cleared the ground for the exploration of factors and issues that once seemed unattainable. There is now ground-breaking work in translation studies that empirically explores the bi-directional relationship between emotions and translation. Particularly interesting is the work by Lehr (2011a, 2011b, 2012a, 2012b, 2013) investigating the role of emotions in the translation process. Focusing on the impact of emotions on translation performance and expertise, her research suggests that positive emotions may enhance facets of creativity in translation—in particular idiomatic expressions and stylistic adequacy—, whereas negative emotions may foster accuracy in translating terminology. These results indicate that positive and negative emotions may trigger different processing styles and can certainly have a bearing on unveiling the influences that emotion may exert on cognitive processes.

Also worthy of note is Ramos' (2013) work on the impact that current audio-descriptive norms may have on the emotional response of unsighted audiences during film watching. Her study combines the use of self-response questionnaires to measure participants' subjective feelings and a heart rate monitor to measure their physiological response. Although results from her research are not conclusive, data suggest that the objectivity principle that guides current AD practice may exert a diminishing effect on the emotional response of unsighted audiences when compared to that of sighted audiences. Moreover, in a later work Ramos and Rojo (*submitted*) provide evidence suggesting that these differences between both types of audience may be more prominent for certain types of films than others (i.e. in avant-garde films as opposed to narrative ones). These findings point to the need to revise current AD practice in order to accommodate for differences between various types of films. There exists the possibility that the objectivity and neutrality principle that was initially adopted to avoid giving visually impaired people a biased and subjective "vision" of facts may in fact have the opposite effect in art films, which give prominence to subjective and personal emotions. Results from studies using particularly complex stimuli that combine—as in the case of films— different communication channels and translation modalities can be especially relevant to uncover the mechanisms that trigger emotions.

Films have been typical multi-modal stimuli to research emotions; and metaphors have been indeed ideal linguistic and textual counterparts to explore emotional response to written translation. Existing attempts to measure the emotional impact of metaphors can be traced back to evidence from studies on "*foregrounded*" language. Foregrounding Theory (Miall, 2007; Miall y Kuiken, 1994; van Peer, 1986; Tan 1994; Zwaan, 1993; Van Peer, 2007) has explained how unusual language may result in higher emotional impact by prompting a defamiliarising process that is accompanied by feelings. This theory has also been empirically tested in a number of studies that have provided evidence on the effects of foregrounding on

defamiliarisation and on the emergence of emotions (e.g. Van Peer, 1986; Miall & Kuiken, 1994). Evidence has also been provided on the existence of differences between foregrounded or literary language and non-literary language, both in terms of the cognitive effort invested and of the patterns of brain activation detected. For instance, Hoorn (1997, 2001) used EEG techniques to prove that readers' attention is related to the degree of foregrounding, reporting cognitive-energetic surprise effects when readers processed literary metaphors. Regarding the effects of defamiliarisation on brain activation patterns, studies using event-related potentials have also indicated that reading foregrounded text accentuates activity in cortical areas specialised for affect (Kutas and Hillyard, 1982).

If a difference in emotional response is accepted between metaphorical and non-metaphorical language, the question prevails as to whether paraphrasing a metaphor may result in diminished emotional response to the target text. Rojo et al. (2011, *in preparation*) designed an experiment to investigate the possibility that two translations that differ only in the presence or absence of the metaphorical image can produce a different emotional impact on the audience. The impact was analysed in terms of the physiological response produced on the reader, and this response was measured using a heart rate monitor to record the participants' pulse rate. Expressions exemplified four basic emotions: happiness, sadness, fear and anger and the analysis was carried out in terms of three parameters: the mean pulse rate of a participant during the whole experiment, their mean pulse rate during the experimental time (from 5 s. before the stimulus was presented to 10 s. after receiving the stimulus) and the difference between both means. Results revealed statistically significant differences between metaphorical and non-metaphorical expressions for the four emotions under analysis. The participants' heart rate increased with metaphorical expressions and decreased with non-metaphorical in three of the four emotions —rage, fear and happiness—. As expected from previous evidence provided by physiological studies,ⁱⁱ sadness displayed the opposite pattern, with the participants' heart rate decreasing with metaphorical expressions and increasing with non-metaphorical stimuli.

The relationship between heart rate and emotions had been sufficiently demonstrated in previous studies. But if the truth is to be told, changes in heart rate point to the existence of an effect, but do not provide enough information to unquestionably determine the cause of such effect. Apart from reacting to emotional stimuli, heart rate can also be altered by other factors, such as the participants' stress or tiredness, which could be unintentionally affecting results. For this reason, further studies should be carried out combining heart rate with measurements of other indicators, such as galvanic skin response, subjective feelings or even retrospective interviews that can provide supplementary data on factors interfering in the process of data elicitation. Studies measuring emotional impact in terms of the participants' physiological response focus on how a given audience receives a certain translation, but do not provide much information on the analysis of a translation or the process leading to produce it. Nevertheless, they can provide insightful evidence on the processing of emotion-related language, such as metaphors, idiomatic expressions or other foregrounded stylistic features.

6. The debate on formal vs. dynamic equivalence in the light of cognitive linguistics

The legendary choice between formal and dynamic equivalence remains the cornerstone of every translation. Leaving aside theoretical criticisms against the notion of equivalence (see Munday 2009; Pym 2010), translators' decisions persistently revolve around gain and loss at

one of two poles: the form or the meaning of the message. This polarity has been named and renamed ad nauseam by translation scholars, becoming the centerpiece of linguistic-oriented approaches and the perturbing companion of virtually every translation theory. But for process research the focal issue lies on determining the factors that draw translators' attention to either the form or the meaning of the message. This section focuses on two approaches from cognitive linguistics, which have been most ground-breaking in exploring the relationship between form and meaning.

6.1. Solving constructional problems in translation

A theoretical construct that can certainly be of help to explore the relationship between form and meaning in translation is the notion of grammatical construction. In cognitive linguistics, constructions are defined as any pairing of form and meaning, where form encompasses different linguistic levels and meaning also includes pragmatic nuances (Goldberg 1995, 2006). Thus, constructions may embrace a variety of structures ranging from the use of a simple morpheme like *-s* to indicate plural, to more complex syntactic structures, such as "*What's X doing Y?*" (e.g. *What's my computer doing in your office?*), used to convey annoyance, or even the Spanish peculiar construction "*Verb_inf, Verb_inf, neg_Verb*" (e.g. *Comer, comer, no come* [lit. 'Eat, eat, he does not eat']), used to express that something is done, but not to the extent ideally desired by the speaker.

The psychological existence of constructions has by now been demonstrated in experiments showing that the meaning attributed to an invented word varies depending on the grammatical construction in which the word is inserted (e.g. Kaschak and Glenberg 2000). In consequence, when hearing the invented verb "*balloon*" in a transitive construction (e.g. "*Susan ballooned him hard*"), speakers are more likely to interpret it as a hitting action than when finding it in a ditransitive construction (e.g. "*He ballooned her a flower*"), which they tend to construe as some sort of transfer event. Likewise, in a construction that designates a path of motion (e.g. "*She ballooned across the street*"), they will most probably interpret it as a motion verb.

However, to date there are not many studies that have applied the notion of construction to translation. Rojo and Valenzuela (2013) is one of the few; they researched the impact that the translation of a construction without a formal equivalent in Spanish —such as an English resultative construction of the type "*He hammered the metal flat*"— may have on the translation process. The cognitive effort invested by participants was measured by using an eye-tracker to record their eye-movements while they sight translated a number of short stories that contained the same sentence formulated either as a resultative construction (e.g. "*He hammered the handle straight*") or as a non-resultative or predicative one (e.g. "*He hammered the handle until it was straight*"). A statistically significant difference was reported between both types of constructions for all the parameters analysed (i.e. number of fixations, backtracks, total gaze time and changes in pupil size). The translation of the resultative version was found to demand greater cognitive effort than its non-resultative counterpart due to the lack of an equivalent construction in Spanish with exactly the same form.

The authors' analysis of the translation strategies used by participants revealed that more literal alternatives involving a verbatim translation of the main verb —as in translating "*She fried the chicken crispy*" for "*Frió el pollo y lo dejó crujiente*" [lit. 'She fried the chicken and left it crispy']— were not always easiest to process. In point of fact, strategies resorting to a

syntactic transposition —as in translating “*She brushed the carpet clean*” for “*Limpió la alfombra con un cepillo*” [lit. ‘She cleaned the carpet with a brush’]— imposed lower cognitive processing demands. Syntactic transposition seemed to be the “default” strategy, that is, the one first resorted to —either because they learnt it first or because they use it more frequently— and only when problems were found, did participants have recourse to a second option. In fact, the main verb was translated literally only when English adjectives were difficult to transform into Spanish verbs (e.g. *crispy, red, curly*). As reported by Sjørup (2011) when exploring the translation of metaphor, the frequency and applicability of the translation strategy also seem to be decisive criteria in the level of cognitive effort demanded when translating grammatical constructions.

6.2. Translating rhetorical style in view of Slobin’s thinking-for-speaking hypothesis

In connection with the choice between form and meaning, translation scholars have also been particularly concerned about the role played by the rhetorical style of the target language. Once again, the question can be traced back to long-established debates and concerns; the weight of the rhetorical style is related, among other things, to the generalised uneasiness about translations sounding forced and stilted and to the desire to confer them the status of original texts in the target culture. From the point of view of translation process research, the real challenge lies in determining the factors that make translators give prominence to TL rhetorical style over SL meaning.

A cognitive linguistic approach that can by and large contribute to clarify the role of the rhetorical style in translation is undoubtedly Talmy’s typology-based approach to motion, which constitutes, in turn, the basis for Slobin’s (1991, 1996, 1997, 2000, 2004, 2006) thinking-for-speaking hypothesis. This hypothesis postulates that the use of different lexicalisation patterns has consequences for speakers’ online use of language, an assumption that is founded on Talmy’s (1985, 1991, 2000) theory of lexicalisation patterns and his two-way language typology. Focusing succinctly on Talmy’s insights into the domain of motion, his theory focuses on how different languages characteristically map morphosyntactic and lexical resources onto this semantic domain, positing a distinction between satellite-framed languages, in which the Path componentⁱⁱⁱ is typically coded in the satellite,^{iv} and verb-framed languages, in which Path is typically incorporated into the verb-root.

Taking Talmy’s distinction as a starting point, Slobin’s hypothesis assumes that the descriptions of motion events provided by speakers of either language type will be constrained by the resources available in their languages. This hypothesis was first tested in what has been commonly known as The Frog Stories (Berman and Slobin 1994; Strömquist and Verhoeven 2004), a series of studies in which speakers were asked to describe the motion events depicted in a sequence of pictures. Results from these studies showed that speakers from each language type —influenced by the lexicalisation constraints of their typology— directed their attention to different aspects of the same motion event. What is more, these differences resulted in variations between the rhetorical styles characteristic of each language type. Consequently, speakers from satellite-framed languages tended to provide most frequent and detailed descriptions of both the Manner and Path of motion events, for they have a rich Manner verb lexicon and can connect several Path segments to a single main verb. In contrast, speakers from verb-framed languages tended to constrain descriptions of Manner to those contexts where it

was relevant and did not impede the flow of discourse, since Manner has to be expressed outside the verb and its description increases processing cost (Filipović and Ibarretxe, *in press*).

Differences in rhetorical style of the described sort have clear implications for translation. Slobin (2003) himself discusses—in what would be later on labelled as his thinking-for-translating theory—the consequences that differing attention to manner may have in the translation process between languages that are typologically different or similar. Slobin (1996, 1997) analysed a number of English and Spanish novels and their translations and concluded that English source texts generally undergo a higher degree of information loss during the translation process than Spanish source texts. Data revealed that in English-to-Spanish translations, Manner information was recurrently omitted and Path information changed or reduced, while in translations from Spanish into English, Path was frequently kept and Manner information either kept or even added in the target text. These results reflect the general tendency of translators to move away from the source text and conform to the rhetorical style of the target language. The implications of these results for translation have been further extended in a series of studies researching different language combinations (e.g. Filipović 2007a; Ibarretxe-Antuñano 2003), identifying lists of possible translation strategies (Ibarretxe-Antuñano and Filipović 2013), investigating the impact of typological differences on the process rather than the product of translation (Cifuentes-Férez and Rojo *submitted*), and even exploring the impact that the characteristic loss of Manner information in English-to-Spanish translations may have on the audience's subsequent judgments of the events reported (Filipović 2011; Rojo 2013; Rojo and Cifuentes-Férez *in preparation*).

Research investigating the impact of these typology-based translation patterns is highly relevant to detect norms and translational behaviour that may have unwanted consequences on certain communicative contexts. Filipović (2011, 2013), for instance, illustrated the consequences of typology-based translation patterns in law-related contexts, as in the case of police interviews with witnesses and suspects and their interpreting into a different language. In line with Slobin's results, data revealed that the consecutive interpreting of Spanish witnesses' reports into English contained more additional manner information as compared to their original testimonies in Spanish. Consequently, a later experiment was designed to test whether the addition or omission of manner could influence people's judgements with regard to dynamicity and intensity of events. To this purpose, a group of monolingual and bilingual participants were asked to rate the violence of a number of reports from witnesses on a scale from 1-10 (1 being the weakest and 10 the strongest). Additionally, bilinguals were also requested to provide their own translation of the sentences to test whether their ratings would be at all affected by the translation. Results displayed no effect of translation on the ratings and no significant difference between the mean rating between monolingual and bilingual speakers; but a highly significant difference was reported between both languages, English and Spanish. Translations into English were judged as being more violent than the Spanish originals, suggesting that the addition of Manner in translation as a consequence of English rhetorical style exerts an influence on the way speakers conceptualise the intensity and dynamicity of events.

More recently, Rojo and Cifuentes-Férez (2013, *in preparation*) designed a set of experiments to test the consequences of typology-based patterns in English-to-Spanish translations in law-related contexts. Participants were also asked to rate the violence of a number of reports from witnesses on a scale from 1-9, but this time two different translation versions were provided for each report: one with manner verbs and one with more neutral verbs.^v Results reported a statistically significant difference between high-manner translations

and their low-manner counterparts, with the former being consistently rated higher than the latter. Besides, participants were also requested to decide on the punishment they would impose on the accused in terms of financial (i.e. a fine in Euros) and criminal (i.e. number of days in prison) liability. In low-manner translations, a positive correlation was reported between degree of violence and criminal punishment and between criminal and financial punishment. In contrast, for high-manner translations only a marginal positive correlation was found between degree of violence and criminal punishment. This difference in the correlations could suggest that degree of violence affects the audience's judgements, since less agreement in the punishment was reported for translations with more manner details. Evidence for a potential effect of the degree of violence was also supported by the fact that the difference between both versions ceased to exist in those contexts describing extremely violent events. For this reason, the potential influence from the textual context was discarded in a later experiment in which participants were asked to rate the violence of a number of short sentences rather than whole texts. Finally, a qualitative analysis of a set of sight translations performed by professional interpreters was carried out to contrast previous quantitative data on the reception of translation with the analysis of on-line problems encountered during the translation process.

Existing research points to a need to further investigate the role of translation on the audience's conceptualisation and subsequent judgments of the events reported. To date, the evidence available on the impact of typology-based translation patterns is especially relevant in the light of forensic and psychological studies showing that linguistic patterns influence human cognitive processes and non-linguistic activities, such as memory and judgments on perceived blame.

7. The impact of personality on translation

The wave of quantitative studies triggered by corpus-based and cognitive process research has recently started to break on the pressing need to account for the major role that personal factors play on translation. Current ethnographic research (see Hubscher-Davidson 2011) has claimed the importance of adopting a more personal —and perhaps less number-driven— approach to translation that brings the importance of individual factors to light. However, quantitative research is not necessarily synonym of impersonal investigation and the study of personality factors must not inexorably cast quantitative approaches off. Rather, there are now process studies proposing an experimental approach to explore the impact of personality and affective and ideological factors in translation.^{vi}

7.1. Correlating personality and affective traits to translation competence

Modern concern for how affective and personality factors influence job performance has placed this type of factors in the limelight of the professional world. And translation and interpreting jobs are by no means an exception. The relevance of personality traits is probably most evident in interpreting, mainly due to interpreters' high levels of anxiety associated to the stressing demands of oral on-line performance. Bontempo and Napier (2011) analyse, for instance, the correlation between sign interpreters' levels of performance and a number of psychological traits frequently associated with organisational capacity (i.e. self-efficacy, goal orientation and

negative affectivity). Results showed that interpreters' competence was positively correlated to goal orientation and self-efficacy, but negatively correlated to negative affectivity. Regarding the role of these psychological traits as predictors of interpreters' competence, only negative affectivity was a significant predictor of interpreters' competence. In a later international research study involving 2,193 sign interpreters and 38 different countries, Bontempo (2013) and Bontempo et al. (*in press*) added seven other personality constructs to the ones already analysed as predictors of interpreters' competence, namely, 'The Big Five' (i.e. openness to experience, conscientiousness, extraversion, agreeableness and neuroticism) and constructs of perfectionism and self-esteem. The International Personality Items Pool (IPIP) and the Rosenberg self-esteem scale served as measuring instruments. Comparing Australian and USA results, five personality variables were significantly correlated to ratings of sign language proficiency in USA (i.e. self-esteem, conscientiousness, emotional stability, extraversion and openness to experience), whereas only four variables were significantly correlated in Australia (i.e. self-esteem, conscientiousness, emotional stability and perfectionism). Regarding self-rated competence, only two variables were retained as significant predictors in each country: self-esteem and conscientiousness in Australia and self-esteem and openness to experience in USA.

Translation studies have also kept track of personality factors in several experiments focused on written translation. Hubscher-Davidson (2009), for instance, carried out a study with the aim of understanding how personality traits can guide translational behaviour. In particular, correlations between the presence of certain personality traits and target text quality were researched. The research instruments used were mainly the Think Aloud Protocol method—which requires the subject to perform a translation while verbalising everything that comes to their minds and while being recorded by an observer—and the Myers-Briggs personality test with four subscales, each of which determines an individual's preference for one of two traits: 1) extroverted (expressive) vs. introverted (reserved), 2) sensing (observant, sticking to facts of life) vs. intuitive (introspective, perceiving possibilities and meanings), 3) thinking (tough-minded, objective and impersonal) vs. feeling (friendly, subjective and personal) and 4) judging (scheduling, living in a planned way) vs. perceiving (probing, living in a spontaneous way). Results only reported a significant correlation between translation quality rates and personality traits for the trait intuitive vs. sensing in half of the subjects. Considering participants were requested to translate a literary text, the fact that those obtaining the best marks for quality had an intuitive trait suggested that participants with this type of personality perform better in literary translation. On the contrary, the lowest scores showed a correlation with a sensing trait, which indicated that participants with this type of personality have more trouble with literary texts, but would be probably better with more technical ones.

These findings were further explored in a later study (Hubscher-Davidson 2013a), which also made use of verbal protocol analysis to investigate the role of intuition in the translation process. Results reported a double role of intuition related to translators' capacity to solve two different types of problems: simpler and more straightforward problems, which can be solved rather quickly by using pattern-matching based on specific domain knowledge; and highly complex problems, which involve a slower solution since they demand a more creative type of intuition that encourages new combinations of knowledge across different domains. Data also suggested that intuition only guarantees successful translating when is backed up by sound knowledge. Apart from intuition, emotional intelligence has also been demonstrated to play a role in regulating translators' behaviour (Hubscher-Davidson 2013b). Emotional intelligence is pivotal in translation and general communication, since it serves to

recognise others' moods and react in appropriate ways to stressful and difficult situations; it is a critical construct in developing fine social and communication skills. Moreover, results from Hubscher-Davidson's (2013b) study suggested that some types of translation may be more strongly related to emotional intelligence than other. By surveying 150 translation professionals, data showed that literary translators achieved higher scores in emotion regulation than non-literary translators.

The study of personality and affective traits not only helps to disclose their impact on the translation process, but can also be of use to understand their role on other problem-solving and communication tasks. Translation is a highly complex task, which poses multiple analytical and communicative challenges for translators. It thus constitutes a perfect testing ground to explore the intricacies of personality. Furthermore, establishing correlations between certain traits and levels of translation competence can serve to elaborate an ideal personality profile for each translation type or translation-related task.

7.2. The impact of ideology on the translation process

Ideology is one of those indefinable concepts that escape an easy definition; and yet everyone is happy to use it without thinking twice about it. However, when asked what is in truth understood by "ideology", answers will most probably differ to quite an extent. Some may relate ideology to their political stance, others may use it to define their value-systems; a few may find it fervently tied up with their religious beliefs. Differences arise from the subjectivity of a concept that is linked to the relationship of individuals to the real world. Hence, it is also allied with personality; personality traits, together with cognitive abilities and educational attainment, indirectly affect ideological preferences. Neurological studies have already demonstrated a possible relationship between ideology, social relations and emotions in terms of changes in neural activation patterns and brain anatomy. A study from the University of South Carolina^{vii} showed, for instance, that being a Democrat is related to more activation in the part of the brain linked to broad social relations (friends and world in general) while being a Republican is related to more activation in the part linked to tight social relations (family). A similar study from the University College London (Kanai et al. 2011) suggested that being a Conservative is related to greater development in the part of the brain in charge of emotions, while being a Liberal is related to bigger size of the part in charge of conflict resolution.

Ideological inclinations may also have an impact on the translation process. Since the first decade of the twenty-first century, cultural and ideological issues have occupied a prominent position in translation studies. There has been a general concern for increasing "interventionism" on the part of translators, a claim that has required greater awareness of the ideological values that may influence their job. As a consequence, ideologically related questions such as translators' ethics, their relative position in the source or target culture and the inherent subjectivity and bias of their own ideological stance have also been placed in the centre of the research agenda. However, despite the generalised claim for greater awareness of ideological aspects, to date there exists virtually no empirical attempt to measure the influence of ideology on the translator's work.

One of the few attempts at filling in such an empirical gap is the study by Rojo and Ramos (*forthcoming*). They designed an experiment to measure the impact that the translator's ideological agenda may have on his/her work in terms of the time needed to find an adequate translation for a set of ideologically loaded expressions. The impact of ideology was measured

by computing the Reaction Time (RT) or latency—that is, the delay between the reception of an input and the response—needed to find an adequate translation when subjects confront a word that agrees or disagrees with their ideological beliefs. Expected results predicted that words with a valence contrary to the translator's ideology would hinder their decisions, making them take longer to find an adequate translation. On the contrary, words consistent with the translator's ideology were expected to facilitate their decisions, making them take less time to find an adequate translation. Scores from a political test were used to allocate participants into two different groups depending on their political views and social attitude: those with a more conservative and right-winged ideology and those with a more liberal and left-winged one. A set of English expressions was selected as experimental stimuli in relation to seven controversial topics: abortion, contraception, sex, euthanasia, death penalty, gay marriage and immigration. For each topic, two different expressions and two different primes were designed: one with a positive valence for conservatives and one with a positive one for liberals.

Results showed a statistically significant effect for type of prime, which indicated that reading a prime with a valence that agreed or disagreed with the ideological values of the participants had an impact on the time they took to find an adequate translation, regardless of the particular ideology they subscribed to. In fact, the effect for the interaction between prime and ideology was not statistically significant, although a tendency towards statistical significance was reported. This result suggested that even though no definite statement could be made on the existence of differences between both groups in terms of the effects of meeting a positive or negative prime, there was certainly a tendency that pointed to the possibility that such differences could be found in a bigger sample. Ideology on its own was not found to have a significant effect on the reaction times of participants. This result was rather encouraging from the point of view of the translation profession since it indicated that the participants' ideological stance was not a compelling "a priori" force driving the translator's job in a certain direction. Having a certain ideological profile did not make participants work slower or faster. Only when they met a word or expression that challenged their ideological expectations, did these expectations become a force exerting an influence on their translations.

Measuring a concept as elusive as ideology is a challenging enterprise. Its multi-faceted and speculative nature is indeed extremely difficult to operationalise in a limited set of quantifiable variables. But recent advances in experimental tools and techniques have now paved the way for researching the impact of ideology on specific fields and tasks. Experimental work of the type described here can certainly contribute to widening the spectrum of studies on ideology and translation. Opening new ground for experimental research on ideological factors can provide additional information on the impact these factors may have on cognitive translation processes. More interestingly, results from studies on ideology and translation can contribute to the understanding of the intricacies of ideological constructs, shedding light on the ways in which ideological inclinations may influence communication and social interaction.

8. Conclusions

The complexity of translation has long kept at bay researchers from other disciplines; long deterred by the intrinsic difficulty of a task that involves two different languages and works with whole texts or discourses, empirically oriented scholars have favoured straightforward monolingual communication or have limited studies to the level of isolated words. Even most adventurous attempts to approach translation have still kept experiments confined to the

lexical or sentential level, where researchers have found the ideal refuge to test their assumptions on bilingualism and contrastive linguistics. Gradually, the charm of translation as a fertile testing ground has become manifest for researchers from neighbouring areas. But unfortunately —and despite current interest in translation— the relationship between translation and other fields has been mainly unilateral. While translation has been a fruitful testing ground for neighbouring areas, the relevance of findings from translation studies has been long undervalued by those same ones ready and willing to take advantage of its potential for researching language processing (Hazitdaki 2013).

Part of the blame for the patronising disregard of other areas for results from translation studies has lied in their lack of empirical and experimental research methods. However, the interdisciplinary turn of modern translation studies has prepared the ground for implementing more experimental, sophisticated methods. The use of techniques and instruments imported from other empirically oriented disciplines, together with the possibility to triangulate different research methodologies, has conferred greater scientific rigour to studies and opened up new venues for investigating translation. Against the increasingly interdisciplinary backdrop of current research scenario, the adoption of a cognitive stance provides a suitable meeting point for research cooperation between translation and other disciplines from cognitive science. On balance, translation is in essence a cognitive task. Translating involves a process of meaning reconstruction from mental simulation in which translators find themselves constrained by many different factors that also get integrated into their conceptualisation frame filtered through their own cognitive capacities and affective traits.

The need for an interdisciplinary approach to investigate translation arises precisely from the multifaceted nature of the translation process. Attempts at describing and explaining such a multifarious task from a single discipline irremissibly fall short and are bound to lead to failure. Translation research requires the adoption of an interdisciplinary approach able to render translation scholars assistance from as many fields as possible. The joined work of disciplines from cognitive science has an influential say in defining the factors that guide the translation process and condition translators' work as well as in describing the potential impact that translation has on communication and language processing. But up to date, the condescending attitude towards the relevance of translation studies to other cognitive sciences has resulted in a one-way relationship in which translation has been the recipient from other areas of humanities and social sciences; nevertheless, the time is now ripe to establish a genuine bidirectional relationship, in which findings from translation studies can finally be used to improve our knowledge of communication and language processing.

Translation research is at present in a vantage point from which it can contribute to widening our knowledge of cognitive processing in bilingual and bicultural contexts. Posing the right questions and standardising research aims and methods can be a decisive factor to bring translation closer to other cognitive science disciplines and highlight the relevance of its findings in the light of a common empirical research agenda. But drafting a common research programme is no straightforward task. Existing interdisciplinary works like the ones described in the present paper have already started to draw this common agenda, but many blank pages still remain to be filled with critical research questions and shared techniques and methods.

Notes

ⁱ See Hatzidaki (2013) for a more extensive review of psycholinguistic studies that have researched cognitive translation processes.

ⁱⁱ There is evidence that sadness is an emotion that implies acceptance of the situation and is thus commonly related to decreased cardiac activation (e.g. Theall-Honey and Schmidt 2006; Kreibig et al. 2007a; Gruber et al. 2008)

ⁱⁱⁱ Talmy distinguishes six semantic elements for motion events, four of which are primary or internal to the event (Figure, Ground, Path and Motion) and two that are more peripheral or secondary (Manner and Cause).

^{iv} Although satellites are commonly —and sometimes rather mistakenly— identified with prepositions, they belong to a wider grammatical category. They are defined by Talmy (2000: 27) as “any constituent other than a noun-phrase or prepositional-phrase complement that is in a sister relation to the verb root.”

^v See Trujillo (2003) for a similar experiment with English texts. Her analysis also involved the design of a high-manner version vs. a low-manner one, but translation was not part of the experimental design.

^{vi} Proof of the current interest awoken by the role of this type of factors in translation research is the recent online workshop on affective factors organised by Hubscher-Davidson with the title “To Feel or not to Feel? That is the Question: International Online Workshop on Affective factors in Translation Process Research”, Aston University, Birmingham (UK), 6th of December 2013.

^{vii} University of South Carolina. “This is your brain on politics: Neuroscience reveals brain differences between Republicans Democrats.” *ScienceDaily*, 1 Nov. 2012. Web. 6 Dec. 2013.

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