

The emotional impact of translation: A heart rate study

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Received 15 April 2014; received in revised form 7 July 2014; accepted 13 July 2014



Abstract

The present work explores the question of whether the adoption of a certain translation strategy can alter the effect that a translated text may cause on a given audience. With this aim, an experimental study was designed to measure whether the loss of metaphoricality in the translation of figurative expressions may actually result in the audience's diminished emotional response to the translation as compared with the one prompted by the metaphorical image. The heart rate of a group of Spanish participants was measured to assess the emotional impact of a series of metaphorical vs. non-metaphorical translations of English figurative expressions based on four basic emotions: happiness, sadness, rage and fear. Results report significant differences between metaphorical and non-metaphorical translations for the four emotions analysed, pointing to a difference in their emotional impact on the recipients of the translation.

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Keywords: Translation; Metaphors; Emotions; Reception

1. The translation of metaphors

The ubiquity of metaphor is overpowering. The distinction between 'conceptual metaphor' and 'linguistic metaphor' postulated by Cognitive Linguistics certainly has contributed to acknowledge the power of metaphor as a manifestation of the potential of human cognition. Metaphors determine not only the linguistic expressions that we use to describe reality, but also the way we think and conceive of the world around us. They are basic cognitive resources that structure our daily experience and therefore pervade every aspect of our interaction with the world. Thus, when we define our mood as *being overflowing with happiness* or *boiling with anger*, the images selected are not chosen to illustrate our metaphorical abilities. Rather, these expressions reflect metaphors that shape our worldview and conceive of happiness and anger as fluids in a container—which in the case of anger is uncomfortably hot. Moreover, the use of these metaphors is not without consequences; they motivate a number of inference patterns or entailments that may sometimes include specific behavioural patterns. For instance, we expect intense anger to produce steam (*I was fuming*), pressure on the person (*He was bursting with anger*) and eventually make the person explode (*She blew up at me*) (Lakoff, 1992:381).

The pervasiveness of metaphor is such that—given the option—speakers tend to prefer metaphorical expressions to refer to many aspects of reality, especially when aiming to imprint emphasis or emotion on our discourse. In this sense, metaphorical sentences have been recently proven to be more emotionally engaging than their literal counterparts; for example, Citron and Goldberg (2014) report greater activation of the amygdala for metaphorical sentences, a brain area typically associated with processing of intense emotional stimuli. They argue that their findings provide initial evidence that

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conventional metaphorical expressions are more emotionally engaging, being therefore chosen over literal expressions because of their greater emotionally evocative power.

This ubiquity of metaphor, both in literary and everyday language, is also one of the reasons why metaphors pose a great challenge for translators, being one of the central topics in translation studies. As Schäffner (2004:1256) observes, the theoretical debate on the translation of metaphor has revolved around two main issues: its translatability, and the procedures or strategies used to transfer it from a source language (SL, henceforth) to a target one (TL). These two issues actually represent two sides of the same coin, the central concern being the debate about the possibility or impossibility to translate a metaphorical image from a given language and culture to others inevitably different. Translatability issues were first addressed by adopting a prescriptive approach that aimed to regulate the different translation procedures available by establishing a suitable set of norms (Samaniego Fernández, 2013). This type of normative approach has mainly focused on providing exhaustive typological classifications of metaphors and full lists of translation procedures, which serve to achieve either a total equivalence by reproducing image and sense—what Van den Broeck (1981) referred to as *translation in 'sensu stricto'*—or a partial one by reproducing at least one of the two. In van den Broeck's classification, this can be achieved through *substitution* (when the image is replaced by a TL one with similar meaning) or *paraphrasis* (when meaning is translated without retaining the metaphorical image).

For a long time, translation scholars believed that the answer to the problem of translating metaphor was to be found in classifications that determine the level of metaphor translatability by identifying their degree of novelty or conventionalisation. Most simple typologies identify two types of metaphors at each end of a \pm novelty/ \pm lexicalisation continuum. Thus, Dickins (2005) distinguishes two main types, namely, lexicalised vs. non-lexicalised metaphors. Similarly, Snell-Hornby (1988) speaks of novel and dead metaphors, although she admits that a whole range of intermediate degrees would be placed between these two extremes. In order to clarify the nature of all those intermediate cases, some authors have proposed tripartite classifications, which posit two extreme types and a third central category including more or less institutionalised intermediate cases. Some examples of this type of classification are van den Broeck's (1981) distinction between lexicalised, conventional and private metaphors, or Rabadán Álvarez (1991) differentiation between lexicalised, traditional and novel metaphors. More problematic, however, are those typologies based on differences that are far too subtle to be of practical use. Newmark (1988a,b), for instance, distinguishes up to five different types of metaphors: lexicalised, cliché, standard, adapted and novel. While the two extremes—that is, lexicalised and novel—coincide with those of dichotomic typologies, the greatest problems arise when differentiating between the more central or intermediate types, which seem to refer to different types of phraseological units: certain types of stereotyped collocations ('clichés'), literary metaphors assimilated by use ('standard') and certain types of idioms ('adapted').

All this effort to provide a typology based on the degree of lexicalisation of the metaphor is grounded on the assumption that the key to a successful translation is selecting the most adequate translation procedure for each type. Thus, most creative metaphors are often reproduced by literal translation procedures, whereas more conventional ones either frequently undergo a substitution process, replacing the SL image for a TL one, or are paraphrased, keeping the meaning at the cost of the image. Besides its prescriptive nature, this type of approach has also been criticised for applying primarily linguistic criteria while neglecting other professional, cultural and cognitive factors that play a leading role in the translation of metaphorical expressions (Samaniego Fernández, 2013; Rojo, 2014). Although the usefulness of this kind of typologies is obvious from a theoretical and pedagogical point of view, they still overlook the role of the audience, conveniently placing the recipient of the translation in the background. The efforts of functionalist approaches in the 70s to vindicate the role of receptors underlined the importance of reproducing the pragmatic function, but still failed to notice the role of cognitive factors, such as the emotional impact caused by a translated metaphor.

In all fairness, the issue of the emotional impact of a translation has been a question frequently neglected in translation studies, most probably because it involves 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 were once unattainable. And the difference in the emotional impact between metaphorical and non-metaphorical translations of figurative expressions is at last within the reach of translation scholars (see for instance the work by Lehr (2011a,b, 2012a,b) on the impact of emotions on translation performance and expertise, and the work by Ramos (2013) on the emotional impact of audio-description). Psychology and literary studies are two of the disciplines that have opened the doors to the study of the emotional impact of metaphor in translation studies. The following section summarises the main methods developed in these areas to analyse the emotional impact of metaphors.

2. Measuring the emotional impact of metaphors

Measuring the emotional impact of metaphors is by no means a straightforward task; existing attempts can be traced back to evidence from two research areas: studies on *foregrounded* language and research on emotions.

The concept of *foregrounded language* was first used by Mukařovský (1964) and Garvin (1964) as a sort of umbrella term to describe those linguistic features that stand out in a text for being rare or creative. More recently, foregrounding theory (Miall, 2007; Miall and Kuiken, 1994; Tan, 1994; Van Peer, 1986, 2007; Zwaan, 1993) has explained how the use of unusual language may result in higher emotional impact of the texts: the novelty of unusual language or linguistic variation prompts a defamiliarizing process that is accompanied by feelings, and those feelings guide, in turn, readers' 'refamiliarizing' interpretative efforts. This theory has been empirically tested in a number of studies that attempt to provide evidence on the effects of foregrounding on defamiliarization and on the emergence of feeling (e.g. Van Peer, 1986; Miall and Kuiken, 1994). For instance, Miall and Kuiken (1994) asked their subjects to rate some text passages according to the emotions elicited, and the authors demonstrated a clear correlation between the foregrounding level of the text and the intensity of the emotions arisen. In a latter study, Sikora et al. (1998) corroborated these data by measuring readers' responses to a striking and evocative passage of Coleridge's poem *Rime of the Ancient Mariner*, demonstrating that highly foregrounded language was capable of arousing more emotions.

Evidence has also been provided on the effect that the defamiliarizing process prompted by foregrounded language may have on the brain. Existing data point to differences between foregrounded or literary language and non-literary language, both in terms of the cognitive effort invested and the patterns of brain activation detected. For instance, Hoon (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 defamiliarization on brain activation patterns, studies using event-related potentials have also indicated that reading foregrounded texts accentuates activity in cortical areas specialised for affect (Kutas and Hillyard, 1982). Moreover, recent evidence from studies using fMRI techniques (Bambini et al., 2011; Bohm et al., 2012) has pointed to differences in brain activation patterns between metaphorical and non-metaphorical language, reporting higher involvement of the right hemisphere in the case of novel metaphors.

The study of the emotional impact of metaphors is also determined by the definition of emotion adopted. Emotions are a multi-componential phenomenon that escapes an easy definition. To date, there are still many controversial opinions and confronted views among researchers who have approached the study of emotions, such as the inclusion or exclusion of cognition in the emotional process (e.g. Moors and Scherer, 2013; Robinson, 2005; Scherer et al., 2001). In an effort to provide a comprehensive definition, Scherer (2005) defines emotions in terms of five components that describe the coordination of systems involved during an emotional episode. According to this author, emotions are "an episode of interrelated synchronised changes in the states of all or most of the five organismic subsystems in response to the evaluation of an external or internal stimulus event as relevant to major concerns of the organism" (Scherer, 2005:697). These five subsystems are, namely, the cognitive, neuro-physiological, motivational, motor expression and subjective feeling components. Each subsystem 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 cognizers' evaluation of events and on their subjective experience of the emotional state once it has occurred (Rottenberg et al., 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., 2001). And the neuro-physiological component has been researched by focusing on some of the bodily symptoms associated with 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 study designed in the present paper explores the physiological component of emotions by measuring the participants' heart rate. Heart rate is an indicator of emotions that is relatively easy to measure; it is also inexpensive and provides information that can be related to differences in the intensity of emotions, which is particularly useful to distinguish between the strength of the emotional impact prompted by metaphorical vs. non-metaphorical translations. On the other hand, measurement of cognitive and subjective feeling components was discarded after the lack of conclusive results reported by Colino (2011) in a previous study that used self-report questionnaires to assess the emotional impact of metaphorical vs. non-metaphorical translations.

3. Measuring the emotional impact of translations: a heart rate study

The study introduced in this section explores the question of whether or not there is any difference in the emotional impact prompted by a metaphorical vs. a non-metaphorical translation of the same figurative expression.

3.1. Aims and hypotheses

To research this question, the following aims were established:

1. To investigate whether the loss of the metaphorical image in the translation causes or not a difference in the readers' emotional response.

2. To measure the participants' heart rate (HR) as evidence of a stronger or weaker emotional response.
3. To explore differences between different types of emotions. We specifically focused on four basic emotions that elicit a robust emotional response: happiness, sadness, rage and fear.

Moreover, three hypotheses were articulated around the postulated aims:

1. Metaphorical translations will elicit in the audience a stronger emotional response than non-metaphorical ones that paraphrase meaning without reproducing the image.
2. The emotional response will provoke either an increase or a decrease in the participants' mean HR.
3. The type of emotion conveyed in the expression will influence participants' emotional response. Participants' heart rate will, therefore, respond differently to different emotions.

3.2. Participants

Ten first year students from the Translation and Interpreting Degree at the University of Murcia volunteered to participate in the experiment. They were not explicitly informed of the real purpose of the experiment. Instead, they were asked about the possibility to participate in an experiment aimed at measuring heart rate during language processing.

Data from two participants were discarded due to problems in the recording process. The final sample was balanced by sex, with four males and four females. All of them were native speakers of Spanish and had English as their main foreign language. Their mean age was 18.9 years (SD: 1.28).

3.3. Instrument and materials

A heart monitor Polar RS 800CX Bike was used to measure participants' heart rate; the software programme Polar Pro Trainer 5 was used to download the data back to the computer for further analysis. Although electrocardiography (ECG) is probably the most accurate method to measure heart rate, heart monitors do not require medical knowledge and are, thus, easier to use and less obtrusive and costly. Moreover, in psychological studies, they have been validated as an effective method to measure HR and HR variability in situations of physical and mental stress (Goodie et al., 2000).

The Polar RS800CX heart rate monitor used in the present study comes with a H3 coded chest transmitter, a Polar ProTrainer 5 software programme to analyse average, minimum and maximum heart rate and a USB adapter to connect it to a PC.

Regarding the materials used in the study, 28 texts were designed in the following way. First, we selected 28 English metaphorical expressions, extracted from the pool of examples mentioned in the literature available on emotions (Kovecses, 1990, 2000; Stefanowitsch, 2004, 2006; Soriano, 2004). The expressions were chosen to portray four basic emotions: happiness (7 expressions), sadness (7 expressions), fear (7 expressions) and rage (7 expressions). Then, we looked for the expressions selected on the Internet in order to find real contexts of use. After, the English expressions were translated into Spanish providing two different versions with the same meaning but a different vehicle; one version (A) replaced the source image with a target language metaphor and the other (B) paraphrased the meaning without any metaphorical image. We finally designed the texts, trying to adjust the different stories so that they would be of a similar length (mean number of words = 56.96; SD = 6.5) and provided the necessary context for the correct interpretation of the final expression.

Example 1 illustrates one of the expressions selected for fear and the two versions designed¹:

English: *He exploded with anger*

A. Marcos explotó de ira (lit. *Marcos exploded with anger*)

B. Marcos se enfadó muchísimo (lit. *Marcos got very annoyed*)

The two different Spanish versions were then inserted at the end of a short story designed to elicit the emotion conveyed by the experimental stimuli. The story was exactly the same for each of the two versions. Table 1 contains an example of a story designed to elicit fear.

¹ A list of all the experimental stimuli is shown in the Appendix, including English source expressions, metaphorical and non-metaphorical translations and stories.

Table 1
Example of the stories designed for the experiment.

A.
La puerta se abrió muy lentamente con un quejido siniestro. Marina se asomó con cuidado a la habitación en penumbra. Avanzó silenciosamente hasta la pared del fondo y se miró en el viejo espejo polvoriento. De repente, y sin saber por qué razón, <i>se le heló la sangre en las venas</i> (lit. <i>her blood froze in her veins</i>)
B.
La puerta se abrió muy lentamente con un quejido siniestro. Marina se asomó con cuidado a la habitación en penumbra. Avanzó silenciosamente hasta la pared del fondo y se miró en el viejo espejo polvoriento. De repente, y sin saber por qué razón, <i>sintió un gran miedo</i> (lit. <i>she felt big fear</i>)
English
The door opened slowly with a sinister creak. Marina peeped out at the half-lighted room. She quietly crept her way through the room and gazed into the old mirror covered in dust. Suddenly, and without knowing why, <i>her blood curdled</i> .

Table 2
Distribution of stimuli for each version.

	Group 1	Group 2
Stimulus 1	Metaphorical	Non-metaphorical
Stimulus 2	Non-metaphorical	Metaphorical
Stimulus 3	Metaphorical	Non-metaphorical
Stimulus 4	Non-metaphorical	Metaphorical
Stimulus 5	Metaphorical	Non-metaphorical
Stimulus 6	Non-metaphorical	Metaphorical
Stimulus 7	Metaphorical	Non-metaphorical
Stimulus 8	Non-metaphorical	Metaphorical
Stimulus 9	Metaphorical	Non-metaphorical
Stimulus 10	Non-metaphorical	Metaphorical

As already indicated, each story had then two versions: the metaphorical and the non-metaphorical one. A within-subjects design was chosen so that all subjects read metaphorical and non-metaphorical stories. To ensure that each participant read only one version of each story, a crossed design was used (see Table 2).

3.4. Procedure

The experiment was run individually. Before starting, each participant was informed of the need to wear a strap with a heart rate sensor attached to their chest in order to record information about their heart rate when performing the experiment. They were reassured by telling them that the system was similar to the ones used when jogging. They were explained that information on their heart rate would be sent to a watch placed on the desk next to the computer where the experiment would be run. Once they had verbally agreed to the procedure, the chest band was placed by a female researcher when participants were females and by a male researcher for male participants.

Participants were also told that a series of short stories would appear regularly on the screen and they would have to read them carefully. They were warned that after each story they would have to answer a question about the content of the story and provide a yes/no answer to the question by pressing the “y” or “n” key. Although they were not explicitly told, the question was designed to merely ensure that participants had correctly read and understood the texts. They were also told that before the real experiment, a trial session was programmed in order to familiarise themselves with the procedure.

Stimuli were then projected on a computer running E-Prime software. A relaxation period was established between texts. Considering that the average heart recovery rate after presentation of a stimulus ranges from 15 to 35 s, texts appeared at 45 s intervals: 35 s to allow heart rate to return to base and the remaining 15 s to provide a short relaxation period before the next stimulus. Participants were randomly assigned to one of the two groups and the presentation order of the texts within each group was also randomised.

3.5. Analysis and discussion of results

Two different measurements were recorded to calculate participants' HR responses to the emotional stimuli: their mean HR through the whole experiment and their mean HR 5 s before and 10 s after exposure to the stimulus. This latter interval was established on the assumption the HR remains stable around 15–20s after exposure to a stimulus. The interval registered precise responses to experimental stimuli, providing measures of actual experimental time. Participants' mean HR recordings throughout the whole experiment provided the baseline against which their HR

response during experimental time could be compared. Calculations were, therefore, based on the difference between each participant's total mean HR through the whole experiment and their mean HR registered during experimental time. No data were discarded, since all the answers to the questions posed after the texts were correct, revealing that all the texts had been properly read and understood.

In what follows, results will be described for each of the four basic emotions analysed: sadness, rage, fear and happiness. For each emotion, analysis of variance (ANOVA) tests are performed to compare the participants' HR response to metaphorical vs. non-metaphorical stimuli. Total results for metaphorical vs. non-metaphorical expressions across the four emotions are not computed, since each emotion is associated to a specific HR pattern (e.g. sadness usually causes a decrease in HR whereas anger tends to increase HR).

3.5.1. Sadness

A clear statistically significant difference was reported in the participants' HR response to metaphorical vs. non-metaphorical expressions of sadness ($p < 0.05$; $F(1, 54) = 6.39$). Graph 1 below illustrates the results obtained for this emotion: whereas metaphorical expressions caused a decrease in participants' HR of 1.51 beats, non-metaphorical expressions increased it by 0.9 beats.

Although at first sight, the decrease in HR prompted by sadness stimuli may seem surprising, 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). It has also been commonly portrayed as a low arousal emotion (Kreibig et al., 2011). For instance, Kreibig et al. (2007b) demonstrated that responses to sadness-eliciting films were characterised by central cardiac deactivation and peripheral vascular and electrodermal activation. Similarly, Davydov et al. (2011) also reported that sad films—especially those related to attachment because of additional positive context information—induced a decrease in amplitude of skin conductance responses and heart rate. Bearing all this evidence in mind, it seems reasonable to assume that metaphorical expressions increased the strength of the emotion, causing thus a decrease in HR. In contrast, non-metaphorical expressions could have provoked a less intense emotional response, failing to cause a decrease in HR.

3.5.2. Rage

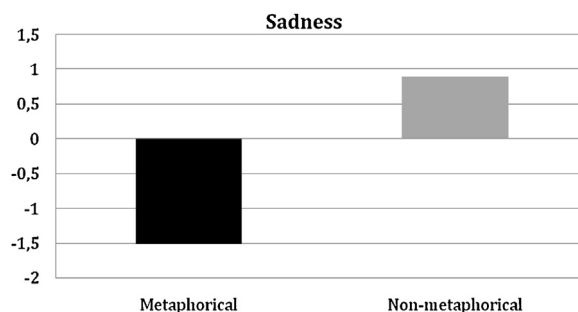
Results on rage revealed an even clearer statistically significant difference in the participants' HR response to metaphorical vs. non-metaphorical expressions of rage ($p = 0.01$; $F(1, 54) = 12.11$). Graph 2 below shows how metaphorical expressions caused an increase in participants' HR of 2.03 beats, while non-metaphorical expressions decreased it by 0.41 beats.

These results agree with previous evidence from psycho-physiological research, which relates the greatest overall increase in cardiovascular measures to anger (e.g. Schwartz et al., 1981). Rage has been in fact consistently typified as an emotion high in arousal. Anger—especially hot anger—has been characterised by a strong increase in HR and HR variability, fast speech rate and high frequency energy (see for instance Davidson et al., 2003).

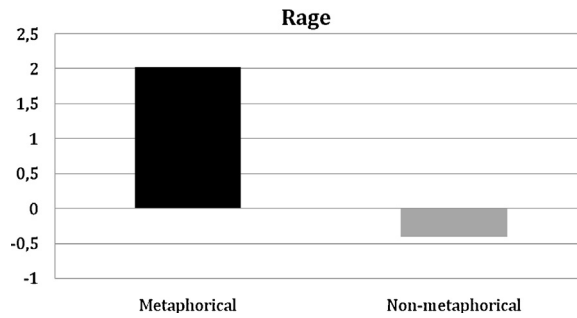
Moreover, the fact that a different pattern is found for rage as compared with sadness—increased vs. decreased HR for metaphorical stimuli—provides evidence in support of the two hypotheses that predicted a difference in the participants' physiological response to different emotions.

3.5.3. Fear

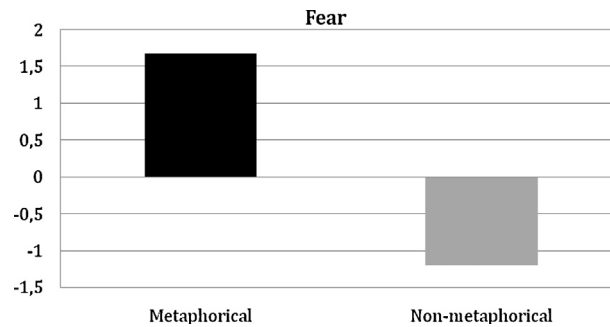
As in the case of anger, fear is typically considered as a high arousal emotion. Both emotions activate the defensive system, since they are commonly elicited in the presence of something unwanted—for instance, a potentially harmful, obstructing, or distasteful object or event (Kreibig et al., 2011). Our results for fear also showed a statistically significant



Graph 1. Results for sadness stimuli.



Graph 2. Results for rage stimuli.



Graph 3. Results for fear stimuli.

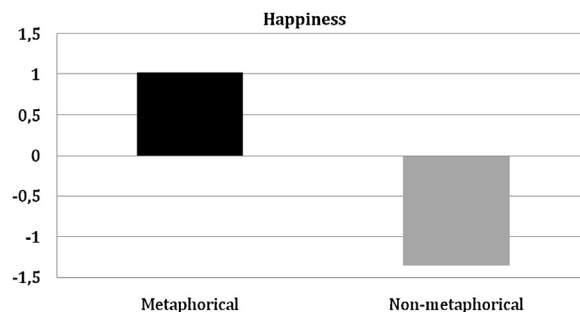
difference between metaphorical and non-metaphorical stimuli ($p = 0.02$; $F(1, 54) = 10.6$). As we can see in [Graph 3](#) above, metaphorical fear expressions managed to increase participants' HR by 1.6 beats. However, non-metaphorical expressions prompted a decrease in the participants' HR of 1.2 beats.

The statistical significance of findings relating to fear is decidedly encouraging, for the feeling of danger needed for arousal of fear is difficult to achieve only in a few written lines without the support of any of the visual or sound effects typical of horror films and thrillers. Nevertheless, the analysis revealed clear differences between both types of expressions.

3.5.4. Happiness

In the case of happiness, the reading of the metaphorical expressions increased participants' HR by 1.02 beats, while non-metaphorical texts elicited a decrease of 1.35 beats. This difference was again found statistically significant ($p < 0.05$; $F(1, 54) = 8.96$). As illustrated in [Graph 4](#) a different pattern was detected between the two types of expressions:

Happiness is hard to classify in terms of arousal, since extreme happiness or joy is related to excitement and is thus considered as a high arousal emotion whereas content is related to feeling at ease and is regarded as low arousal.



Graph 4. Results for happiness stimuli.

In terms of cardiovascular behaviour, previous evidence has shown that happiness produced effects quite similar to those in fear, except for the fact that happiness elicited less increase in heart rate during experimental conditions (Schwartz et al., 1981:357). Our results are, therefore, congruent with this finding, since fear and happiness stimuli elicited a similar HR pattern, with the only difference that happiness caused a smaller increase in HR than fear.

As in the case of fear, results on happiness are particularly promising, because happiness is also difficult to elicit by using only linguistic stimuli. Attaining happiness usually involves achieving and sustaining a state of well-being (Sheldon and Lyubomirsky, 2006), which requires far more than being able to relate to the account of a positive anecdote. It is also an emotion that is highly dependent on personal attitudes and goals, which makes its impact even harder to measure.

4. Conclusions

Metaphors and emotions go hand in hand. Metaphors provide a compelling mechanism to turn abstract concepts into more concrete and explicit entities. Such potential makes metaphorical expressions particularly useful to describe emotional states. They allow speakers to word their emotions in images that provide a more 'tangible' and intense description than their literal counterparts. Thus, when we describe a state of extreme anger as *being boiling with anger*, we add an element of 'heat' and a danger to 'overflow' or 'change our actual state', which adds an intensity to the emotion which goes well beyond the emphasis conveyed by adverbials such as 'very' or 'extremely' in the literal expression *being extremely annoyed*. From the point of view of translation, we should then ask ourselves where all this plasticity and force go when translators choose to paraphrase meaning at the cost of sacrificing the metaphoricality of the expression.

The study included here has provided empirical evidence suggesting that the loss of metaphorical image will most probably result in diminished emotional impact. The level of emotional impact has been interpreted in terms of recorded levels of heart rate acceleration or deceleration as predictors of the degree of physiological arousal. The results reported in the present paper support our first hypothesis, revealing statistically significant differences between metaphorical and non-metaphorical expressions for all the emotions under analysis. Furthermore, findings also corroborate the other two hypotheses postulated in the study. The participants' physiological response to the stimuli is reflected in either an increase or a decrease in their mean heart rate, depending on the type of emotion conveyed by the stimuli. In fact, the participants' mean heart rate is found to increase with metaphorical expressions and decrease with non-metaphorical ones for all the emotions but sadness, which displays the opposite pattern. The generalised decrease in heart rate reported for metaphorical sadness stimuli is nevertheless congruent with evidence in physiological research that relates sadness to decreased cardiac activity.

As interesting and challenging as these results may be, they should nevertheless be interpreted with caution. A sample size of ten participants is too limited to be fully statistically reliable. It would thus be convenient to replicate the study with a bigger sample of participants. On this occasion, heart rate has been measured as a physiological indicator of emotional impact. The relationship between heart rate and emotions has been sufficiently demonstrated in previous studies. But if the truth 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 an effect. Apart from reacting to emotional stimuli, heart rate can also be altered by other factors, such as participants' stress or tiredness, which could be unintentionally affecting our 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 with the process of data elicitation.

But despite these limitations, results from the present study are highly encouraging, for a similar pattern was found for the four different emotions under analysis. Moreover, these data have obvious implications for the practice and teaching of translation. If, as suggested by the reported data, losing the metaphorical image in the translation will most likely cause a different impact from that prompted by reproducing it, then translators should certainly be more sensitive to the implications of reproducing the meaning at the cost of the image. In the same way, trainees should be made aware of the pervasiveness of metaphors and of their power as cognitive devices that serve to organise and structure our daily experience. When conceived as cognitive resources, translators would probably be more reluctant to sacrifice them at the expense of meaning than when viewing metaphors as mere ornamental, rhetorical devices.

Acknowledgements

Ana Rojo and Marina Ramos wish to acknowledge support from project FFI2013-45553-C3-3-P. Javier Valenzuela wishes to acknowledge support from project P09-SEJ-4772.

Appendix A. Experimental metaphorical and non-metaphorical expressions and stories

Happiness			
English source	Metaphor	Non-metaphor	Story
<i>She was possessed by intense joy</i>	fue presa de una intensa felicidad	se alegró enormemente	Ana llevaba muchos meses soñando con Javier. Además de listo y simpático, Javi era el chico más guapo que Ana había visto en su vida. Podía tener a cualquier chica que quisiera porque todas estaban loquitas por él. Por eso, cuando se le acercó en clase y la invitó a salir, Ana
<i>I was intoxicated with happiness</i>	Estaba borracho de alegría	Estaba muy contento	Sí, después de todos estos interminables años, lo habíamos conseguido. Por primera vez en la historia de España, la selección ganaba el mundial. Y ahí estaba yo, saboreando el mayor triunfo de mi carrera, abrumado por los vítores de un público enloquecido y alzando la copa del mundo.
<i>All joy broke loose as the kids opened their presents</i>	sintieron una felicidad desatada al abrir sus regalos	se sintieron muy felices al abrir sus regalos	A las 7 en punto, Juanito y Celia se levantaron de un salto de la cama; casi no habían podido dormir por los nervios. Recorrieron el pasillo a toda velocidad, entusiasmados por lo que les esperaba. Y ahí estaba aquel gran árbol de navidad rodeado de paquetes envueltos en papel de colores. Los niños
<i>She was overflowing with happiness and joy</i>	rebosaba felicidad y gozo	parecía muy feliz y satisfecha	Era lo que más le gustaba. Todos los días, al ir al trabajo, observaba al torcer la esquina a una viejecita regando su jazmín en el balcón de la planta cuarta. Se notaba que estaba en los mejores años de su vida y que amaba profundamente a esas silenciosas compañeras, sus plantas. Rodeada de delicadas flores, la mujer
<i>They burst with happiness</i>	explotaron de felicidad	se sintieron muy felices	Se habían pasado toda la clase de historia nerviosos, mirando el reloj. Los chicos sabían que en pocos minutos empezarían sus ansiadas vacaciones de verano. ¡Por fin! Después de 9 largos meses de invierno, deberes y exámenes, a todos les esperaban 3 meses de playa, amigos y juegos. Al oír el timbre, los chicos
<i>The baby injected a dose of happiness into their lives</i>	inyectó una dosis de felicidad en sus vidas	añadió felicidad a su vida	Antonio y Laura no podían tener hijos. Llevaban ya varios años intentándolo todo, desesperados, soñando con un bebé al que pudieran educar juntos y dar todo su amor. Por eso, al final decidieron adoptar. Después de mucho papeleo, por fin fueron a China a recoger a Li. Cuando la pequeña llegó a casa,
<i>Fires of joy were kindled by the birth of her son</i>	ardía en llamaradas de felicidad	estaba incluso más feliz todavía.	Laura siempre había sido una persona muy alegre. Motivos no le faltaban: había tenido suerte en la vida, le había ido bien. Siempre había gozado de una salud de hierro, adoraba su trabajo y estaba felizmente casada con el hombre de sus sueños, atractivo, dulce e inteligente. Sin embargo, desde el nacimiento de su hija, Laura
Rage			
English source	Metaphor	Non-metaphor	Story
<i>He was a thunderstorm ready to explode</i>	se lo llevaron los demonios	le puso un castigo ejemplar	Mi hermano pequeño se pasaba las tardes jugando al ordenador. Mi padre lo había castigado repetidamente sin ningún resultado. Seguía jugando a escondidas. A final de curso suspendió todas las asignaturas. Como mi padre tenía muy mal carácter, escondió las notas durante semanas y le engañaba diciendo que no se las habían dado. Cuando mi padre por fin las encontró,

Appendix A (Continued)

English source	Metaphor	Non-metaphor	Story
<i>He was blowing off steam</i>	estaba que echaba chispas	estaba enfadadísimo	El director del colegio lo había llamado a su despacho a primera hora. Daniel sabía que le esperaba un castigo ejemplar. La pesada broma se le había escapado de las manos. Había inundado los baños y roto varios grifos. Además, era la segunda vez en la misma semana que el director lo llamaba a su despacho. Cuando al fin entró, el director
<i>He could feel heated anger rising inside of him</i>	una ira ardiente creció en Pedro mientras escuchaba sus palabras	Pedro se fue enfureciendo cada vez más mientras escuchaba sus palabras	Pedro y Rafael habían trabajado en la misma compañía durante 25 años. Sin embargo, debido a la crisis, su jefe tenía que despedir a uno de los dos. Pedro estaba seguro de que su jefe echaría a Rafael, puesto que él tenía 3 hijos y Rafael era soltero. Por eso, cuando su jefe le llamó al despacho para despedirlo sin previo aviso,
<i>She was seething with indignation</i>	le salía el humo por las orejas	estaba más y más enfurecida	Marta llevaba más de una hora esperando a su marido. Sabía que esa cita con la ginecóloga era importante para ella. No quería ir sola y durante semanas le había rogado que la acompañara. Aun así, era ya muy tarde y su marido seguía sin aparecer. Le estaba fallando una vez más. Cada vez que miraba el reloj, ella sentía que
<i>It unleashed a rising tide of public fury</i>	desató la ira del público	enfureció al público	La actuación de Lady Gaga había provocado una tremenda polémica en aquel pueblecito rural. La mayoría de sus habitantes eran católicos muy tradicionales. Nadie podía creer que hubiera enseñado uno de sus pechos y blasfemado reiteradamente en una emisión de máxima audiencia y en horario infantil. Todo el mundo estaba escandalizado. Sin duda, en aquel pueblecito ese gesto obscuro
<i>Rage was pounding in my veins</i>	la cólera le palpitaba en las venas	no podía estar más furioso	Enrique siempre llegaba tarde al trabajo. Su socio en la empresa se quejaba de ello con frecuencia, aunque siempre intentaba recordar que era su mejor amigo. Aquel día el futuro de su empresa estaba en juego y Enrique volvió a llegar tarde. Era la gota que colmaba el vaso. Cuando irrumpió en la sala de reuniones disculpándose, su socio sintió que
<i>He exploded with anger</i>	explotó de ira	se enfadó muchísimo	Marcos necesitaba recuperar el dinero que le había prestado a su socio. Su situación económica había empeorado considerablemente desde la crisis. Durante meses, se lo había pedido en repetidas ocasiones, pero Marcos siempre tenía alguna excusa. Aquel día le había jurado por sus hijos que le pagaría a primera hora. Cuando llegó sin el dinero una vez más, Marcos

Fear

English source	Metaphor	Non-metaphor	Story
<i>He was haunted by fear</i>	era presa del terror	estaba aterrorizado	Ana se había jactado de que pasaría una noche entera en aquel caserón abandonado. No le importaban las historias sobre los asesinatos que decían se habían producido allí; estaba tranquila. No era el caso de Ian, su acompañante; cuando volvieron a escuchar pasos en el techo a mitad de la noche, Ana lo miró y se dio cuenta de que su compañero:
<i>The burn of panic inched along her bones</i>	un pánico ardiente avanzó por sus huesos	comenzó a sentir cada vez más pánico	El terremoto había sido intensísimo; el edificio estaba a punto de derrumbarse. En el noveno piso, Emilia se arrastró con cuidado por el suelo, intentando no precipitarse al vacío por algunos de los agujeros abiertos. Al llegar a la escalera de incendios, vio que se había derrumbado y ya no estaba allí:

Appendix A (Continued)

English source	Metaphor	Non-metaphor	Story
<i>His blood froze in his veins</i>	se le heló la sangre en las venas	sintió un gran terror	La puerta se abrió muy lentamente con un quejido siniestro. Marina se asomó con cuidado a la habitación en penumbra. Avanzó silenciosamente hasta la pared del fondo y se miró en el viejo espejo polvoriento. De repente, y sin saber la razón
<i>The fear pricked his skin as if an ice cube ran along his ribs</i>	el miedo le pellizó la piel como si un cubito de hielo le recorriese las costillas	empezó a temblar de miedo	Dijeran lo que dijeran, estaba segura de que no existían los vampiros. Pero ella estaba a salvo en el cementerio, ¿no? Estaba rodeada de las cruces de las tumbas y completamente sola; la luz mortecina de las farolas mostraba la completa soledad de la noche. Por eso, al escuchar una voz de niño que le llamaba
<i>Fear crawled up his spine</i>	pudo sentir cómo el miedo trepaba por su médula	sintió un enorme miedo	Era una noche como cualquier otra. Miguel y su familia se habían acostado temprano porque al día siguiente tenían un largo viaje por delante. Estaba profundamente dormido cuando de repente oyó el ruido de un cristal que se rompía. Tras unos breves segundos, el ruido estaba ya en la planta de abajo. Abrió los ojos y vio la puerta abriéndose lentamente. En ese momento,
<i>Fear was eating her away</i>	Un intenso miedo la estaba devorando	El sentimiento de miedo era demasiado grande	Era la primera vez que dormía fuera de casa. Nunca le había gustado dormir sola y menos aún en aquella noche infernal. Los truenos sonaban cada vez más cerca y los relámpagos creaban extrañas sombras en la habitación. Detrás de la puerta, se oían pasos de gente corriendo y voces que parecían pedir ayuda. Sin embargo, no podía mover ni un solo músculo y se sentía desvanecer.
<i>Fear was stabbing at her heart</i>	pudo sentir el miedo apuñalándole el corazón	experimentó un intenso miedo	Había sido realmente uno de los peores vuelos de su vida. Pero después de cinco largas horas de turbulencias, parecía que todo había vuelto a la normalidad. Vencida por el cansancio, cerró los ojos para dormir un rato, pero al cabo de un minuto los gritos del resto de los pasajeros la despertaron. El avión comenzó a caer en picado y en aquel preciso instante

Sadness

English source	Metaphor	Non-metaphor	Story
<i>He fell in the depths of despair</i>	se sintió profundamente apenado	se sintió tremendamente apenado	Llevaba mucho tiempo como miembro del equipo de rescate para víctimas de terremotos. Muchas veces lograban rescatar a alguien de entre los escombros y entonces sentía que merecía la pena. Pero algunas situaciones eran muy duras. Cuando se dio cuenta de que no podría haber ningún superviviente en aquella guardería derrumbada,
<i>My sea of sadness is drowning me</i>	me estoy ahogando en un mar de tristeza	estoy muy afectado por una gran tristeza	No puedo sobreponerme; la muerte de mi mujer ha sido demasiado para mí. Mis amigos, que en realidad quieren ayudar, me organizan cosas: viajes, reuniones, comidas... Pero no funciona; haga lo que haga, todas mis acciones y mi visión de la vida reflejan esta gran verdad:
<i>He flung himself into the bitter waters of despair</i>	se arrojó a las amargas aguas de la desesperación	se abandonó a la desesperación	Tanto amigos como médicos le decían lo mismo: para superar un accidente tan grave y volver a andar algún día, tenía que seguir haciendo sus ejercicios de rehabilitación de manera regular y, sobre todo, no desanimarse nunca. Pero cuando le dijeron tras un año de duro trabajo que tenían que volver a operarle y perdería otra vez el control de la pierna izquierda,

Appendix A (Continued)

English source	Metaphor	Non-metaphor	Story
<i>He felt his heart sink</i>	se le cayó el alma a los pies	se entristeció inmediatamente	Era su primer día de trabajo en el asilo de ancianos. Le habían advertido de las terribles condiciones de algunos de los ancianos, pero estaba contenta e ilusionada de poder ayudarlos con su trabajo. Sin embargo, cuando llegó a la planta de enfermos terminales y vio todos esos ancianos moribundos y solos que se enfrentaban a la muerte sin ningún familiar,
<i>She could not support these heavy draperies of grief</i>	se sentía incapaz de soportar aquellos pesados cortinajes de aflicción	se sentía incapaz de aguantar tanta pena	Su mujer llevaba años en coma, desahuciada por los médicos, pero él había continuado a su lado día y noche esperando a que despertara. Ahora era el momento de desconectar la máquina que la mantenía con vida. Recordaba los años de felicidad a su lado y al saber que ya nunca volvería a ver su rostro ni a sentir el contacto de su piel,
<i>A black hole is sucking all my feelings and emotions</i>	Vivo en un agujero negro que absorbe todos mis sentimientos	Soy totalmente incapaz de sentir nada	No podía creer que mi pequeño hubiera muerto en aquel accidente de tráfico. Tenía tan sólo dos años y eran nuestras primeras vacaciones en familia. Aquel accidente cambió mi vida para siempre. Todos los días pienso que nunca debería haber planeado aquel viaje. Desde entonces, no he vuelto a reír ni a llorar ni a compadecerme por los demás.
<i>Waves of depression came over him</i>	se precipitaron sobre él las olas de la depresión	se sintió terriblemente deprimido	Llevaba una racha intentando sobreponerse a un destino que parecía estar en su contra. Ya casi había superado su ruptura matrimonial y la terapia con la psicóloga estaba funcionando bastante bien. Pero cuando le volvieron a denegar el ascenso en el trabajo, de nuevo

References

- Appelhans, Bradley M., Luecken, Linda J., 2006. [Heart rate variability as an index of regulated emotional responding](#). *Rev. Gen. Psychol.* 10 (3), 229–240.
- Bambini, Valentina, Gentili, Claudio, Ricciardi, Emiliano, Bertinetto, Pier M., Pietrini, Pietro, 2011. [Decomposing metaphor processing at the cognitive and neural level through functional magnetic resonance imaging](#). *Brain Res. Bull.* 86 (3–4), 203–216.
- Bohm, Isabel C., Altmann, Ulrike, Jacobs, Arthur M., 2012. [Looking at the brains behind figurative language – a quantitative meta-analysis of neuroimaging studies on metaphor, idiom and irony processing](#). *Neuropsychologia* 50 (1), 2669–2683.
- Citron, Francesca M., Goldberg, Adele E., 2014. [Metaphorical sentences are more emotionally engaging than their literal counterparts](#). *J. Cogn. Neurosci.* http://dx.doi.org/10.1162/jocn_a_00654 (in press).
- Colino, Emilia, 2011. [La recepción de la metáfora en el público meta. Un estudio basado en la encuesta](#). (Unpublished Master's Thesis). University of Murcia.
- Davidson, Richard J., Scherer, Klaus R., Goldsmith, H. Hill, 2003. *Handbook of Affective Sciences*. Oxford University Press, London.
- Davydov, Dmitry M., Zech, Emmanuelle, Luminet, Olivier, 2011. [Affective context of sadness and physiological response patterns](#). *J. Psychophysiol.* 25, 67–80.
- Dickins, James, 2005. [Two models for metaphor translation](#). *Target* 17 (2), 227–273.
- Garvin, Paul L., 1964. *A Prague School Reader on Esthetics, Literary Structure, and Style*. Georgetown University Press, Washington, DC (Original work published 1932).
- Goodie, Jeffrey L., Larkin, Kevin T., Schauss, Scott, 2000. [Validation of Polar heart rate monitor for assessing heart rate during physical and mental stress](#). *J. Psychophysiol.* 14 (3), 159–164.
- Gruber, June, Oveis, Christopher, Keltner, Dacher, Johnson, Sheri L., 2008. [Risk for mania and positive emotional responding: too much of a good thing?](#) *Emotion* 8 (1), 23–33.
- Hoon, Johannes F., 1997. [Electronic evidence for the anomaly theory of metaphor processing. A brief introduction](#). In: Tötösy de Zepetnek, S., Sywensky, I. (Eds.), *The Systematic and Empirical Approach to Literature and Culture as Theory and Application*. University of Alberta, Edmonton, pp. 67–74.
- Hoon, Johannes F., 2001. [A renaissance perspective on the empirical study of literature. An example from psychophysiology](#). In: Schram, D.H., Steen, G. (Eds.), *The Psychology and Sociology of Literature*. John Benjamins, Amsterdam/Philadelphia, pp. 129–143.
- Kovecses, Zoltan, 1990. *Emotion Concepts*. Springer-Verlag, New York.
- Kovecses, Zoltan, 2000. *Metaphor and Emotion: Language, Culture, and Body in Human Feeling*. Cambridge University Press, Cambridge/New York.

- Kreibig, D. Sylvia, Wilhelm, Frank H., Gross, James J., Roth, Walton T., 2007a. The psychophysiology of fear and sadness: cardiovascular, electrodermal, and respiratory responses during film viewing. In: Paper Delivered at the Society for Psychophysiological Research, 47th Annual Meeting, Savannah, USA.
- Kreibig, D. Sylvia, Wilhelm, Frank H., Roth, Walton T., Gross, James J., 2007b. Cardiovascular, electrodermal, and respiratory response patterns to fear and sadness-inducing films. *Psychophysiology* 44 (5), 787–806.
- Kreibig, D. Sylvia, Wilhelm, Frank H., Roth, Walton T., Gross, James J., 2011. Affective modulation of the acoustic startle: does sadness engage the defensive system? *Biol. Psychol.* 87, 161–163.
- Kutas, Marta, Hillyard, Steven A., 1982. The lateral distribution of event-related potentials during sentence processing. *Neuropsychologia* 20, 579–590.
- Lakoff, George, 1992. The contemporary theory of metaphor. In: Ortony, A. (Ed.), *Metaphor and Thought*. Cambridge University Press, Cambridge, pp. 202–251.
- Lehr, Caroline, 2011a. Emotions in translation: towards an explorative empirical investigation. In: Presentation at the International Conference on Translation and Interpreter Education Development, Beijing Foreign Studies University, Beijing, 21–22 May.
- Lehr, Caroline, 2011b. The happier, the better? Exploring the impact of positive and negative emotions on performance in translation. In: Presentation at the International Symposium for Young Researchers in Translation, Interpreting and Intercultural Studies, Universitat Autònoma de Barcelona, 20th June.
- Lehr, Caroline, 2012a. Beyond cognition – affective responses to feedback and their impact on translation performance in a group of master students. In: Presentation at the DidTrad Conference on Research into the Didactics of Translation, Universitat Autònoma de Barcelona, 21–22 June.
- Lehr, Caroline, 2012b. The impact of positive and negative emotions on performance in translation professionals – a challenge to expertise? In: Presentation at the International Workshop on Expertise in Translation, Copenhagen Business School, 17–18 August.
- McManis, Mark H., Bradley, Margaret M., Berg, W. Keith, Cuthbert, Bruce N., Lang, Peter J., 2001. Emotional reactions in children: verbal, physiological, and behavioral responses to affective pictures. *Psychophysiology* 38 (2), 222–231.
- Miall, David S., 2007. Foregrounding and the sublime: Shelley in Chamonix. *Lang. Lit.* 16, 155–168.
- Miall, David, Kuiken, Don, 1994. Beyond text theory: understanding literary response. *Discourse Process.* 17, 337–352.
- Moors, Agnes, Scherer, Klaus R., 2013. The role of appraisal in emotion. In: Robinson, M., Watkins, E., Harmon-Jones, E. (Eds.), *Handbook of Cognition and Emotion*. Guilford Press, New York, pp. 135–155.
- Mukařovský, Jan, 1964. Standard language and poetic language. In: Garvin, P.L. (Ed.), *A Prague School Reader on Esthetics, Literary Structure, and Style*. Georgetown University Press, Washington, DC. (Original work published 1932), pp. 17–30. (Original work published 1932).
- Newmark, Peter, 1988a. *Approaches to Translation*. Prentice Hall International, London.
- Newmark, Peter, 1988b. *A Textbook of Translation*. Prentice Hall International, New York.
- Rabadán Álvarez, Rosa, 1991. *Equivalencia y traducción: problemática de la equivalencia transléctica inglés-español*. University of León.
- Ramos, Marina, 2013. *El impacto emocional de la Audiodescripción*. (Unpublished PhD Thesis). University of Murcia.
- Robinson, Jenefer, 2005. *Deeper than Reason: Emotion and Its Role in Literature, Music, and Art*. Oxford University Press, Oxford.
- Rojo, Ana, 2014. With or without metaphor? Factors involved in the translation and impact of metaphorical phraseological units. In: Pietro García-Seco, D., et al. (Eds.), *Enfoques Actuales para la Traducción Fraseológica y Paremiológica: Ámbitos, Recursos y Modalidades*. Instituto Cervantes, Madrid.
- Rottenberg, Jonathan, Ray, Rebecca D., Gross, James J., 2007. Emotion elicitation using films. In: Coan, J.A., Allen, J.J.B. (Eds.), *Handbook of Emotion Elicitation and Assessment*. Oxford University Press, New York, pp. 9–28.
- Samaniego Fernández, Eva, 2013. The impact of cognitive linguistics on descriptive translation studies: novel metaphors in English-to-Spanish newspaper translation as a case in point. In: Rojo, A., Ibarretxe-Antuñano, I. (Eds.), *Cognitive Linguistics and Translation: Theoretical and Applied Models*. Mouton de Gruyter, Berlin/New York, pp. 159–198.
- Schäffner, Christina, 2004. Metaphor and translation: some implications of a cognitive approach. *J. Pragmat.* 36, 1253–1269.
- Scherer, Klaus, 2005. What are emotions? And how can they be measured? *Soc. Sci. Inf.* 44 (4), 695–792.
- Scherer, Klaus, Schorr, Angela, Johnstone, Tom, 2001. *Appraisal Processes in Emotion: Theory, Methods, Research*. Oxford University Press, New York/Oxford.
- Schorr, Angela, 2001. Subjective measurement in appraisal research: present state and future perspectives. In: Scherer, K., Schorr, A., Johnstone, T. (Eds.), *Appraisal Processes in Emotion: Theory, Methods, Research*. Oxford University Press, New York, pp. 331–349.
- Schwartz, Gary E., Weinberger, Daniel A., Singer, Jefferson A., 1981. Cardiovascular differentiation of happiness, sadness, anger, and fear following imagery and exercise. *Psychosom. Med.* 43 (4), 343–364.
- Sheldon, Kennon M., Lyubomirsky, Sonja, 2006. Achieving sustainable gains in happiness: change your actions, not your circumstances. *J. Happiness Stud.* 7, 55–86.
- Sikora, Shelley, Kuiken, Don, Miall, David S., 1998. Enactment versus interpretation: a phenomenological study of readers' responses to Coleridge's 'The Rime of the Ancient Mariner'. In: Paper Presented at the Sixth Biannual Conference of the International Society for the Empirical Study of Literature – IGEL, Utrecht, 26–29 August.
- Snell-Hornby, Mary, 1988. *Translation Studies: An Integrated Approach*. John Benjamins, Amsterdam.
- Soriano, Cristina, 2004. *The Conceptualisation of Anger in English and Spanish. A Cognitive Approach*. (Unpublished PhD Thesis). University of Murcia.
- Stefanowitsch, Anatol, 2004. HAPPINESS in English and German: a metaphorical-pattern analysis. In: Achard, M., Kemmer, S. (Eds.), *Language, Culture, and Mind. CSLI*, Stanford, CA, pp. 137–149.
- Stefanowitsch, Anatol, 2006. Words and their metaphors: a corpus-based approach. In: Stefanowitsch, A., Gries, S.T. (Eds.), *Corpus-Based Approaches to Metaphor and Metonymy*. Trends in Linguistics. Mouton de Gruyter, Berlin/New York, pp. 61–105.
- Sudheimer, Keith D., 2009. *The Effects of Cortisol on Emotion*. (Dissertation). University of Michigan, Michigan.
- Tan, Ed S., 1994. Story processing as an emotion episode. In: van Oostendorp, H., Zwaan, R.A. (Eds.), *Naturalistic Text Comprehension*. Ablex, Norwood, NJ, pp. 165–188.

- Theall-Honey, A. Laura, Schmidt, A. Louise, 2006. Do temperamentally shy children process emotion differently than nonshy children? Behavioral, psychophysiological, and gender differences in reticent preschoolers. *Dev. Psychobiol.* 48, 187–196.
- Van den Broeck, Raymond, 1981. The limits of translatability exemplified by metaphor translation. *Poet. Today* 2 (4), 73–87.
- Van Peer, Willie, 1986. *Stylistics and Psychology: Investigations of Foregrounding*. Croom Helm, London.
- Van Peer, Willie, 2007. Introduction to FG: a state of the art. *Lang. Lit.* 16 (2), 99–104.
- Weins, Stefan, Katkin, Edward S., Öhman, Arne, 2003. Effects of trial order and differential conditioning on acquisition of differential shock expectancy and skin conductance conditioning to masked stimuli. *Psychophysiology* 40, 989–997.
- Zwaan, Rolf A., 1993. *Aspects of Literary Comprehension: A Cognitive Approach*. John Benjamins, Amsterdam/Philadelphia.

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