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Reading anger stories: A lexical decision task as a test for the existence of metaphorical representation

1. Introduction

The theory of metaphor (and metonymy) developed within the cognitive paradigm since the nineteen eighties (the Cognitive Theory of Metaphor and Metonymy, henceforth CTMM) has decisively influenced not only our understanding of metaphorical expressions in language, but also our current assumptions about mental representation and language processing. In the most traditional view, metaphor is a linguistic phenomenon used for aesthetic or rhetorical purposes, and motivated by the similarity of two entities in the world. In contrast, the cognitive paradigm argues that metaphors are not just a matter of language, but also, and more importantly, a matter of thought (e.g., Lakoff, 1993). Metaphors are “ways of thinking” and as such their main function is not to cause aesthetic pleasure, but to facilitate reasoning and to structure abstract or complex thoughts. Most of them are not motivated by an objective similarity between entities in the world, but rather by the correlation of two phenomena in experience or by a certain schematic resemblance at a structural level.

This view of metaphor emerged out of the observation of striking similarities and systematicities in language use.¹ In 1979, Reddy noticed that our talking about linguistic communication was heavily metaphorical and that the various linguistic expressions commonly used could be related to one single conceptual association:

¹ And in the inferential patterns associated to those linguistic expressions.

communication was understood as the sending of physical objects from a speaker to a hearer. He called this metaphorical view THE CONDUIT METAPHOR (Reddy, 1993 [1979]) and explained how this particular conceptualization had important consequences for the assumptions one made about the dynamics and general characteristics of linguistic communication. After Reddy, Lakoff and Johnson (1980) noticed that many of the conventional expressions we normally use to talk about life, time or love did not form a haphazard and unrelated list of expressions either, but seemed to be motivated by the regular association of those concepts with some others. For example, they hypothesized the existence of a conventional understanding of time in terms of money (TIME IS MONEY), as evidenced by the expressions *You're wasting my time*, *I've invested a lot of time in her*, *How do you spend your time these days?*, *This gadget will save you hours*, etc. They further argued that the conceptualization of time in terms of money expanded our knowledge and reasoning abilities about the first.

In the light of these findings it became important to distinguish between conceptual metaphors (or just 'metaphors' for short, e.g., TIME IS MONEY) and their linguistic realizations (e.g., *You're wasting my time*). Conceptual metaphor can be defined as "the cognitive mechanism whereby one experiential domain is partially 'mapped', i.e. projected, onto a different experiential domain, so that the second domain is partially understood in terms of the first one. The domain that is mapped is called the *source* or *donor* domain, and the domain onto which the source is mapped is called the *target* or *recipient* domain" (Barcelona, 2000: 3). A conceptual metaphor can be conceived of as a template that licenses or motivates an open-ended number of metaphorical expressions. The conceptual associations between both domains can have not only linguistic but other types of manifestation (e.g., gestural, pictorial, behavioral, ideological, etc).

The mappings established between two domains in conceptual metaphor share certain features. Such mappings are: partial (not all the structure of the source domain is mapped onto the target) (Lakoff and Johnson, 1980), culturally constrained (Kövecses, 2005), hierarchically structured (Lakoff, 1993), unidirectional (mappings only occur from source to target) (Lakoff and Johnson, 1980), and more important for our purposes in the present work, *automatic*, *unconscious* and *effortless* ("the system of conventional conceptual

metaphors is mostly unconscious, automatic, and used with no noticeable effort”, Lakoff, 1993: 245)

2. Some criticisms

The view of metaphor defended by the cognitive paradigm has been challenged in at least two ways. First, Murphy (1996) has argued against the possibility that conceptual representations can be metaphorical. According to his theory, the Structural Similarity View, entities are represented in their own terms, i.e. literally, and metaphors arise in an *ad hoc* fashion, out of structural similarities between two domains. In other words, there are no stable cross-domain mappings in the speakers’ minds.

A second form of criticism relates to the alleged automaticity of conceptual metaphor. According to Glucksberg, MacGlone and Keysar, among others, (Glucksberg, Keysar and MacGlone, 1992; Glucksberg and MacGlone, 1999; Keysar, Shen, Glucksberg and Horton, 2000), there may be pre-stored metaphorical mappings in our minds, but they need not be accessible each and every time we use language. This claim is also supported by Gibbs, who argues the following as regards the well known conceptual metaphor ANGER IS A HEATED FLUID IN A CONTAINER:

We can say that people’s metaphorical knowledge partly *motivates* their making sense of why certain linguistic expressions mean what they do. However, it is not necessarily the case that people automatically activate their pre-existing metaphorical knowledge that anger is a heated fluid in a container each and every time they read or hear the expressions *He almost exploded with anger* or *She blew her stack when she heard of her husband’s affair* (Gibbs, 1994: 19)

The controversy around the alleged automaticity of conceptual metaphor has great relevance for our work and will be discussed here in some detail.

Regarding the first criticism, on the psychological reality of conceptual metaphors,² Murphy manifests some concerns about the use of idioms and polysemous words as evidence for some of the claims of the CTMM. In his opinion, idioms (e.g., *He flipped his lid*) may not reflect conceptual metaphors (ANGER IS A HOT FLUID IN A CONTAINER), but simply the idiom representation (and nothing about the representation of a particular target domain, in this case anger); or they may simply reflect a way of talking about something (not a way of representing it conceptually). However, it is intuitively very unlikely that the comprehension of expressions like *He flipped his lid* is unrelated to the comprehension of other semantically very similar linguistic items, like collocations around the word *anger* (e.g., *Burst with anger*), novel expressions about the emotion (e.g., *When my father explodes, my mother follows as in a chain-reaction*), anger-related words (*Explode, Erupt*), and even drawings of angry people, all of which can be coherently explained by hypothesizing the existence of a conceptual metaphor ANGER IS A HOT FLUID IN A CONTAINER (see Soriano, 2005 for examples of this sort in English and Spanish). Furthermore, there is empirical evidence that the meaning of idioms like *He flipped his lid* and *He blew his stack* are not arbitrary and unrelated to one another, but motivated by a conceptualization of anger as a fluid contained in a pressurized recipient (Gibbs and O'Brien, 1990; Gibbs and Nayak, 1989). There is one aspect in Murphy's argumentation that we fully agree with, though: the frequent circularity in metaphor research (the existence of linguistic structures is used both as a reason to hypothesize the existence of conceptual metaphor and as post-hoc evidence of their reality) and the fact that it can end up being mostly interpretative. In order to break the circularity, non-linguistic evidence and the empirical psycholinguistic validation of those linguistic claims are necessary. This is what the present study attempts to investigate:

² Though all of Murphy's criticisms are relevant for the CTMM, we will review here only the most directly related to the present work; for a more complete summary of responses to Murphy's criticisms, cf. Soriano 2005.

the conceptual nature and functioning of metaphor through psycholinguistic experimentation.³

The second form of criticism encountered by the CTMM concerns the claimed automaticity of conceptual metaphors. According to Lakoff: “The system of conventional conceptual metaphor is mostly unconscious, automatic, and used with no noticeable effort” (1993: 245). If conceptual metaphors are in fact automatic and, therefore, “inescapable”, a reference to the source domain should inevitably activate the metaphor in the speakers’ minds.

This hypothesis has been challenged by psycholinguistic investigation (Glucksberg and MacGlone, 1999; Keysar, Shen, Glucksberg and Horton, 2000; Gibbs, 1994). Metaphors may be associative structures available in long-term memory (Nayak and Gibbs, 1990; Gibbs and O’Brien, 1990; Gibbs, 1992), but it is not clear that they are activated (i.e. accessed) each and every time people speak. The activation may be context and task dependent. Conceptual metaphors have been shown to be recruited when speakers are presented with novel linguistic expressions (Keysar, Shen, Glucksberg and Horton, 2000) and when they are required to consciously reflect on the meaning of some metaphorical expression (Nayak and Gibbs, 1990; Glucksberg and McGlone, 1999). However, the results are more dubious in reading-time tasks, where no deliberate judgment on the meaning of an expression is needed. Idioms in metaphor-congruent contexts are not read any faster than idioms in incongruent ones (Glucksberg, Brown and McGlone, 1993). The fact that a metaphor-related context does not facilitate the processing of an idiom motivated by the same metaphor suggests that such conceptual metaphor is not accessed in the on-line processing of the idiom within the reading task.

Not all methodologies are valid in the investigation of this issue, though. In a different study, Glucksberg and MacGlone (1999) asked students to provide paraphrases of the meaning of a number of

³ For a review of empirical evidence - some of it language-independent - supporting the view that conceptual metaphors are real cognitive phenomena and not mere post-hoc explanatory devices see Lakoff and Johnson, 1999 (Kövecses, 2002 or Soriano, 2005).

sentences that could have been motivated by the metaphors LOVE IS A JOURNEY (*Our love is a bumpy rollercoaster ride* and *Our love is a voyage to the bottom of the sea*) and LOVE IS A CONTAINER (*Our love is a filing cabinet*). In the study, most informants failed to call up metaphor-related ideas to make sense of the expressions. However, the fact that people do not consciously evoke the journey frame or domain when trying to make sense of an unknown sentence does not mean that the conceptual structure provided by the metaphor love is a journey has not been *unconsciously* activated during language processing. According to Gibbs (forthcoming): “Paraphrase tasks are notoriously insensitive as measures of people’s, especially children, ability to understand metaphors”.

Glucksberg and MacGlone’s methodology in this study is also inadequate because it is off-line and off-line studies may involve post-comprehension processes that can interfere with the experimental results (cf. Keysar and Bly, 1995). On-line studies, on the contrary, allow for a direct observation of linguistic and conceptual processing. This is the case of Gibbs, Bogdanovich, Sykes and Barr (1997), who used a lexical priming methodology. In their study the use of metaphorical idioms was shown to facilitate the recognition of congruent metaphor-related words

In conclusion, even though there is ample evidence that many concepts are (at least in part) metaphorically construed, there is still scarce and contradictory evidence as regards the alleged automaticity of conceptual metaphors in language processing. Such activation may be context and task dependent, in which case it would be necessary to further investigate exactly under what circumstances it takes place.

3. The current study

The experiment that we present in this paper was designed to investigate the use of conceptual metaphors by speakers of peninsular Spanish in relation to the emotion concept ANGER. Our knowledge of this emotion is said to be largely based on a number of projections between ANGER and other domains, such as HOT FLUID IN A

PRESSURIZED CONTAINER or NATURAL FORCE (Lakoff and Kövecses, 1987; Kövecses, 1995; Barcelona, 1989; Soriano, 2005). In other words, we use our understanding of the behaviour of fluids in pressurized containers or our knowledge of natural forces to structure and develop our understanding of anger.

The target domain chosen for the investigation is ANGER. Therefore, this research is also a psycholinguistic validation of the (language-based) claims put forward by the CTMM for the metaphor system for the notion ANGER. Inasmuch as it provides evidence that such metaphors are automatically accessed in on-line idiom processing, it also answers the question of whether metaphors are “cognitively real” or merely *post-hoc* constructs.

Method

Some empirical evidence has already been provided for the claim that conceptual mappings may under certain circumstances be accessed automatically and unconsciously. In one of the studies mentioned in the previous section, Gibbs and his colleagues (Gibbs, Bogdonovich, Sykes and Barr, 1997) demonstrated that certain conceptual mappings get automatically activated during the on-line processing of some idiomatic expressions. Among the fifteen metaphorical idioms used by these researchers, there was one related to anger: *to blow one's stack*. This idiom was shown to prime the recognition of the letter-string *heat* as a word in the English language. These are encouraging results, but some more systematic evidence of the automatic activation of ANGER metaphors in on-line language use is still needed, at least for Spanish.

In the present study, the methodology used by Gibbs and his colleagues (Gibbs, Bogdonovich, Sykes and Barr, 1997) was adapted for the study of Spanish anger-related metaphorical expressions. This was a priming experiment consisting of a self-paced reading task followed by a visual lexical decision task. In the former a number of metaphorical expressions were read that served as primes for the letter-strings in the second task (more on this below).

Some of these expressions were idiomatic. This choice was motivated by the view of idiomaticity according to which the meaning

of idioms is not arbitrary or historically opaque, but (at least in part) motivated by conceptual metaphor (Gibbs, 1994).

The question now is whether people access conceptual metaphors during the on-line processing of the metaphorical expressions. If it were so, after reading them the source and target domains should be active in their minds and this activation should facilitate (i.e. speed up) the subsequent recognition of metaphor-related target words.

Participants

30 undergraduate students of English philology and Law of the University of Murcia — 13 men and 17 women —, all of them monolingual native speakers of Spanish, volunteered to participate in this study.⁴ Their ages ranged from 20 to 28.

Materials and design

Six short stories were constructed with five sentences each. The last phrase was a metaphorical expression related to anger. As most of these expressions were idioms (e.g., 1-3), in the rest of this paper this will be referred to as the “idioms group”. (4) is an example of the stories used:

- (1) *Estar hasta la coronilla* (“to be up to the crown”, to be fed up)
- (2) *Montar en cólera* (“to mount/ ride on cholera”, to get furious)
- (3) *Llevarse los demonios a alguien* (“to be taken by the devils”, to throw a fit)
- (4)
 - *Miguel llegaba siempre tarde a todo en el trabajo* (Miguel was always late for everything at work),

⁴ By “monolingual” we mean that informants were not technically perfect bilinguals, even if some of them could speak English as a foreign language.

- *su socio en la empresa se quejaba de ello con frecuencia* (his partner in the company often complained about it),
- *un día llegó tarde a una reunión importante* (one day he was late for an important meeting),
- *cuando intentó disculparse su socio le dijo* (when he tried to apologize, his partner told him),
- “estoy hasta la coronilla” (“I’m up to the crown”, i.e. fed up).

In addition to the idioms, two more types of ending were created for the stories: literal paraphrases of the meaning of the idioms and control phrases (i.e. unrelated literal phrases coherent with the context). The literal and control phrases used in (4) were the following:

(5) Literal paraphrase: *Estoy muy enfadado* (I’m very angry)

(6) Control phrase: *No me des más excusas* (don’t give me more excuses)

In addition to these stories (set A), six more were constructed with the same kinds of ending (set B). For the first six, or experimental stories, a metaphor-related and a metaphor-unrelated word were chosen. In (4) the metaphor at stake is ANGER IS A (HOT) FLUID IN A CONTAINER; the metaphor-related target word was *contenedor* (container) and the unrelated word was *conquistador* (conqueror). The remaining six, or filler stories, were assigned a nonce word instead (e.g., **pultenedor*).

Stories were distributed in six lists. Each list contained the six experimental stories (set A) and the six filler ones (set B). In each of those sets, two stories ended with an idiom, two with a literal paraphrase and two with a control phrase.

Of the two experimental stories ending with an idiom, one was followed by a metaphor-related target word and the other by a metaphor-unrelated one. The same happened with the stories ending with paraphrases and control phrases.

The distribution of stories, endings and target words is presented in Tables 1 and 2.

SET	List # 1			List # 2			List # 3		
	<i>Story</i>	<i>end</i>	<i>target</i>	<i>story</i>	<i>end</i>	<i>target</i>	<i>story</i>	<i>end</i>	<i>target</i>
A	1	I	r	1	P	R	1	C	R
	2	P	r	2	C	R	2	I	R
	3	C	r	3	I	R	3	P	R
	4	I	u	4	P	U	4	C	U
	5	P	u	5	C	U	5	I	U
	6	C	u	6	I	U	6	P	U
B	1'	I	Nw	1'	P	Nw	1'	C	nw
	2'	P		2'	C		2'	I	
	3'	C		3'	I		3'	P	
	4'	I		4'	P		4'	C	
	5'	P		5'	C		5'	I	
	6'	C		6'	I		6'	P	

Table 1. Distribution of stories, endings and target words in lists 1, 2 and 3.

SET	List # 4			List # 5			List # 6		
	<i>Story</i>	<i>end</i>	<i>target</i>	<i>story</i>	<i>end</i>	<i>target</i>	<i>story</i>	<i>End</i>	<i>target</i>
A	1	I	u	1	P	U	1	C	U
	2	P	u	2	C	U	2	I	U
	3	C	u	3	I	U	3	P	U
	4	I	r	4	P	R	4	C	R
	5	P	r	5	C	R	5	I	R
	6	C	r	6	I	R	6	P	R
B	1'	I	Nw	1'	P	Nw	1'	C	nw
	2'	P		2'	C		2'	I	
	3'	C		3'	I		3'	P	
	4'	I		4'	P		4'	C	
	5'	P		5'	C		5'	I	
	6'	C		6'	I		6'	P	

Table 2. Distribution of stories, endings and target words in lists 4, 5 and 6.

Consider, for example, list #1. In this list, as in every other, there are two sets of stories: six experimental stories (set A) that have a target word and six control stories (set B) that have a nonce word (nw) as target. In the experimental set, two of the stories (stories 1 and 4) end with an idiom (I), two (stories 2 and 5) end with a literal paraphrase of the meaning of that idiom (P) and the remaining two (stories 3 and 6) end with a control phrase (C). In each of these pairs, one of the stories

is followed by a metaphor-related word (r) (stories 1, 2 and 3) and the other by a metaphor-unrelated word (u) (stories 4, 5 and 6).

This design ensured a balanced exposure to the experimental cues because, when a subject was exposed to any of the lists, he or she was presented with:

- the same amount of experimental and control stories (i.e. there was the same amount of stories followed by a word as stories followed by a nonce word),
- the same amount of stories ending with an idiom, a paraphrase or a control sentence,
- the same amount of stories whose target was a metaphor-related, a metaphor-unrelated or a control word.

Each subject saw one of the lists. The design of the experiment also guaranteed that every person would give us a measure of each possible combination of final phrase and target word:

- idiom and related target (I-r),
- paraphrase of the idiom and related target (P-r),
- control phrase and related target (C-r),
- idiom and unrelated target (I-u),
- paraphrase and unrelated target (P-u),
- control and unrelated target (C-u).

Only the first four combinations were useful to us, though, as the *experimental hypotheses* were the following:

1. the recognition of the metaphor-related target words will be faster after reading the idioms than after the paraphrases or the control phrases ($I-r_{\text{time}} < P-r_{\text{time}}$ or $C-r_{\text{time}}$);
2. the recognition of target words after reading the idioms will be faster for metaphor-related targets than for unrelated ones ($I-r_{\text{time}} < I-u_{\text{time}}$).

The program chosen to build and run the experiment was E-prime 1.1 (Psychology Software Tools, Inc). It was installed in eleven PCs of one of the computer rooms of the Department of English Philology at the University of Murcia. Windows 2000 was the operative system in all of them.

The program was set to elicit some information about the participants as well: sex, handedness and age.

In order to design the experiment a number of studies were conducted first. For example, people were familiar with the idioms used for the experiment, as determined by a norming study carried out on 14 undergraduate students of the University of Murcia. Another norming study with 12 students showed that the idioms and literal paraphrases were generally equivalent in meaning. The overall frequencies of the related ($M = 146$) and unrelated ($M = 150$) target words were also controlled following Alameda and Cuetos' (1995) lexical frequency dictionary.

In order to select the target words a procedure different to Gibbs' was followed. He and his colleagues chose to present 20 UC Santa Cruz students with the inventory of conceptual metaphors investigated in their study and a set of three words for each one of them. The students were asked to select the word "[...] that best captured the overall meaning of the conceptual metaphor" (Gibbs, Bogdanovich, Sykes and Barr, 1997: 144). Which words were offered as options or how they were selected by the scholars to begin with was not explained, nor was it clear whether the students had the adequate background as cognitive linguists to determine which single word best evoked the complex conceptual structure of a metaphor. Depending on the choice of words, the task could be too easy or extremely challenging.

Instead, in this study words were selected following the experimenters' intuitions as trained cognitive scholars and discrepancies were solved through discussion. Words that could be literally related to the idiom under examination were avoided (otherwise the priming might have been lexical, instead of metaphor-mediated). A list of the experimental final phrases, metaphors and target words can be found in the [Appendix](#).

As a way of example let us comment on one of those pairs: the idiom *estar hasta la coronilla* ("to be up to the crown") — which is motivated by ANGER IS A HOT FLUID IN A CONTAINER —, and the metaphor-related target word *contenedor* (container). The expression "to be up to the crown" does not necessarily involve the semantic component VOLUME. "Up to the crown" denotes height: the highest point in a scale — if we take the body as a measurement scale ([Fig. 1](#)). The potential activation of the concept VOLUME, inherent in *contenedor* (container), can only be explained if the subjects

automatically access a metaphorical conceptualization of the body as a container and of anger as a substance that fills it up (ANGER IS A FLUID IN THE BODY-CONTAINER) (Fig. 2).

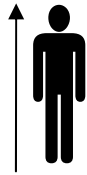


Fig. 1. Graphic representation of *hasta la coronilla* if “literally” understood.⁵

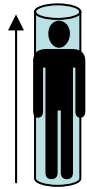


Fig. 2. Graphic representation of *hasta la coronilla* mediated by ANGER IS A FLUID IN THE BODY-CONTAINER.

Procedure

Before the experiment, participants were administered the TECLE⁶ reading test (Marín and Carrillo, 1999). This was an addition to Gibbs’ methodology in order to be able to rule out the potential interference of slow readers. All participants obtained comparable rates, so none was excluded from the study.

⁵ In spite of the term “literal”, this representation is of course not literal. What we intend to achieve by calling it this way is to highlight the absence of the metaphor under investigation: ANGER IS A FLUID IN A CONTAINER. However, even the “literal” interpretation is mediated by the primary conceptual metaphor MORE IS UP or QUANTITY IS VERTICAL ELEVATION (cf. Grady, 1997).

⁶ “Test Colectivo de Eficacia Lectora”, collecting test of reading efficiency.

The participants read the stories one line at a time on a computer screen. In order to see the following line they had to press the space bar, a sign that they had read and understood the sentence. After each story (which ended in either an idiom, a paraphrase or a control unrelated phrase), a yellow screen flashed for 100 ms and a letter string appeared on the screen immediately afterwards. The participants had to decide whether it was or not a word in their mother tongue (Spanish) and signal their response by pressing the appropriate key on the keyboard (A = yes, L = no). They were instructed to respond as quickly as possible without making mistakes. In order to facilitate speeded responses, they were encouraged to keep their hands on the appropriate keys of the keyboard throughout the experiment. After this lexical decision response there was a delay of 2 s after which the following story began.

Instructions for the experiment were given verbally, but they were also shown on the computer screen. Participants were warned that they should pay attention to the stories because at the end of the experiment they would be asked something about what they had read.

After hearing the instructions, subjects were given a set of six stories as practice trials. These stories were identical in structure to the experimental ones, but the response times were not considered for the analysis. After that, the beginning of the experiment was announced on the screen and subjects pressed a key to start. From that moment on, they were shown a total of 16 stories followed by a letter string. The reaction time for the lexical decision task of the last 12 was recorded. However, the time of the first four, or buffer stories, was not considered, as their function was to rule out the interference of anxiety as a possible distorting factor in the experimental tasks. This was an addition to Gibbs' methodology as well.

Except for the first four (buffer stories), stories were presented in a different random order to each subject.

The program assigned the participants to different lists by their subject number. Across the 6 lists, an equal number of subjects saw an equal number of final phrases. That is, there were 5 subjects assigned to every list and each of them saw 6 experimental stories; 2 of those ended with an idiom, two with a paraphrase of the meaning of that idiom and two with a control phrase. All subjects across all lists saw the same filler stories with their final phrases. These were six and

exhibited the same distribution of final phrases designed for the experimental set (i.e. two of each sort).

After the experiment, subjects were given a page with twelve stories. Half of them had appeared in the experiment, and the remaining six were close variations of some others they had also read. Participants were asked to identify which of them they had seen. No subjects failed to identify at least 8 of the 12 stories, and so all of them were included in the data analysis.

The experiment took about 20 minutes to complete.

Results

Lexical decision times longer than 1.9 s were eliminated (1.6 % of all responses). These were cases in which some participant's attention had wandered away from the task, as they were also inconsistent with the remaining responses of those subjects in the experiment (i.e. these slow responses were not the result of a slow reader with slow response times in all cases).

Only lexical decision times in which participants had made a correct decision were considered for the analysis.

The mean response times obtained for the four investigated combinations of final phrase and target word are presented in Table 3 and Fig. 3

<i>Structures</i>	<i>Mean response time</i>
Idiom + related target (I-r)	812.83
Idiom + unrelated target (I-u)	879.23
Idiom + related target (I-r)	812.83
Paraphrase + related target (P-r)	848.52
Control + related target (C-r)	883.07

Table 3. Mean response time (in milliseconds) on an LDT upon different (metaphorical and non-metaphorical) primes.

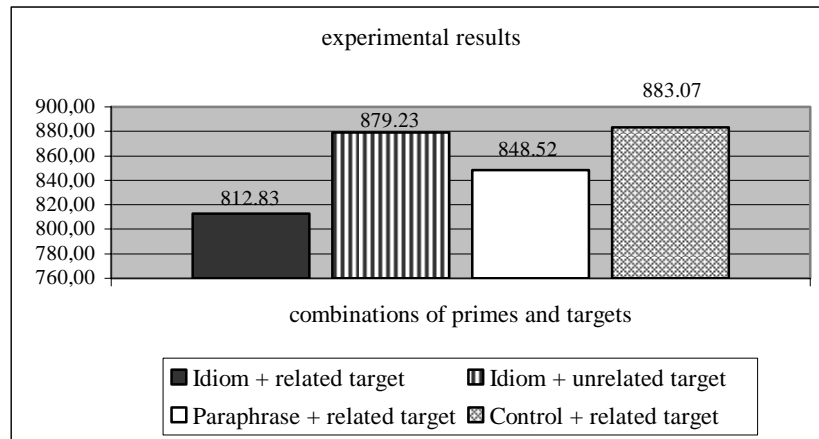


Fig. 3. Mean response time (in milliseconds) on an LDT upon different (metaphorical and non-metaphorical) primes.

4. Discussion

After reading a metaphorical idiom, people were generally faster responding to the metaphor-related than to the metaphor-unrelated target words. For example, after reading the idiom *estar hasta la coronilla* (“to be up to the crown”) the mean reaction time to the target *contenedor* (container) was 1.05 s, while for *conquistador* (conqueror) it was 1.255 s.

People were also faster identifying the related targets after reading the metaphorical idioms than they were after reading the paraphrases or the control phrases. For example, after reading the idiom *estoy hasta la coronilla*, people identified the target *contenedor* in roughly 1.05 s, while it took them longer to do so after reading the paraphrase *estoy muy enfadado* (I’m very angry) and the control phrase *no me des más excusas* (don’t give me more excuses). The mean reaction times for the latter were 1.109 m and 1.094 s respectively.

The figures above indicate tendencies, but the clearest results were obtained for the contrast between metaphor-related and

metaphor-unrelated targets after a metaphorical idiomatic expression (I-r vs. I-u). An ANOVA⁷ test showed that in these cases the different reaction times after the phrases motivated by ANGER IS A (HOT) FLUID IN A CONTAINER and ANGER IS AN OPPONENT IN A STRUGGLE were statistically significant ($F(1, 4) = 4.53, p = 0.05$). An effect of more than 100 ms was found in them. When the word following the idiom was anger-related the mean reaction time was 800.49 ms, while it was 977.24 ms after metaphor-unrelated target words (Table 4).

<i>Target type</i>	<i>Mean reaction time</i>
Metaphor-related	800.49
Metaphor-unrelated	977.24

Table 4. Reaction times (in milliseconds). I-r vs I-u for ANGER IS A (HOT) FLUID IN A CONTAINER and ANGER IS AN OPPONENT expressions.

5. Conclusions

The results of this study are encouraging, but they do not evidence that metaphorical representations are activated each and every time metaphorical language is processed. It is necessary to further investigate exactly under what conditions that activation takes place. Clearer results could be obtained by increasing the power of the experiment with a larger number of subjects. Also, some variations could improve the experimental conditions. For example, a longer time of exposure to the metaphorical expressions might enhance the priming effect.

In spite of its limitations, the results of this study suggest that some processes of metaphorical language comprehension involve the automatic activation of metaphorical mappings. For example, neither *reventar* (bursting) nor *hinchar* (swelling) are semantically related to HEAT, and yet, the word *calor* (heat) is recognized faster after reading those two verbs in an anger-related construction (*me estás hinchando* — “you’re swelling me”, i.e. you’re annoying me—, *me revientan* — “they burst me”, i.e. they annoy me). The same was shown to happen

⁷

Analysis of variance.

in English, where the idiom to *blow one's stack* primed the recognition of the word *heat* (Gibbs, Bogdonovich, Sykes and Barr, 1997).

These findings support the view that at least some of the metaphors discussed in the literature on anger conceptual metaphors (Lakoff and Kövecses, 1987; Barcelona, 1989; Soriano, 2005) are not only *post hoc* explanatory categories useful for the coherent account of a large number of linguistic phenomena, but they have some psychological reality as well. We are only starting to understand what this psychological (and neural) status is really like. It has been known for some time that metaphor plays a role in the development of language throughout history (e.g., Sweetser, 1990). It has also been hypothesized that it influences people's current understanding of words, and we have some psychological evidence of it too.⁸ It seems metaphors may also be automatically accessible under certain circumstances. But we still need to investigate many other issues, like whether some types of construction favor this metaphorical activation (e.g., novel metaphorical expressions vs. idioms); what role context plays; whether all sorts of metaphors are activated under the same circumstances (e.g., basic-level and generic-level), etc. In the meantime, the results of this study suggest that the on-line processing of some anger-related metaphorical expressions can involve automatic access to metaphorical conceptual representations.

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⁸

See Gibbs (1994) for a summary of this research.

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Appendix

Metaphorical expression

Estoy hasta la coronilla, "I'm up to the crown"

Literal paraphrase

Estoy muy enfadado, I'm very angry

Control phrase

No me des más excusas, don't give me more excuses

Related target

Contenedor, container

Unrelated target

Conquistador, conqueror

Conceptual metaphor

ANGER IS A (HOT) FLUID IN THE BODY-CONTAINER

Metaphorical expression

Me estás hinchando, "you are swelling me"

Literal paraphrase

Me estás fastidiando, you are annoying me

Control phrase

Los quiero aquí mañana, I want them here tomorrow

Related target

Calor, heat

Unrelated target

Olor, smell, odor

Conceptual metaphor

ANGER IS A (HOT) FLUID IN THE BODY-CONTAINER

Metaphorical expression

Montó en cólera, "he got on/rode on anger"

Literal paraphrase

Se encolerizó, he got furious

Control phrase

No se dio cuenta, he did not realize

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Related target

Animal, animal

Unrelated target

Actual, current

Conceptual metaphor

ANGER IS AN AGGRESSIVE ANIMAL

Metaphorical expression

Se lo llevaron los demonios, “the devils took him away”

Literal paraphrase

Se puso hecho una furia, he got very mad

Control phrase

Le puso un castigo ejemplar, he gave him a severe punishment

Related target

Lucha, fight, struggle

Unrelated target

Leche, milk

Conceptual metaphor

ANGER IS AN OPPONENT

Metaphorical expression

Despertó la ira del público, “awakened the audience’s anger”

Literal paraphrase

Disgustó mucho al público, annoyed the audience a lot

Control phrase

Dejó indiferentes a otros, left others indifferent

Related target

Bestia, beast

Unrelated target

Pista, clue

Conceptual metaphor

ANGER IS AN AGGRESSIVE ANIMAL

Metaphorical expression

Me revientan, “they burst me”

Literal paraphrase

Me fastidian, they annoy me

Control phrase

Menos me gustan, the less I like them

Related target

Contenedor, container

Unrelated target

Conquistador, conqueror

Conceptual metaphor

ANGER IS A (HOT) FLUID IN THE BODY-CONTAINER