Are conceptual metaphors accessible on-line?
A psycholinguistic exploration of the CONTROL IS UP metaphor [*]

Javier Valenzuela [◊] *and Cristina Soriano* [◊◊]
[◊] Universidad de Murcia
[◊◊] Swiss Center for the Affective Sciences
jvalen@um.es

Abstract

In this work, we intend to examine the primary metaphor CONTROL IS UP. By means of this metaphor, the domain of CONTROL (or POWER) is conceptualized on a vertical axis, in such a way that powerful entities are conceptualized as being higher up than less powerful ones, which are construed as being down. This gives rise to many linguistic expressions, such as "he has complete control *over* her", "he's *under* my supervision", etc. In this study we want to test whether vertical organization is present in the on-line processing of relationships of control.

To this end, we have conducted a number of studies. In the first one, participants were shown pairs of words; their task was to say whether both words were related semantically or not. Word-pairs were presented one on top of the other on the screen: sometimes the "powerful" member of the pair (e.g., *captain*) was on top and the less powerful one (e.g., *soldier*) below, a configuration of positions coherent with the metaphor CONTROL IS UP; other times words were presented in a metaphor-incongruent position. Our prediction that canonical positions would elicit a quicker response was confirmed.

To discard this possibility that subjects were conceptualizing the relationship between both words focusing on a relationship other than 'control' (e.g., social prestige, wealth, etc.), we conducted a second experiment in which subjects read a text involving two human participants (e.g, *Tim & Tom*), one of which was presented as having control over the other. Subjects were then offered the two names in metaphor congruent and incongruent vertical positions (i.e., 'controlling' participant up and 'controlled' down, and viceversa). Their task was to say whether those were the names of the participants in the previous story. Our hypothesis that metaphor-congruent vertical orientation would elicit quicker reaction times than incongruent positions was only partially confirmed. Results are discussed and future work suggested.

Keywords: conceptual metaphor, psycholinguistic reality of conceptual metaphor, CONTROL IS UP

Resumen

El objetivo de este trabajo es examinar la metáfora primaria CONTROL ES ARRIBA (CONTROL IS UP). Por medio de esta metáfora conceptualizamos el dominio del CONTROL (o PODER) en un eje vertical, de tal manera que las entidades poderosas se representan mentalmente en una posición más elevada que las menos poderosas, las cuáles representamos "abajo". Esta conceptualización da lugar a numerosas expresiones lingüísticas, tales como "tiene control *sobre* ella", "está *bajo* mi supervisión", etc. En nuestro estudio queremos investigar si la organización vertical está presente en el procesamiento en línea de las relaciones de control.

Con este objetivo se llevaron a cabo tres experimentos. En el primero los participantes veían pares de palabras y tenían que decir si estaban relacionadas semánticamente o no. Las dos palabras aparecían una encima de la otra en la pantalla del ordenador: unas veces la palabra de arriba correspondía al elemento poderoso del par (p. ej. *capitán*) y la de abajo al menos poderoso (p. ej. *soldado*), una configuración espacial coherente con la metáfora CONTROL ES ARRIBA; otras veces las palabras aparecían en una posición no congruente con la metáfora. Nuestra predicción de que las posiciones canónicas elicitarían una respuesta más rápida se vio confirmada.

Para descartar la posibilidad de que los sujetos estuvieran conceptualizando el vínculo entre ambas palabras utilizando una relación distinta de la de "control" (p. ej. prestigio social, dinero, etc.), llevamos a cabo un segundo experimento en el que los sujetos leían un texto en el que aparecían dos participantes humanos (p. ej. Tim & Tom), uno de los cuales ejercía algún tipo de control sobre el otro. A continuación, se ofrecía a los sujetos los nombres de los dos personajes en posiciones verticales congruentes o incongruentes con la metáfora (i.e., el participante 'controlador' arriba y el 'controlado' abajo, o viceversa). Su tarea consistía en decir si esos eran los nombres de los personajes de la historia anterior. Nuestra hipótesis de que la orientación vertical congruente con la metáfora elicitaría tiempos de reacción más rápidos se confirmó sólo parcialmente. Se discuten los resultados y se sugieren futuros trabajos.

Palabras clave: metáfora conceptual, realidad psicolingüística de las metáforas conceptuales, CONTROL ES ARRIBA

1.   Introduction

The Cognitive Theory of Metaphor and Metonymy (CTMM) offers a coherent and comprehensive account of mental issues such as the organization and functioning of abstract concepts (Lakoff & Johnson, 1980; Lakoff & Johnson, 1999). The theory suggests that information from concrete, mostly sensori-motor domains is used to structure those other domains that are more

divorced from direct experience, or are inherently more difficult to structure. The impact that this theory has had on linguistics and several areas of cognitive science has been profound. The CTMM has helped characterize many linguistic phenomena in a natural and common-sensical way, such as the diachronic evolution of the meaning of words (e.g., Sweetser, 1990) or the extension of meanings in our lexicon (i.e. polysemy). Thus, instead of a haphazard collection of meanings, the different senses of the words in our mental lexicon can be organized by links which are metaphorically or metonymically motivated (e.g., Lakoff, 1987; Tyler & Evans, 2003).

The explanations offered by the CTMM go beyond language, though. They involve hypotheses about mental representation and function too. For the CTTM, a metaphor is not just a linguistic phenomenon, but a *cognitive* mechanism by means of which we organize conceptual structure. Nowadays, there is more or less a general agreement on the fact that non-linguistic evidence is needed to support the notion that metaphor is a mental capacity by means of which we structure abstract concepts. The pitfall to be avoided is what has been termed the "circularity of linguistic reasoning", that is, the problem inherent to the use of linguistic evidence both as a reason to posit the existence of a conceptual metaphor, and as post-hoc evidence of its existence. For some authors, evidence from linguistic analyses provides useful cues, but they have to be complemented with other analytical techniques, as advocated by the "converging evidence" spirit of cognitive science.

Additionally, the theory has received open criticism from some psycholinguists, who have cast doubts on the role that conceptual metaphor plays in on-line language processing (e.g., Glucksberg, Brown & McGlone, 1993; Glucksberg & McGlone, 1999; Keysar & Bly, 1999; McGlone, 1996, 2007; Murphy, 1996, 1997). This has generated a lively debate, which has not been completely settled yet. A new wave of experiments whose results seem to provide support to the claims of the CTMM are currently adding to the issue (e.g., Boroditsky, 2000, 2001; Boroditsky & Ramscar, 2002; Casasanto & Boroditsky, 2008; Gibbs, Lima & Francuzo, 2004; Meier & Robinson, 2004; Schubert, 2005; Santiago, Lupiáñez, Pérez & Funes, 2007; Schubert, 2005; Silvera, Josephs & Giesler, 2004; Torralbo, Santiago & Lupiáñez, 2006).

While the jury is still out, one of the latest developments of the theory has helped to focus the debate. Previous classifications of metaphors in the CTMM paradigm (e.g., structural, imagistic, ontological, etc.) were downsized in Lakoff & Johnson (1999) and a new distinction was presented between *primary* and *complex* metaphors (classification originally introduced by Grady, 1997). For a number of reasons, primary mappings - of all other types - are a good place to start looking into the alleged psychological nature of metaphor. Primary metaphors are based on universal correlations of experiences. For example, the co-occurrence in real life of an "increase in quantity" and "an increase in verticality" gives rise to the primary metaphor MORE IS UP. Other typical examples are the correlation between warmth and affection (giving rise to expressions such as "*cold* reception" or "a *warm* wel-

come"), or between size and importance (as in "today is *big* day" or "it's just a *small* thing")[1]. Primary metaphors are thus learned mostly unconsciously and automatically, and since the correlations they are based on are grounded in the structure of the world and common human experience, they are in principle less culture-specific, and better candidates for universals.

2.   Spatial metaphors in abstract thought

Out of the more common list of primary metaphors, a sizeable group of them involve the structuring of an abstract domain by means of its spatialization. For example, the domains of QUANTITY, CONTROL, HAPPINESS and EVALUATIVE JUDGMENT (i.e., GOOD/BAD) are all structured with respect to verticality (UP/DOWN); TIME is organized with respect to (linear) SPACE; domains such as INTIMACY or SIMILARITY are organized in terms of (physical) DISTANCE between two objects, etc. This group of metaphors, as other primary metaphors, are fully compatible with *perceptual simulation approaches to cognition* (e.g., Barsalou, 1999; Glenberg & Kaschak 2001; Zwaan & Yaxley 2003, *inter alia*). The idea that the domain of SPACE is somehow basic in cognition and serves to structure many other domains is not new in linguistics (see for example Gruber, 1965 or Jackendoff 1983), but new experiments are gathering evidence on its important role in the cognitive structuring of abstract domains.

Probably, TIME is the abstract domain which has been more thoroughly investigated so far, and for which the clearest evidence can be found (e.g., Boroditsky, 2000, 2001; Boroditsky & Ramscar, 2002; Casasanto & Boroditsky, 2008; Nuñez, Motz, & Teuscher, 2005). There is now evidence that time is construed spatially in a number of languages, though the spatial axis that is used varies from culture to culture; the time line may correspond to a sagittal axis (front-back) or a vertical one (up-down). Interestingly, research by Santiago and collaborators (e.g., Lupiáñez, Pérez & Funes, 2007; Torralbo, Santiago & Lupiáñez, 2006) has addressed the existence of conceptual metaphors for time that have no linguistic reflex; those that use a transversal axis (left-to-right or right-to-left, mostly depending on the writing conventions of the culture). The existence of two different versions of the spatial metaphor of time (the EGO-MOVING metaphor and the TIME-MOVING metaphor) has also been empirically tested (e.g., Boroditsky & Ramscar, 2002). Boroditsky and Casasanto (Boroditsky, 2000; Casasanto & Boroditsky, 2008) have also proved that different languages/cultures make use of different mappings when conceptualizing time, thus providing new arguments for supporters of the Whorfian hypothesis.

Meier & Robinson (2004) also demonstrated that positive and negative value judgments are influenced by vertical organization; thus, in their ex-

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1   For other primary metaphors, see Grady (1997), Lakoff & Johnson (1999) or Lima (2006); Valenzuela (in press) reviews a number of experimental studies carried out on primary metaphors.

periments, subjects responded more quickly to positive words (e.g., *hero* or *good*) when they appeared at the top of the screen, and to negative words when they appeared at the bottom half of the screen; their responses were slower in the inverse cases. This could be taken as evidence of the existence of a GOOD IS UP/BAD IS DOWN metaphor.

Converging evidence showing that this is not a linguistic effect was provided by Casasanto & Lozano (2008), who used a variant of the Stroop effect paradigm to investigate the vertical organization of abstract domains such as HAPPINESS. In their study, participants who were sitting in front of a computer had to use both hands to move marbles from one tray to another one located either above or below (the trays were located at both sides of the screen). The direction of the hand motions was made to depend on the colour of a word that appeared in the middle of the screen. So, for example, if the word appearing on the screen was blue, they would have to move a marble to the blue tray below, and if it was red, they had to move the marble up to the red tray. Crucially, the meaning of the word (related to "happy" or to "sad") was completely irrelevant for the task (only its colour was relevant). Results showed that participants were both quicker and more accurate when the motion they had to perform was metaphor-congruent (that is, when a "happy" word corresponded to an "up" gesture) than in metaphor-incongruent cases. Since the meaning of the word was irrelevant for the task, the activation of the metaphor was not due to deep linguistic processing/representation. At most – if subjects could simply not help reading the words on the screen– the effect could be due to *shallow* word processing. Importantly, though, exactly the same pattern of results was found when non-linguistic cues were used: instead of words, happy or sad faces appeared on the screen (with colored background to guide the marble motion).

Casasanto (in press) studied the relationships between SIMILARITY and a different aspect of spatial configuration: PROXIMITY (as captured by the metaphor SIMILARITY IS CLOSENESS). In his initial experiment, he asked participants to rate the similarity of a number of abstract words (e.g., *grief, justice*) which appeared side by side in the screen, but located at three different distances (close to each other, separated from each other, or far from each other). Participants tended to judge the same word-pairs as more similar when they appeared close to each other than in the more distant positions. In a second experiment, he used unfamiliar faces as stimuli, and the inverse effect was observed: the closer they were, the less similar they were judged and vice versa. In a final experiment, he asked participants to rate the similarity of concrete objects by using one of two criteria: either perceptual similarity, or function (use). Participants who used the criterion of function to rate the similarity tended to lump together similarity and physical proximity (as the linguistic metaphor predicts); the same objects rated by participants who were told to rate their perceptual similarity exhibited the same inverse relationship observed with faces: the closer, the more dissimilar they were judged. In our opinion, it may be argued that, when judging literal formal

similarity, the metaphor SIMILARITY IS CLOSENESS does not play a major role (maybe overridden by other factors like ease of perception – and therefore easy of comparison - in items that are close by), while it is activated in a more abstract assessment of similarities between two elements (beyond their physical appearance).

The results of the studies reported in this section stress the need for experimental testing of conceptual metaphors, to calibrate the extent of our language-based psychological predictions and to uncover mappings that exist at a conceptual level but have no obvious counterpart in language.

3.   The CONTROL IS UP metaphor: a psycholinguistic examination.

In this work, we want to look at one of these spatially-based primary metaphors, namely, the CONTROL IS UP metaphor[2]. In this metaphor, the domain of CONTROL (or POWER) is conceptualized by means of a vertical axis, in such a way that powerful entities are conceptualized as being higher up than less powerful ones, which are construed as located down. This metaphor is normally included in any list of primary metaphors, which means that, putatively, it stems from experiential correlations. In fact, this correlation between controlling entities and height is easy to find. The first example would be the relationship between parents and children; children soon learn that persons who are taller than them (parents, older siblings, relatives, friends) can hold power over them, by authority or by physical coercion. The relationship between verticality (either vertical height, or vertical position) and dominance is pervasive in our experience of the world. Physically, for example, vertical height is correlated with size, and bigger entities are typically more powerful than smaller ones. One study (Judge & Cable, 2004) presented a model which showed the positive relationship between height and career success and income. Taller people have also been found to be more likely to emerge as leaders of other people; Wikipedia has an entry, titled "Heights of United States Presidents and presidential candidates", which discusses the "folk wisdom about U.S. presidential politics that the taller of two major-party candidates always wins".[3]

This conceptual metaphor motivates a host of linguistic expressions, as seen in (1):

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2   For other metaphors of control in Spanish, see Osorio (2004), who discusses possibilities such as CONTROL IS OBJECT MANIPULATION, TYING, PARENTHOOD, FIGHTING FOR TERRITORY or DOMESTICATING.

3   For the 46 elections in which the height of both candidates is known, this is not completely true. However, taller candidates do have a very clear edge: they won roughly in 60% of the cases, versus a mere 30% of the shorter ones, a statistically significant difference (Chi-square $p < 0.05$). By the time of the writing of this paper it is still unknown if this will also be the case in the Obama (186 cm) vs McCain (170 cm) presidential election.

(1)   a. *He has complete control* over *her*
       b. *He is* under *my supervision*
       c. *She has* climbed to the top *of the company*
       d. *Your* Highness
       e. *It is better to have a* high *status than a* low *one*

In accordance with CTMM proposals, the claim is that these are not mere unrelated *linguistic* metaphors, but actually reflect a stable *conceptual* association between two domains, i.e. they reflect a conceptual metaphor. We not only speak of control in terms of verticality, but *think* about it in this way. An initial hint that this may well be the case is the fact that the metaphor shows up in many non-linguistic manifestations. Kings sit on thrones which place them higher than their subjects; priests stand on altars, teachers and judges stand on daises, and winners of sport competitions in podiums. In Chaplin's classic movie "The Great Dictator", Hitler and Mussolini act out the relationship between height and control in several ways; in one the scenes, Hitler tries to give Mussolini a lower chair, so he can achieve psychological control (a plan which is thwarted by Mussolini's sitting on the table); in another scene, both of them are going to take a haircut at the same time and each starts to manipulate his elevating barber chair to position himself higher than the other, until they end surrealistically close to the ceiling of the room. A quick review of images in the Internet provides further graphic support of this association, as shown in Figure 1.
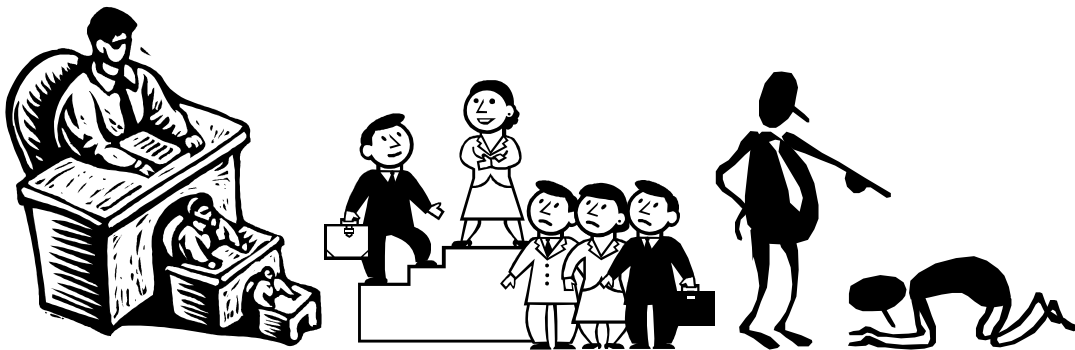

Figure 1. Some graphical examples of the control is up metaphor

However, to test whether this metaphoric association between control and verticality is actually active in our minds, psycholinguistic experimentation is necessary, and such is the purpose of the present work, which complements research by other authors such as Schubert (2005). More specifically, we will try to test whether the CONTROL IS UP metaphor is active in the on-line processing of lexical items involved in a control relationship.

4.   Experiment 1

In the first experiment, we presented subjects with pairs of words. Their task was to say whether both words were related semantically or not. Word-pairs were presented one on top of the other; sometimes the "powerful" member of the pair was on top (e.g., *captain*) and the less powerful one below (e.g., *soldier*) (positions coherent with the metaphor CONTROL IS UP). Some other times, it was the other way round: the powerful member was down and the less powerful one up. Our prediction was that subjects would take a longer time to respond to non-canonical positions, while canonical positions would elicit a quicker response.

Our approach constitutes an adaptation of the Zwaan and Yaxley (2003) paradigm, in which two words were presented one on top of another on a screen, and subjects had to answer whether they were semantically related or not. The motivation in their study was to test analogical models of mental representation. And indeed, in their experiments, when the vertical orientation of the words on the screen iconically resembled their relative position in reality (i.e., *branch* above *root* instead of the other way round – see Fig. 2), the semantic relationship between the word pairs was recognized faster

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\boxed{\begin{array}{c}\text{Branch}\\\text{Root}\end{array}} \qquad \boxed{\begin{array}{c}\text{Root}\\\text{Branch}\end{array}}
$$

Figure 2. Zwaan & Yaxley (2003) paradigm
for the study of analogical models of mental representation

Instead of iconic pairs, we used words in which there was a metaphorical up-down orientation based on the metaphor CONTROL IS UP (e.g, *carcelero-presidiario* – jailor-prisoner – or *casero-inquilino* – landlord-tenant). By virtue of the metaphor, we can expect controlling entities (e.g., landlord) to be represented on top of the controlled ones (e.g., tenant). In our experimental setting we used both metaphor-congruent and metaphor-incongruent spatial arrangements (Fig. 3).

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\boxed{\begin{array}{c}\text{Tenant}\\\text{Landlord}\end{array}} \qquad \boxed{\begin{array}{c}\text{Landlord}\\\text{Tenant}\end{array}}
$$

Figure 3. Adaptation of Zwaan and Yaxley (2003)
for the study of metaphorical models of mental representation

4.1. Participants

A sample of forty-six undergraduate students of the University of Murcia agreed to participate in the experiment; all of them were native speakers of

Spanish and all had normal or corrected-to-normal vision. Five of them were male and the rest female; the participants mean age was 22.

4.2. Materials

A set of fourteen word pairs was used. In all pairs, there was a control relationship between both items (see the full list in Appendix 1). Initially, a longer list of word pairs was designed; a norming study was carried out to select those among them that were more clearly perceived as entailing a control relationship. From our initial list, a set of fourteen word pairs were selected. We decided to include only relationships among humans; other relationships (e.g., human-animal – *fisher-fish–*, human-controlled object – *driver-car–,* human-instrument – *painter-brush*) were discarded so as to achieve a greater homogeneity in the stimuli set.

Another factor that was controlled for was *association strength*. We wanted to know whether there were directionality effects in the association strength of both items. It is well known that associative priming, in contrast to semantic priming, is highly asymmetric; this means that, in associative priming, the fact that Word A primes Word B does not entail that the reverse is true (i.e., that Word B primes Word A). For example, it seems that *bed-pan* produces a strong priming effect, whereas *pan-bed* does not (Neely, 1991). Similarly, we could have different association strengths from, say, *jailor* to *prisoner* than from *prisoner* to *jailor*. To determine this, we gave 32 subjects a questionnaire with pairs of words, and they had to indicate in a Likert-like scale the degree of relatedness they found between the words. One of the members in the pair was powerful and the other one was not. Fig. 4 is an example:

ARCHITECT					
– Bricklayer	1	2	3	4	5

Figure 4. Likert scale to measure association strength in word pairs

The pairs appeared in two positions in the questionnaire (e.g, *architect > bricklayer* and *bricklayer > architect*), so that the association strengths of both directions could be tested. The results showed that, for the word-pairs we had selected as stimuli, the association strength did not have any directionality; powerful words were associated to non-powerful ones (3,83) and the reverse direction was only slightly higher (3,96); this difference was statistically non-significant.

4.3. Design and procedure

Stimuli were presented with a 15" screen Pentium computer running E-prime (Schneider, Eschman & Zuccolotto, 2002). Word pairs were presented in

black font vertically arranged on the screen; subjects were told to indicate whether both words were related semantically or not by pressing a key (X if the words were not related, and M if they were); they were told that the semantic relationship (or lack of it) should be obvious, because the items were not designed to be confusing. A fixation cross of 1000 ms was inserted between the stimuli. Subjects were instructed to keep their fingers on the keys all the time during the experiment, and to try to be as quick and accurate as possible. Conditions (match vs non-match) were randomly presented and counterbalanced across subjects; filler items, both related (e.g., *knife-fork*) and unrelated (e.g., *word-chimney*) were the same for all subjects. A practice block with 40 items was run prior to the experimental blocks.

4.4. Results

Globally, subjects recognized the semantic relationship faster in the congruent position (i.e., most powerful member, on top) than in the incongruent one. The mean reaction time for items in congruent positions was 1000,24 ms, while for those in incongruent positions it was 1098,88 ms, that is, 98,64ms slower. An ANOVA test revealed this difference to be statistically significant ($F(1,43)=48,11$; $p <0.001$).
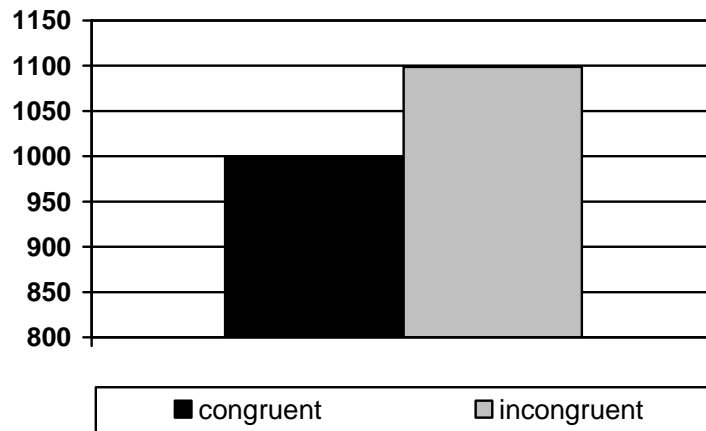

Figure 5. Congruent vs incongruent reaction times in Experiment 1

For some pairs, no significant effect was found, or the effect was actually reversed (faster for the incongruent position). For example, the relationship in *coach-footballer* was recognized faster with *footballer* in the upper position.

4.5. Discussion.

In this experiment, we found a speeded reaction time to congruent position word pairs which could be explained by the existence of the CONTROL IS UP metaphor. Those words that related to more powerful members in a human-to-human control relationship were recognized faster when they were located on top than in the inverse position. This statistically significant effect sug-

gests that there is a (vertical) spatial component in the representation of well-established relationships of control.

However, the adaptation of Zwaan & Yaxley paradigm to the investigation of metaphorical relations is not without problems: while Zwaan & Yaxley's iconic relationships are drawn from objective reality (a branch is always above the root), our investigated control relationship could perhaps be considered to be subjective to a certain extent. A footballer and a couch are clearly engaged in a relationship of power and control (as reflected by our norming sudy). But is a footballer conceived of as less powerful than a coach in all cases? In some of the word pairs, the hypothesized control relationship can be somehow blurred when world-knowledge factors come into consideration. While they are training, or playing in the field coaches exert control over footballers, telling them what to do and when, and deciding when or how they should play. In this sense, they are a fairly canonical example of a control relationship between two humans. However, if we look at the real world, footballers do not necessarily have less power than their coaches. In the most culturally-salient cases, it is rather the other way round: footballers hold the fame and much greater income (and thus, social power). In the case of football, this is the power relationship we found in our results.

There are a few other cases from our stimuli list in which word pairs did not show the expected effect. A possible reason is that semantic complexity makes it difficult to isolate exactly one type of relationship between two words. Participants could have perceived a relationship other than "control" between the pairs, or a more complex one involving more than just "control" (hence the metaphor does not apply). Though the word pairs were selected because of their control relationship, we cannot be completely sure that this is the relationship activated at the moment in which participants process the word pair. Other possibilities, such as social prestige or wealth (cf. GOOD IS UP) could be activated in some cases as well.

5.   Experiment 2

To ensure that participants focus on a control relationship, we carried out a second experiment. This time, we tried to induce the desired conceptualization by providing participants with a specific context. The way in which this was carried out was the following: participants read a short story which included the names of two human participants involved in a control relationship. After reading the text, the task of the participants was to identify the names of the characters in the story. The names could appear on the screen in congruent (i.e., powerful up, less powerful down) or incongruent position.

5.1.   *Subjects*

A sample of twenty-four undergraduate students of the University of Murcia agreed to participate in the experiment; all of them were native speakers of

Spanish and all had normal or corrected-to-normal vision. Fifteen were female and the rest were male; their mean age was 24.

5.2. Materials

Thirty-two experimental stories were created in which there was a controlling relationship between two human participants; these participants were named by their Christian names. The relationships between the characters were those listed in Appendix II (e.g., mother-child, headmaster-student, etc.).

Several potentially confounding variables were controlled for:
– *Attention to story*: To ensure that participants were paying attention to the story (and thus, taking into account the relationship between the characters and not just focusing on the names and ignoring the story), questions about the content of the story were asked periodically. E.g.: relation among the characters (*are the characters brother and sister?*).
– *Story length:* All stories had a similar length. Experimental stories: a mean of 34 words, SD = 2,5. Filler stories, 36 words, SD = 1,9.
– *Gender of characters in stories*: Half of the characters in the stories were men and half women. However, within any single story, the characters were always of the same sex, to avoid potential confounding variables from sexual stereotypes.

5.3. Procedure

Participants were presented with a story; once they had read (and understood) the story, they had to press the spacebar. After this, a mask appeared during 2000 ms and then two names appeared on the screen. Both names were vertically aligned. Participants had to press one key if those were the names of the characters that appeared in the story, and another key if they were different. They were instructed that if only one of the names had appeared, then the answer was 'no'.
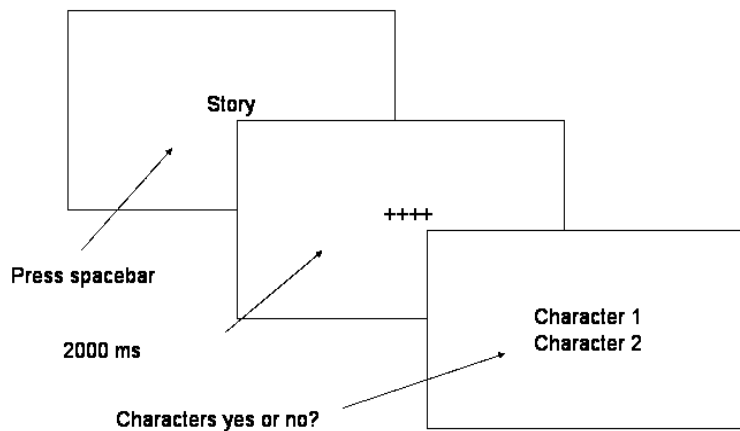

Figure 6. Experiment 2 design

We took into account six types of answers: there were two "yes" answers (corresponding to the names of the characters in congruent or incongruent conditions) and four "no" answers: two which included the powerful character and a different one (and this powerful character appearing in congruent or incongruent positions) and two which included the less-powerful character and a different one (this less-powerful character appearing in congruent or incongruent positions). Table 1 lists the possibilities along with their code (expressed in brackets); A and B stand for the names of the characters in the story (A = controlling character; B = controlled one), while x and y correspond to characters not mentioned in the story (no other possibility was included; that is, all the answers included at least one participant in the story):

Yes answers		No Answers			
congruent (con)	incongruent (incon)	congruent (con1)	incongruent (incon1)	congruent (con2)	incongruent (incon2)
A	B	A	X	x	B
B	A	x	A	B	x

Table 1. List of possible answers for Experiment 2.

Therefore, if we take into account Conceptual Metaphor Theory the predictions for this pattern of answers would be three: first, when the answer supplied includes both characters in the story, the congruent position (con) should be recognised faster than the incongruent position (incon); second, when only the most powerful character in the story is mentioned (eliciting a "no" answer), the cases in which it appears in the upper position (con1) should be answered quicker than if it appears below (incongruent position; incon1); finally, when only the less powerful character in the story is mentioned, the answer should be quicker when it appears in the lower position (con2) than in the upper one (incon2).

> Hypothesis A: con (A/B) < incon (B/A)
> Hypothesis B: con1 (A/x) < incon1 (x/A)
> Hypothesis C: con2 (x/B) < incon2 (B/x)

Figure 7. Experiment 2 hypotheses.

5.4. Results

Our results did not confirm Hypothesis A, that is, participants did not answer more quickly to the case where both characters appearing in the story were presented either in a congruent or an incongruent position (Hypothesis A). Something similar occurred with the case in which only the less powerful member was mentioned; no effect was obtained (Hypothesis C). However, some effect was obtained for Hypothesis B, although only marginally $F(1,31)= 2.65$, $p = 0.11$. So, when participants were presented only one

member appearing in the story, and that character corresponded to the one exerting power, they answered more quickly when it was located in the upper position (A/x) than in the lower position (x/A) (910,48 vs 996,63 ms) (Fig.8):
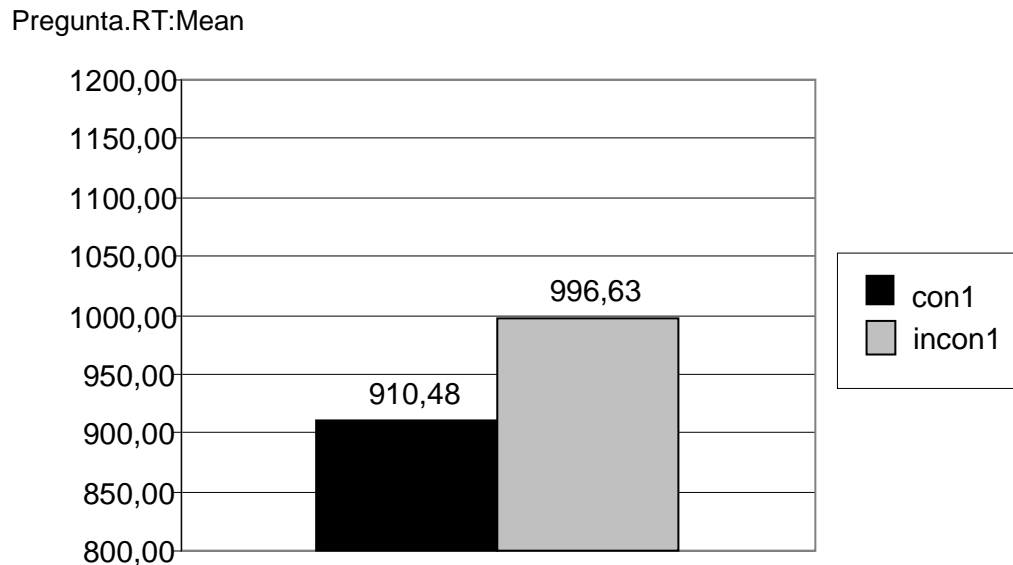
Pregunta.RT:Mean

Figure 8. Results of Experiment 2, Hypothesis B (A/x vs x/A)

5.5. *Discussion*

In this experiment, only some partial effects were found. The most important reason for these results can be found in one confounding effect we had not taken into account: what has been termed the *advantage of first mention* (Gernsbacher & Hargreaves, 1988). In Gernsbacher & Hargreaves' original paper, subjects recognized the name "Tina" equally quicker after being given a sentence in which this name figured as agent ("*Tina beat Lisa in the tennis match*") or as a patient ("*Tina was beaten by Lisa in the state tennis match*"); the second mentioned name ("Lisa") was recognized more slowly in both cases. The same effect was found in cases of shared subjecthood: after *Tina and Lisa argued during the meeting* vs *Lisa and Tina argued during the meeting*, it was always the first name that was recognized quicker. Finally, this effect was equally strong when the participants mentioned were not syntactic subjects of their sentences. Thus, the name "Tina" was recognized more quickly both in *Because of Tina, Lisa was evicted from the apartment* and in *Tina was evicted from the apartment because of Lisa*.

This effect was initially reported for English; however, it has been found in a number of languages. One of them is Spanish (Carreiras, Gernsbacher & Villa, 1995), but also in Korean or Chinese. The advantage of first mention effect is in fact thought to be a general cognitive phenomenon. In Spanish, for example, sentence components that are mentioned first are accessed faster regardless of their grammatical role (e.g., subject or object),

their semantic role (e.g., agent or patient) or whether they were inanimate object or proper names (Carreiras, Gernsbacher & Villa, 1995).

Thus, it appeared as necessary to control this confounding variable by including this parameter as another variable in the experiment. This is what we did in Experiment 3, which repeated Experiment 2 but controlling for the position of the powerful vs less-powerful members in each story.

6.   Experiment 3

This experiment was equivalent to experiment 2 but including *order of mention* as a variable; thus we implemented a 2 (congruent vs incongruent position) x 2 (first vs second order of mention) design.

6.1.   Subjects

Thirty-two undergraduate students of the University of Murcia agreed to participate in the experiment; all of them were native speakers of Spanish and all had normal or corrected-to-normal vision. Twenty-two were female and the rest were male; their mean age was 23

6.2.   Materials

There were thirty-two stories describing a relationship of control between two human characters and thirty-two filler stories. The stories and controls used were the same from Experiment 2.

6.3.   Procedure

The procedure used was the same as in Experiment 2; the only difference was a slightly longer mask (3.000 ms), in order to help dispel the possible advantage of first mention effects. In this design, due to the complexities, only 'yes' answers were taken into account (the four types: congruent-incongruent or first-or-second-mention); all 'no' answers were excluded in the analysis.

6.4.   Results

A two-way ANOVA with Advantage of first mention and Congruency as factors was carried out. No main effects were found for either Advantage of First mention or Congruency; however, an interaction effect was found ($F(1,31)=3,85$, $p=0.058$) (Fig. 9).

6.5.   Discussion

At a first glance, the fact that there were no results from main effects seems to work against the existence of a mental metaphor for CONTROL. However, a
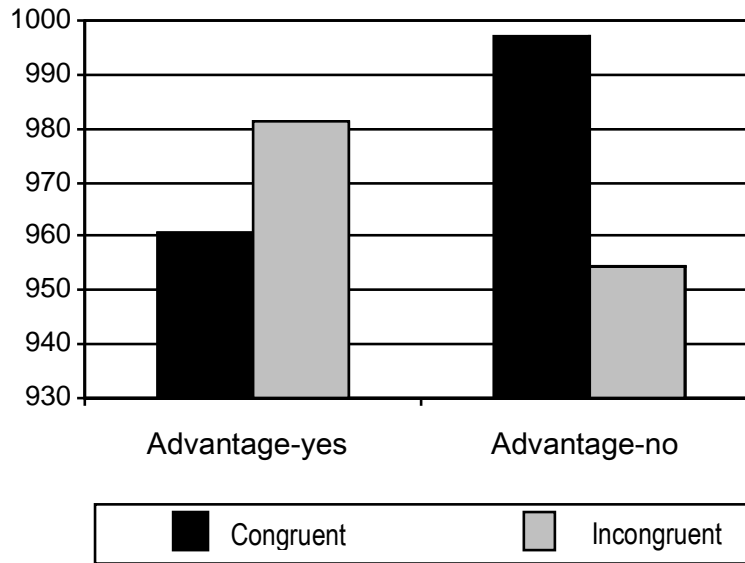
Figure 9. Advantage of first mention and metaphor congruency effects in Experiment 3

closer examination of the patterns of responses allows a more nuanced interpretation of the results that hints in the opposite direction. To begin with, the fact that there was no main effect for Congruency is not surprising. As we saw in Experiment 2, the reason seems to lie in the interference of the "order of mention", an effect likely to override any possible congruency effect allowed by the metaphor. What can be considered surprising and unexpected is the fact that Experiment 3 shows no statistically significant "order of mention" effects. This should not be the case for such a robust phenomenon, observed in many languages and across many grammatical cases. Gernbacher & Hargreaves (1988), for example, tested a formally very similar case finding a strong order of mention effect. One plausible explanation for the unexpected disappearance of the effect in our experiment could actually be the existence of a mental metaphor that organizes the characters on a vertical axis and provides a competing priming effect. Half of the cases of first-order mention were also metaphor-congruent, while the other half were metaphor-incongruent (the same is true for second-order mention). It could be the case that the metaphor congruency effect counteracts the expected advantage of first mention effect, decreasing it in such a way that, although active, it actually fails to reach statistical significance. A more refined design analysis which correlated the presence or absence of the advantage of first mention effect with a metaphor-(in)congruency effect would be helpful in settling this question.

Finally, the interaction found is also interesting and relevant for a discussion of the possible existence of a metaphor-congruency effect. If we look at the cases in which the top-character corresponds to the first mentioned one (first-order mention cases), congruent cases were recognized much faster than incongruent cases; this is what can be seen if we compare the first two columns in Figure 4. The comparison of columns three and four, where the

effect seems to be reversed, is not useful for our purposes (since the advantage of first mention is a confounding factor). Again, a more complex experimental design taking into account these possibilities would be needed to further clarify the issue.

7.   General discussion and conclusion

In this paper, we report three experiments which have tested the possible existence of the CONTROL IS UP metaphor. We have found some effects that can be explained by the presence of a conceptual metaphor in the minds of the speakers. In the first experiment, a number of human-to-human relationships were examined. Most of the items tested involved relationships which are kept in long-term memory; as a matter of fact, most of the word-pairs made reference to a set situation (teacher-student, boss-employee, jailor-prisoner, admiral-sailor, architect-bricklayer) which could be related to our stock of cognitive frames (in the sense of Fillmore, 1982). In the third experiment, in which on-the-fly control relationships were constructed by participants (i.e., no inherent power relationship existed between the names of the characters in the stories), the presence of a mental cross-domain mapping between VERTICALITY and CONTROL could explain some of the results obtained, such as the unexpected mitigation of the robust advantage of first mention effect, an effect that has been observed in many previous studies and is described in several papers as a "general cognitive mechanism". The interaction effects found could also be explained by the presence of the metaphor: in the cases where there was no competition between priming effects (first mention priming vs metaphor-congruency priming), powerful elements in top positions were recognized faster than in lower positions.

Further research is still needed to fill in some of gaps, though. While a vertical organization of controlling-controlled entities seems quite probable in the case of stored mental representations, the on-line vertical organization of ad-hoc cases must still be further researched. Any experimental paradigm used for this purpose needs to take into account the powerful "advantage of first mention" effect. Nevertheless, with all the provisos previously mentioned, there seems to be some evidence that CONTROL is conventionally associated to vertical spatial representations in on-line language understanding as well.

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Appendix 1. Word pairs used in Experiment 1

capitán/soldado (captain-soldier)
árbitro/jugador (referee-player)
carcelero/presidiario (jailor-prisoner)

hombre/mujer (man-woman)
casero/inquilino (landlord-tenant)
rey/vasallo (king-vassal)
almirante/marinero (admiral-sailor)
profesor/estudiante (teacher-student)
empresario/trabajador (boss-employee)
policía/delincuente (policeman-criminal)
jefe/oficinista (boss-clerk)
capataz/obrero (foreman-worker)
arquitecto/albañil (architect-bricklayer)
entrenador/futbolista (coach-footballer)

Appendix 2. Relationships represented in Experiments 2 and 3

Director-actress

Father-son

Lord-assistant

Duke-butler

Headmaster-teacher

Boss-employee

Director-agent

Doctor-patient

Cook-aid

Teacher-student (male)

Knight-squire

Mother superior-nun

Teacher-student (male)

Mother-daughter

Madame-prostitute

Bishop-priest

CEO-TV presenter

Dealer-junkie

Teacher-ballerina

Chief-underling

Censor-movie director

Blackmailer-blackmailed

Umpire-player

Queen-princess

Advisor-Ph student

Boss-employee (female)

Judge-defendant

Lady-valet

Lady-maid

Thief-victim

Librarian-student

Master-slave