EXPLORING FIGURATIVE LANGUAGE PROCESSING IN BILINGUALS: THE METAPHOR INTERFERENCE EFFECT

A Thesis

by

FRANCISCO EMIGDIO MARTINEZ, JR

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

December 2003

Major Subject: Psychology

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Approved as to style and content by:

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ABSTRACT

Exploring Figurative Language Processing in Bilinguals:

The Metaphor Interference Effect. (December 2003)

Francisco Emigdio Martinez, Jr., B.A., Texas A&M International University

Chair of Advisory Committee: Dr. Jyotsna Vaid

While studies suggest that figurative, or non-literal, meanings are automatically activated in single language users, little is known about how language proficiency may influence the automaticity of non-literal meaning activation. The present research sought to address this issue by comparing figurative language activation in Spanish-English bilinguals. An interference paradigm (Glucksberg, Gildea & Bookin, 1982) was used in which participants were to judge the literal truth or falsity of statements of the form *Some Xs are Ys*. Judgments on this task are typically slower to statements that, though literally false, are metaphorically true (e.g., *Some lawyers are sharks*), suggesting that metaphorical meanings are non-optionally activated (at least in single language users). The present research involved four experiments: Experiment 1 conducted with English-speaking monolinguals, replicated the metaphor interference effect; in Experiment 2 the effect was replicated in English-dominant and in balanced bilinguals tested only in English. Experiment 3 conducted with bilinguals tested in both languages, showed that the metaphor interference effect was not obtained in either language in English-dominant bilinguals and was obtained in Spanish only in the balanced group. The findings from Experiments 1 and 2 support the view that nonliteral (metaphoric) meanings are automatically accessed in monolinguals and bilinguals alike. Experiment 3 involved a fewer number of metaphor trials per language, raising the possibility that this procedural difference may have led

to a weakening of the metaphor interference effect. This possibility was directly tested in Experiment 4, conducted with English-speaking monolinguals presented with the same number of metaphor trials as the bilinguals in Experiment 3. The results showed a clear metaphor interference, even with the reduced number of trials. As such, the findings of Experiment 3, where a metaphor interference effect was obtained only for Spanish items, are somewhat equivocal: at face value, they suggest that the effect is modulated by language proficiency. Alternatively, the metaphor interference effect may turn out to be present in both languages, but may simply have been obscured by variability owing to the small sample size per language order. Which of these two interpretations turns out to be valid will depend on additional testing. Implications of the present findings for theories of the organization of the bilingual representational system are addressed.

I dedicate this thesis to my family and friends. Without their support and encouragement, I would never have been able to pursue the goal.

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INTRODUCTION

Figurative language refers to phrases or expressions in which the intended meaning is independent of and typically not directly computable from the literal meaning of the constituent elements. As Katz (1996) notes, "[I]n the broadest sense, an utterance can be understood as figurative when the expressed meaning differs from the meaning one intends to convey" (p 18). For example, the statement, *That salesman is a bulldozer,* describes a salesman in terms of a word normally denoting a piece of machinery. The intended meaning of the phrase requires listeners to go beyond the surface meaning and make certain inferences regarding the similarity between the qualities of the salesman and the features of a bulldozer, e.g., its weight, its aggressiveness, etc. The particular non-literal meanings that are foregrounded may vary and are likely to be decided with reference to context. Figurative language may be contrasted with literal uses of language in which the meaning of an utterance is derivable directly from the meaning of its elements (cf. Ariel, 2002).

Mastery of appropriate use of figurative expressions in a second language (L2) has been acknowledged to be one of the greatest challenges for second language learners. Not surprisingly, therefore, empirical investigations of L2 figurative language use have been guided largely by pedagogical concerns surrounding the appropriate use of humor (Deneire, 1995; Schmitz, 2002), irony, sarcasm, idioms (Cooper, 1999), metaphor (Danesi, 1992), and other forms of figurative expressions in a second language context. Hardly any psycholinguistic-oriented research has been conducted on figurative language processing or representation in bilingual or multiple language users. The present research sought to fill this gap. Before turning

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This thesis follows the style of *Journal of Memory and Language*.

to the present research, a review of central psycholinguistic issues in figurative language processing is provided.

Figurative Language: Peripheral vs. Central?

Empirical studies of figurative language processing have been characterized by two differing theoretical positions with respect to the role of figurative language in linguistic expression or conceptualization. An early prevailing view regarded literal forms of language as central, with non-literal forms serving essentially stylistic or pragmatic functions (Grice, 1975). In contrast, an alternative vew (e.g., Lakoff & Turner, 1980; Gibbs, 1994) claims that non-literal forms of language are central to linguistic expression and thought and regards these forms as autonomous, i.e., non-derivative from literal meaning.

In the former view, figurative language is characterized as an additional layer of meaning that embellishes the literal level (Billow, 1977) but is not crucial to conveying the central meaning, which was thought to be sufficiently represented by a literal level. Consistent with this view of figurative language as peripheral, early models of figurative language comprehension, such as the standard pragmatic model (Grice, 1975; Searle, 1979), posited that each utterance is initially analyzed for its literal meaning and that only when a literal meaning is unavailable or otherwise inappropriate contextually is a non-literal meaning sought. In the standard view, then, figurative language comprehension occurs only after an interlocutor has considered (and rejected) a possible literal interpretation. Another implication of the standard pragmatic model is that the processing of figurative meaning is thought to be optional, rather than obligatory.

By contrast, recent work, pointing to the pervasiveness of figurative language in everyday language, has argued that figurative language is in fact central, rather than peripheral, to language functioning. Some researchers have even suggested that figurative processing is not

restricted to language use but may characterize thought itself (Gibbs, 1994; Giora, 2003; Katz, Cacciari, Gibbs & Turner, 1998; Kovecses, 2002; Lakoff & Turner, 1980).

Models of Figurative Language Processing

Research on figurative language processing carried out in the last two decades has given rise to several different models of figurative language processing aside from the standard pragmatic model (e.g., Giora, 2001). Two have attracted particular attention: the conceptual metaphor view (Gibbs, 1992, 1994; Lakoff & Johnson, 1980; and Lakoff & Turner, 1989) and the attributive categorization view (Glucksberg, 1991; Glucksberg, 2003; Glucksberg & Keysar, 1990; Glucksberg, Brown & McGlone, 1993; Glucksberg, Keysar & McGlone, 1992).

The conceptual metaphor view claims that linguistic meaning is based on embodied experience (Lakoff & Johnson, 1980; Lakoff & Turner, 1989). In this view, embodied experience (e.g., seeing our body as a container) shapes language and thought and, through conceptual metaphors, meanings of words and phrases are constrained, which allows for the immediate understanding of linguistic expressions (Gibbs, 2003). Thus, embodied experience is the groundwork on which the conceptual metaphor view is built. Gibbs (2003) reviews some of the cognitive linguistic work on embodiment that illustrates how metaphor characterizes how we think. Via the embodied experience of containment and the conceptual metaphor ANGER IS HEATED FLUID UNDER PRESSURE, for example, it is possible to understand figurative expressions such as *blowing his stack, exploding, flipped her lid,* or *making someone's blood boil* as characterizations of anger. One drawback of this model is that there is no direct empirical evidence that knowledge structures in the form of conceptual metaphors are, in fact, accessed prior to arriving at a figurative interpretation (but see Gibbs, 2003). The staunchest form of evidence for this model may come from studies such as those on figurative language production

that show that figurative expressions are produced as clusters and that these clusters are guided by conceptual metaphors (Corts & Meyers, 2002).

The attributive categorization view, put forth by Glucksberg (2003), argues that metaphors are understood as categorical assertions. In this view, the sentence *Some lawyers are sharks* is understood as metaphorical when the person encountering this expression has knowledge of the meanings associated with the word "shark." Glucksberg argues that most words in metaphors have a dual reference. For example, in *Some lawyers are sharks*, the attributes of "shark" are not limited to cartilaginous fish, but extend to predatory creatures as well, allowing the interlocutor to understand the phrase as "some lawyers are predatory." The embodiment view, by contrast, might explain our understanding of this metaphor by claiming that the conceptual metaphor PEOPLE ARE ANIMALS (e.g., *a snake in the grass, sheep in wolf's clothing, dirty rat*) underlies the correspondence between lawyers and sharks.

The two models presented above differ in the type of knowledge structures they assume guide metaphor processing. Whereas the conceptual view holds that conceptual metaphors guide metaphor interpretation, the attributive category view holds that categories accessed while encountering a metaphor activate other categories that are relevant to the topic (cf. McGlone, 1996). However, both views theorize that metaphor processing may occur without invoking an initial literal interpretation of the metaphor. That is, both models would reject the view that specific literal interpretation is first sought and has to be judged anomalous before a figurative interpretation is achieved.

Processing Priority of Literal vs. Non-Literal Meaning: Methodological Issues

A major debate in psycholinguistic research on figurative language has concerned how to test whether metaphorical meanings are understood as quickly and as automatically as literal

language (see Gibbs, 1994). Arriving at a consensus about how best to operationalize figurative language comprehension has proven to be difficult. Whereas early experimental approaches to the study of metaphor employed memory-based techniques, there has been a shift to online measures intended to track mental processing while the processing occurs. Latency-based (reaction time) measures have been the most commonly used; these include reading times of complete phrases or for each word in a figurative phrase, eye movement studies, and priming tasks.

To measure truly online comprehension processing of figurative expressions, some researchers have suggested that it is necessary to use spoken rather than written language. One popular paradigm used to investigate spoken metaphor comprehension is the cross modal priming paradigm (see Blasko & Connine, 1993; Matlock, & Heredia, 2002; and Stewart & Heredia, 2002). In this paradigm, participants listen to spoken sentences with an embedded metaphor (e.g., "*Some lawyers are sharks*") and a visual prime that is related to the literal interpretation of the metaphor (e.g., "fish") or of the metaphorical meaning (e.g., "predators"). Visual primes are presented immediately at prime offset, or 300 ms or 1000 ms after prime offset, depending on the experimental condition. However, encapsulating the meaning of a conceptually rich phrase into a single word is somewhat problematic.

In a recent review, Glucksberg (2003) refers to an earlier study of his (Glucksberg, Gildea, & Bookin, 1982) which sought to answer the question of whether people process metaphoric meanings obligatorily or optionally by using a Stroop-like interference paradigm. In this seminal study, Glucksberg and colleagues devised a task in which metaphoric meanings, if activated, would interfere with task performance. The task was to judge whether a class-inclusion statement of the form *Some As are Bs* was literally true or false. Thus, on seeing the

statement *Some animals are dogs* participants were to say "true" and on seeing the statement *Some weapons are pelicans* they were to say "false." The critical items were metaphorical statements such as *Some cats are detectives*. Glucksberg and colleagues (1982) argued that, on reaching a certain level of fluency, users of a language obligatorily activate metaphoric meaning if it is available. They thus hypothesized that when participants were required to make a "false" response based on a statement's literal meaning, reaction times would be longer if that statement had a metaphorical meaning than if it did not have a metaphorical meaning. That is, "true" metaphorical meanings should interfere with making a correct "false" response. Glucksberg et al., (1982) found that participants were indeed faster at responding to false statements that were not readily perceived as metaphorical (e.g., *Some weapons are pelicans*) than to statements that were more easily perceived as metaphorical (e.g., *Some cats are detectives*). This finding presents a problem for the optional activation of figurative meanings view and suggests instead that metaphorical meanings are automatically activated.

In summary, the consensus based on several studies of idiom and metaphor comprehension is that literal meanings do *not* have priority over figurative meanings and that figurative meanings are activated automatically (Gibbs, 1994; Giora, 2003; Glucksberg, 2001; Katz et al., 1998; Kovecses, 2002). It should be noted that this consensus is based predominantly on research with single language users. What might one expect with respect to figurative language processing in multiple language users? That is, how might knowledge of more than one language influence the ease with which figurative meanings are activated in each language, relative to the situation in users of a single language? Secondly, does automatic activation of non-literal meanings (such as has been obtained in single language users) depend on attaining a certain level of proficiency in a language? In bilinguals who are less proficient in one of their

languages might figurative meanings not be automatically activated in the less dominant language? These questions were tested in the present research using monolinguals and adult fluent and less fluent bilinguals. Since the language proficiency variable introduces a developmental component into the discussion, it may be instructive at this juncture to review studies of the development of figurative language competence in single language users.

Developmental Perspectives on Figurative Language Competence

Figurative language competence is thought to require both linguistic and cognitive abilities. Examples of the latter are domain-specific knowledge and cognitive capacity (Gentner, 1988; Johnson, 1989; 1991; 1996; Johnson & Rosano, 1993). Developmental studies have found that children can understand figurative expressions once they have attained a certain level of mastery over requisite linguistic and conceptual skills (Gentner, 1988; Johnson, 1989; 1991; 1996; Johnson & Rosano, 1993). Johnson (1991) identified conceptual knowledge, linguistic ability and information processing capacities as developmentally influenced factors required for the understanding of figurative language.

Levorato (1993) suggested the following developmental sequence underlying figurative competence: a) a broadening of word meanings, b) knowledge of multiple meanings of words, c) cancellation of referential strategies (i.e., converting metaphors into similes), d) an understanding of the relationship between figurative and literal uses of words, e) use of context to understand ambiguous and novel words, and f) an ability to produce novel expressions and syntactically transform figurative expressions.

As noted with the adult literature on processing of figurative language, developmental studies have had to contend with methodological concerns as well. One is the use of tasks such as multiple-choice tests or paraphrasing. Studies that employ offline tasks such as multiple-

choice tests may not be sensitive enough to measure comprehension at the level of interest here. That is, offline tasks cannot allow one to infer anything about processes during comprehension; instead, they are more likely to inform one about processes that may come into play *after* comprehension has occurred. This limitation aside, the developmental approach has offered valuable insights into the kinds of skills that underlie the emergence of figurative language competence.

Figurative Language Processing in Second Language Users and Bilinguals

Figurative language competence has piqued the interest of a number of second language researchers. Leading the front are Danesi (1992, 1995) and Johnson and Rosano (1993). They argue that metaphors and idioms cannot afford to be ignored by second language curricula. Their push is to instill in language learners a more functional communicative competence over a traditional formal competence. Danesi (1995) argues, for example, that second language learners do not reach the fluency level of a native speaker until they have knowledge of "how that language 'reflects' or encodes concepts on the basis of metaphorical reasoning" (p. 5). Other second language researchers interested in conceptual fluency have investigated formulaic expressions (Kecskes, 2000; Wray, 2003), phrasal verbs (Matlock & Heredia, 2002) and idioms (Bortfeld, 2002; Cooper, 1999).

Second language research on figurative language processing is important and relevant to the present study. However, the present study differs from these other studies in that it seeks to investigate conceptual representation structures of bilinguals (i.e., those who have attained a stable level of language competence in their two languages) rather than second language learners.

There is some previous empirical research on metaphors in the context of bilingualism. Most of this work has been addressed at how the memory for metaphors may be influenced by such factors as structure or orienting task. Harris and colleagues, for example, compared bilinguals' memory for similes and metaphors in each language and found that bilinguals remember the metaphor phrases as similes (Harris, Tebbe, Leka, Garcia, & Erramouspe, 1999). Nelson (1992, 1995) examined memory for metaphors vs. non-metaphors in a levels of processing approach to memory. In these studies, the researcher was interested in investigating how the different orienting conditions influenced the recall of metaphorical statements. Under the various orienting conditions non-fluent bilinguals translated into English (L1) either the figurative meaning, literal meaning, or a non-specific instructed translation or merely copied metaphoric statements presented in Spanish (L2). Nelson found that bilinguals' recall was best when they had to translate the metaphor's figurative meaning. Similarly, Vaid and Martinez (2001) examined bilinguals' incidental memory for the language of proverbs, for Spanish and English proverbs that underwent different levels of processing in the encoding phase. They found, among other results, that meaning-based prior encoding (i.e., paraphrasing the proverb) lessened the accuracy of recognition of the input language of the proverbs relative to simply copying the proverb.

Other work in bilingualism has considered metaphor interpretation in bilingual children as a function of degree of language competence (e.g., Bountrogianni, 1988; Johnson, 1996; and Johnson & Rosano, 1993). However, a limitation of some of these studies is that they do not directly address the issue of conceptual representations. Instead, they address semantic issues that may be at play during figurative language comprehension. That is, the approach taken by Johnson and colleagues suggests that the metaphoric statement, *My shirt is a butterfly*, can be

interpreted as metaphorically based primarily on the knowledge of the meaning of the words "shirt" and "butterfly" and less on the underlying conceptual relationship between shirt and butterfly in L1 and/or L2.

More generally, existing theoretical frameworks of bilingual lexical memory have been criticized for focusing only on lexical or semantic variables with little consideration of the complexities of conceptual representations in bilinguals and how they might change and interact with changes in language proficiency or use (Pavlenko, 2000). Indeed, while there is active examination within monolingual research of the nature of conceptual structures in metaphorical processing, the same cannot be said of research in bilingualism. With few exceptions, the predominant emphasis of psycholinguistic investigations of bilingual language processing to date has been on testing models of lexical processing or production. Some recent work has addressed sentence comprehension (Heredia & Altarriba, 2002) but experimental studies of figurative language use in bilinguals remain relatively scarce.

In part to redress this gap, Vaid (2000) suggested that the study of creative language use, such as humor, provides a promising avenue for investigations of conceptual representations in bilingual memory. The study of metaphoric processing clearly constitutes an example of creative use of language and should, likewise, contribute to advancing our understanding of the relation between linguistic and conceptual functioning in users of more than one language.

Impact of Bilingualism on Language and Cognitive Development

There has been a longstanding tradition within cognitive research on bilingualism to examine linguistic and conceptual repercussions of mastering two symbolic systems (Lambert, 1969; Bialystok, 2004, in press). Vygotsky (1962) speculated about the enhanced linguistic awareness that may ensue from knowing two languages: "the child learns to see his language as

one particular system among many, to view its phenomena under more general categories, and this leads to awareness of his linguistic operations"(p. 110). This insight was put to empirical test in Peal and Lambert's (1962) landmark study which established, for the first time, a positive advantage of bilingualism on linguistic and nonverbal functioning. As Bialystok (2004) notes, Peal and Lambert "concluded that the experience of having two ways to describe the world gave the bilingual the basis for understanding that many things could be seen in two ways, leading to a more flexible approach to perception and to interpretation"(p. 579).

Since the Peal and Lambert study, several other studies have also shown specific cognitive repercussions associated with knowing two or more languages beyond a certain minimum level of competence. These include enhanced metalinguistic awareness (understanding that words and meanings are arbitrarily linked), word segmentation ability, ambiguity detection, syntactic awareness, and phonological awareness. Not all tasks in which bilingual and monolingual children have been compared produce a bilingual advantage, though. Bialystok (2004) considers the cognitive advantage arising from bilingualism to be a form of enhanced selective attention, noting that "the cognitive effect of bilingualism is to enhance the ability to selectively attend to specific features and to ignore or inhibit attention to salient but misleading information" (p. 597).

Among the findings ascribed to bilingualism in the cognitive literature is an enhanced awareness of multiple meanings of ambiguous words or sentences. Surprisingly, however, no previous study has directly sought to compare bilingual vs. monolingual processing of literal vs. non-literal meanings of words or phrases. At the very least, in the present study, which examined whether non-literal meanings are automatically activated even when the task requires judgments only of literal meanings of statements, one would expect bilinguals to show at least as strong an

interference effect as monolinguals from the metaphoric meanings of literally false statements and probably even greater interference than monolinguals.

Present Research

The present research examined first whether non-optional activation of metaphoric meaning found in monolinguals will also be found to the same extent in the two languages of bilingual adults. A second goal of the present study was to determine to what extent figurative meaning activation may be influenced by language proficiency. It was predicted that, if a certain threshold level of linguistic fluency is a necessary condition for the metaphor interference effect to occur, that we would only expect to see interference when participants are tested in their more dominant language. If, on the other hand, metaphoric meaning activation relies on a conceptual system that is language-independent, a metaphor interference effect would be expected in the dominant and the non-dominant language, regardless of language proficiency.

In monolingual research, stimulus familiarity has been shown to influence the degree to which an utterance is processed literally or figuratively. The present research will provide an indirect test of this issue in that it will allow us to examine if stimulus (or, in this case, language) familiarity is a factor determining when and if literal meaning is given processing priority. Bilinguals who are more dominant in English than in Spanish would presumably take longer to process the Spanish items in general. Would greater difficulty in processing the less familiar language mean that items presented in that language are first (and perhaps only) processed literally)?

The methodology used in the present research involved an adaptation of the Glucksberg et al. (1982) metaphor interference paradigm. This paradigm offers a useful alternative to standard lexical decision reaction time paradigms that have attempted to investigate the

comprehension processes of figurative expressions. Glucksberg et al. (1982) suggest that the interference paradigm is well suited for investigations of meaning activation in figurative language because category-assertion decisions are likely to be post-lexical. That is, in the metaphor interference paradigm participants have to decide whether a phrase is literally true or false and not simply whether the statement is grammatical or whether it "makes sense." Given the proper motivation, participants may be able to "make sense" and correctly classify as grammatical even such notoriously ungrammatical sentences as Chomsky's "*Colorless green ideas sleep furiously.*" The metaphor interference paradigm prevents that type of strategizing. Furthermore, Hoffman and Kemper (1987) in reviewing reaction time studies of metaphor comprehension concluded that the metaphor interference paradigm is "the most 'finely tuned' figurative language comprehension task" (p. 168).

Overview of Experiments

In what follows, four experiments are described. Experiment 1 was designed to establish that a metaphor interference effect is replicable in a group of English-speaking monolinguals; this experiment used the same materials and procedure as were used by Glucksberg et al. (1982, Exp. 3). Experiment 2 was designed to investigate if a metaphor interference effect for English sentences is also present in English-Spanish bilinguals, and to compare the size of the interference obtained in bilinguals vs. monolinguals. Experiment 2 compared two groups of bilinguals: those who were more dominant in English than Spanish, and those equally proficient in both, on the basis of self-report data. Experiment 3 sought to test if a metaphor interference effect is present in both languages of bilinguals; in this experiment, bilinguals varying in Spanish proficiency were tested using English and Spanish stimuli. Lastly, Experiment 4 was designed to

test how procedural variables (i.e., list length) introduced in Experiment 3 influences the metaphor interference effect.

EXPERIMENT 1

This experiment was designed simply to replicate the Glucksberg et al. metaphor interference effect using the same stimuli and procedure as was described in Glucksberg et al. (1982, Exp. 3) with a set of monolingual participants in Texas.

Method

Participants

As a pretest measure, 30 undergraduate students at Texas A&M University provided metaphorical and familiarity ratings to the sentences from Experiment 3 in Glucksberg et al. (1982) for research credit. An additional group of 33 English monolingual students participated in the metaphor interference experiment for research credit.

Materials

The same 24 Metaphor sentences and 24 Scrambled Metaphor sentences of the form *'Some X's are Y's'* from Glucksberg et al. (1982, Experiment 3) were used (see Appendix). The 30 pretest participants rated the sentences on a 7-point scale for metaphoricity (i.e., metaphor goodness) and familiarity (where 1 refers to low and 7 to high). The mean metaphorical and familiarity ratings for the Metaphor sentences were 4.96 and 3.93 respectively, while the mean metaphorical and familiarity ratings for the Scrambled Metaphor sentences were 2.01 and 1.23 respectively. These numbers are comparable to the metaphorical and familiarity ratings from the Glucksberg et al. (1982) study where the mean metaphor and familiarity ratings were 5.33 and 4.84, respectively for the Metaphor sentences.

Two practice lists were constructed. Practice list 1 was composed of 12 items and contained 6 instances of the word "true" and 6 instances of the word "false". This practice list ensured that the participants are familiar with the key assignments to indicate their responses to

the sentences. Practice list 2 consisted of 48 stimuli of the form *Some Xs are Ys*. Of these 48 items, 12 items included exemplars that are highly typical members of their given category (e.g., *Some fruits are apples; Some insects are ants*), 12 items were low typical members of their given category (e.g., *Some fruits are figs; Some insects are crickets*), and 12 items were false instances of the category items such that items presented in the true condition were re-paired to form false statements (e.g., *Some fruits are crickets, Some insects are apples*). Six items were metaphorical statements (e.g., *Some words are daggers, Some girls are radios*). These metaphorical statements were the same ones employed by Glucksberg et al., (1982, Experiments 1 and 2). Finally, six items were scrambled metaphors formed by re-pairing the metaphorical statements (e.g., *Some girls are daggers, Some words are radios*).

The test list consisted of 192 items. Forty-eight of these items were statements that are high typical instances of their given category (e.g., *Some flowers are daisies*), 48 were statements that are low typical instances of their given category (e.g., *Some flowers are gladiolas*). Similarly, 48 items were re-paired to form the Standard False statements (e.g., *Some flowers are cobras*). The items were displayed on the computer screen under the control of a computer program (E-Prime, 2000).

Design and Procedure

A repeated measures design was used with four levels of sentence type as the within subjects factor. The participants were informed that the task of this study was to decide whether a phrase is true or false. They were instructed to make their decisions by using their right index finger to press the “O” key when the sentence was true and their right middle finger to press the “P” key when the sentence was false. Additionally, they were instructed to advance from one item to the next by using their left index finger to press the “Q” key to clear a fixation point

(+++). At this point, the fixation point was replaced with a blank slide for 50 ms prior to displaying the next item. Finally, they were instructed to respond as quickly as possible but to be accurate as well.

The first practice session ensued once the participant had heard the instructions for the study. In the practice session they were told that either the word “true” or “false” would appear on the screen and that they were to respond by using the assigned keys. The experimenter gave feedback to the participants when incorrect or hesitant responses were given. A second practice session ensued once the participant indicated familiarity with the key assignments.

In the second practice session, the participants encountered sample sentences (Appendix B) and were instructed to indicate whether a sentence is true or false using the assigned keys. The experimenter gave feedback when incorrect or hesitant responses were given. At the end of this practice session, the experimenter clarified any questions and reminded the participants of their task one last time. At this point, the 192 test sentences were presented. At the end of the testing session, the participants filled out a language background questionnaire to ensure that only data from English monolinguals were included in this experiment.

Results

Mean RTs for correct responses only were included in the data analysis. Responses that were less than 150 milliseconds or greater than 4000 milliseconds were treated as errors. Table 1 summarizes the reaction time scores by stimulus type, i.e., “true” statements (further subdivided by high vs. low typicality), and three types of “false” statements - standard, metaphors, and scrambled metaphors.

A paired samples *t* test was computed to compare responses to “true” statements according to whether they were high or low in typicality. This comparison serves as a

manipulation check to ensure that subjects in the task are processing sentences as they normally do in sentence verification tasks (i.e., faster responding to high typical than low typical). This was indeed the case with the monolingual subjects ($t(32) = -9.128$, $p < .01$). The high vs. low typicality data were pooled in subsequent analyses.

The mean RT for the four sentence types differed reliably (F (2.13, 68.16) = 9.31, $p <$ .01). The degrees of freedom were adjusted using a Greenhouse-Geisser correction following the convention for controlling for the violation of the sphericity assumption underlying this analysis. Planned comparisons were conducted to test the hypotheses that the average response time for True sentences will differ from that for False sentences, and that the average response times of the Metaphor sentences will differ from the average of those other sentences requiring a false response. True sentences were responded to faster than were any other sentence type (t (160) = -2.99) and responses to metaphoric statements were slower than to any other type of sentence that required a false response (t (160) = 3.23). Pairwise comparisons showed that the mean difference between Metaphor sentences and Standard false sentences was significant (MD = 85.68, $p < .01$). However, the mean difference between the Scrambled and the Metaphor sentences was marginally significant (MD = 41.16, p= .069). Evaluating the strength of the relationship between these two sentence types (omega square = .62) suggests that increasing the sample size might reveal a significant difference at the accepted significance level of .05.

Discussion

The data suggest that the results from Glucksberg et al. (1982) were replicated. If one attributes fast reaction times to an easy literal true-false decision and slower reaction times to a more difficult decision, it can be suggested that the monolingual participants in this study activated the nonliteral meanings of the metaphor sentences non-optionally. This supports the

view that accessing the nonliteral meanings of sentences need not follow an *a priori* activation and rejection of its literal meaning.

EXPERIMENT 2

To explore figurative language processing further, the metaphor interference effect was examined in two groups of English-Spanish bilinguals tested in English. One group was more dominant in English than Spanish while the other group considered themselves equally proficient in English and Spanish. Two questions were of interest here: would a metaphor interference effect be obtained for English to the same extent in bilinguals who are more fluent in English than Spanish as in those who are equally fluent in English and Spanish? Secondly, would the size of the metaphor interference effect obtained in bilinguals be the same as or larger than that obtained in monolinguals?

Method

Participants

Thirty-seven English-Spanish undergraduate students from Texas A&M International University in Laredo, Texas, participated in this study for research credit. Two participants were excluded because their comprehension in Spanish was better than English and two other subjects were excluded because of coding error.

Responses from a self-report Language Background Questionnaire (see Appendix B) were used to assess participants' proficiency level. A composite comprehension score was computed by taking the average of participants' 7-point understanding, reading and speaking scores for each language. These scores were submitted to a paired samples t-test. The average for the English composite proficiency score was 6.51 (SD = 1.12) while the average Spanish composite proficiency score was 5.40 (SD = 1.44). This difference was statistically significant ($t(36) = 3.34$, $p < .01$). A 95% confidence interval was constructed for these data. The upper and lower limits were 1.78 and .44 respectively. Participants were classified as "Equally proficient"

if the difference between their English and Spanish composite comprehension scores lay inside the confidence interval. Similarly, if the difference between their English and Spanish composite scores lay outside the confidence interval, they were classified as more English or Spanish dominant (see Table 2).

Following the above criteria, 14 of the bilinguals were classified as English dominant and 19 were classified as equally proficient in both languages. Participants from the two groups did not differ in their relative dominance in English.

Materials and Procedure

The materials and procedures of this experiment were identical to those of Experiment 1, with the exception that PsyScope was the computer software used to display the sentences and collect the participant's responses. Additionally, the participants answered a Language Background Questionnaire (see Appendix) that included self-ratings of understanding, reading, and speaking of both English and Spanish on a 7-point scale. Responses were used to assess whether participants were English dominant or equally proficient in their two languages.

Experiment 2 was a mixed design with the four levels of sentence type as the within subjects factor and bilingual group (English Dominant vs. Equally Proficient) as the between subjects factor.

Results

To ensure that participants were responding in accordance with the norm of sentence verification tasks, the averages of the high typical true sentences and the low typical true sentences for the English dominant group and the equally proficient group were examined in separate t- tests. A paired samples *t* test was computed to compare the high typical (M = 1432.53, SD = 230.32) and low typical (M = 1699.72, SD = 264.45) true sentences for the English

dominant group. This difference was significant ($t(13) = -10.79$, $p < .01$), indicating that the participants in this group were responding as would be expected in a sentence verification task. Therefore, the high/low typicality true data were pooled in subsequent analyses. In the same manner, a paired samples *t* test was computed to compare the high typical ($M = 1407.08$, $SD = 284.51$) and low typical ($M = 1619.75$, $SD = 310.71$) true sentences for the equally proficient group. This analysis also revealed a significant difference between the two sentence types, ($t(18) = -10.66$, $p < .01$). These data were also pooled in subsequent analyses.

The data (see Table 3) were submitted to a mixed design ANOVA with Bilingual Group (English Dominant vs. Equally Proficient) as the between subjects factor and Sentence Type as the within subjects factor. There was a main effect of Sentence Type (F (3, 93) = 29.78, $p < .01$) but no main effect of Group ($F(1,31) = 1.154$, $p = .291$). Group by Sentence Type was marginally significant (F (3,93) = 2.58, $p = .058$). The simple main effects of bilingual group at each level of sentence type showed that the interaction was a result of differences in the sentences that required a false response. That is, the English Dominant Group was significantly slower at responding to the Metaphor Sentences ($F(1, 124) = 33.97$, $p < .01$), the Scrambled Metaphor Sentences ($F(1, 124) = 33.78$, $p < .01$), and the Standard False Sentences ($F(1, 124) = 10.41$,) but not the True Sentences ($F(1,124) = 3.01$, $p < .08$).

Planned comparisons were computed separately per bilingual group to test the hypothesis that average response time for True sentences will be faster than that for False sentences, and that average response times for the Metaphor sentences will be slower than the average of the Scrambled Metaphor and Standard False sentence types.

English Dominant Group

The mean responses to the True sentences were indeed faster than those to the False sentences ($t(93) = -5.10$, $p < .01$). Furthermore, the mean responses to the Metaphor sentences were reliably slower than those to any other type of sentence that required a "false" response ($t(93) = 4.48$). The pairwise comparison between Metaphor and Standard False sentences was significant ($MD = 38.70$, $p < .01$). However, while the difference between the Metaphor and the Sentences and the Scrambled Metaphor conditions was in the expected direction, it failed to reach statistical significance ($MD = 74.28$, $p = .12$).

Equally Proficient Group

The responses to the True sentences were faster than to any of the False sentence types ($t(93) = -2.89$, $p < .01$). Moreover, responses to the Metaphor sentences were reliably slower than to other sentence types requiring a "false" response (t (93) = 6.45). Once again, the pairwise comparison between Metaphor and Standard False sentences was significant ($MD = 165.30$, $p < .01$), but the difference between the Metaphor Sentences and the Scrambled Metaphor was not ($MD = 73.77$, $p = .12$).

Bilinguals vs. Monolinguals

To compare the size of the metaphor interference effect across monolinguals (from Experiment 1) and bilinguals in the present experiment, metaphor interference indices were computed by taking the difference between the mean response to Metaphor sentences and the response to the average of the Scrambled and Standard false sentences (both of which also required a "false" response). The size of the index provides an indication of the relative difficulty in rejecting a Metaphor Sentence as false. The Metaphor Interference Index for the monolingual participants in Experiment 1 was 63.42 milliseconds while the corresponding values were 159.31

and 121.54 for the English Dominant and Equally Proficient Bilinguals, respectively. Thus, bilinguals showed nearly double the amount of interference from metaphoric meaning than monolinguals. See Figure 1 for a summary of the False Sentences by Experiment (e.g., Glucksberg et al, 1982 study, and Experiments 1 and 2 of the present study).

Discussion

The results from Experiment 2 clearly show that the metaphor interference effect is robust in participants tested in a language that is their more proficient one, or in a language in which they are equally proficient as their other language. From these results, one can conclude that non-optional activation of the figurative meanings of metaphor sentences is not limited to monolinguals. Indeed, the effect appears to be even greater in bilinguals than monolinguals. However, given that bilinguals in this experiment were tested only in their more dominant (or highly proficient) language, the question remains as to whether the size of the effect may vary according to degree of language proficiency.

EXPERIMENT 3

This experiment was conducted to investigate whether metaphor interference will occur in the less dominant language to the same degree as the more dominant language of English dominant bilinguals and whether it will be equivalent across the two languages of equally proficient bilinguals.

Method

Participants

A group of 26 English-Spanish undergraduate students at Texas A&M University participated in this study for research credit. Participants completed a Language Background Questionnaire (see Appendix) that included their self-ratings for understanding, reading, and speaking of each language on a 7-point scale. A composite comprehension score was computed by taking the average of participants' 7-point understanding, reading and speaking scores for each language. These scores were submitted to a paired samples t-test. The average for the English composite proficiency score was 6.9 (SD = .26) while the average Spanish composite proficiency score was 6.56 (SD = .29). This difference was statistically significant ($t(26) = 5.11$, $p < .01$). A 95% confidence interval was constructed for these data. The upper and lower limits were 0.48 and 0.21 respectively. Participants were classified as "Equally proficient" if the difference between their English and Spanish composite comprehension scores lay inside the confidence interval. Similarly, if the difference between their English and Spanish composite scores lay outside the confidence interval, they were classified as more English or Spanish dominant (see Table 2).

A separate group of eleven English-Spanish undergraduate students at Texas A&M University provided metaphorical and familiarity ratings for the Spanish translations of the 24 English metaphor sentences.

Materials

The Spanish version of the 24 Metaphors is presented in the Appendix. The pretest participants first rated the Spanish version of the sentences on a 7-point scale for metaphorical (i.e., metaphor-goodness) and familiarity (where 1 refers to "low" and 7 to "high"). The mean metaphorical and familiarity ratings for the Spanish metaphor sentences were 4.93 and 3.21 respectively. These numbers are comparable to the metaphorical and familiarity ratings obtained for English in Experiment 1 (i.e., 4.96 and 3.93, respectively).

The stimuli were initially translated from English to Spanish by the experimenter. However, the participants who provided the metaphorical and familiarity ratings were also asked to back translate the sentences from English to Spanish. This ensured that the most common wording for across languages was maintained. Additionally, the experimenter translated the practice items from English to Spanish.

Procedure

The procedure in this experiment was identical to that of Experiment 2, with the exception that E-prime was the computer software used to display the sentences and collect the participants' responses. Furthermore, half of the items presented to each participant were presented in English and half were presented in Spanish. The language of presentation was blocked so that the first half of the 192 test items were presented in English first and the remainder were presented in Spanish first. Four lists were constructed to counterbalance the language presentation order and control for any order effects.

Fourteen participants (8 English Dominant and 6 Equally proficient) were tested in English followed by Spanish, while 12 participants (4 English Dominant and 8 Equally proficient) were tested in Spanish followed by English.

Design

Experiment 3 was a 2x4x2 mixed design with Sentence Type and Language of Presentation as within-subjects factors and Bilingual Group as the between subjects factor.

Results

A preliminary analysis comparing the performance of bilinguals who were given English items first vs. Spanish items first showed no order effects ($F < 1$).

A summary of the correct reaction time responses as a function of Language Presentation, Group and Sentence Type is presented in Table 4. A one-way repeated measures ANOVA was computed to test whether the difference in mean response times between the high and low typicality "true" sentences was significantly different. The analysis suggested that this was indeed the case ($F(1.687, 40.484) = 41.59$, $p < .01$) a Greenhouse-Geisser adjustment was applied to the degrees of freedom to control for violating the homogeneity of sphericity assumption and the high-low "true" responses were pooled in subsequent analyses.

The main effect for Sentence Type was significant ($F(2.10, 50.42) = 11.94$, $p < .01$); the degrees of freedom were adjusted to control for the violation of sphericity using the Greenhouse-Geisser correction. Language of Presentation was also significant ($F(1,24) = 65.73$, $p < .01$), indicating slower responses overall to Spanish than to English sentences.

The two-way interaction of Presentation Language by Sentence Type was significant ($F(3, 72) = 4.74$, $p < .01$). Neither of the other two-way interactions, Sentence Type and

Bilingual Group, and Language Presentation and Bilingual Group, were significant (*Fs* < 1) nor was the three-way interaction (*F* (3, 72) = < 1, *ns*).

To determine the nature of the two-way interaction of Presentation Language and Sentence Type, the simple main effects of Sentence Type at each level of Presentation Language were examined. Sentence Type was significant for English (*F*(3, 144) = 29.74, *p* <.01) and for Spanish (*F*(3,144) = 218.38). This suggests that the nature of the interaction may be attributed to differences in responding to English and Spanish phrases. Thus, it seems as if the participants were slower across all sentence types when the items were in Spanish.

Once again, planned comparison analyses were conducted to determine whether the participants were faster at responding to "true" sentences over any other type of sentence and whether metaphor sentences were reliably slower than any other type of sentence that required a "false" response.

English Dominant Group

The responses to the True sentences were reliably faster than to any other type of sentence when the items were presented in English (*t*(72) = -.3.12, *p* < .01). However, the responses to the Metaphor sentences in English were *not* reliably slower than to any other type of sentences that required a "false" response (*t*(72) = .843, *p* = .40).

Similarly, when the items were presented in Spanish, the True sentences were reliably faster than any other type of sentences (*t*(72) = -4.80, *p* < .01). However, responses to the Metaphor sentences were *not* reliably slower than to any other type of sentences that required a "false" response (*t*(72) = .614, *p* =.54).

Equally Proficient Group

For the Equally Proficient bilingual group in English, responses to the True sentences were *not* reliably faster than to any of the false sentences ($t(72) = -.475$, $p < .64$). Furthermore, responses to the Metaphor sentences were *not* reliably slower than to any other type of sentences that required a "false" response ($t(72) = 1.614$, $p = .11$).

However, when the items were presented in Spanish, the Equally Proficient bilinguals were significantly faster to decide whether a sentence is true over any other type of sentence ($t(72) = -7.54$, $p < .01$). This group was also reliably slower at rejecting a Metaphor sentence as false than any other sentence that required a "false" response ($t\ (72) = 2.65$, $p < .01$).

Discussion

The results showed that responses to the Spanish stimuli were, in general, slower than those to English stimuli. Moreover, while the English Dominant group showed faster "true" than "false" responses for English and Spanish items, the Equally Proficient group showed faster "true" relative to "false" responses only for Spanish items. Finally, the metaphor interference effect in the present experiment was reliable only for the Equally Proficient bilinguals, and only for Spanish items.

Based on the results from Experiment 3, one cannot conclude that there is non-optional activation of figurative meanings for the metaphor sentences, as we did in Experiments 1 and 2. One interpretation of the different pattern of findings in this experiment relative to the previous two experiments lies in the fact that, because half of the items were presented in English and half in Spanish, the total number of critical items (metaphor sentences) was half that of the previous experiments, where only one language was tested. Since only correct responses were included in the data analyses, it is possible that while the participants may be committing the same number

of errors as in the two previous experiments, the effect of removing the error trials in the present experiment was to eliminate an interference effect. The error rate for the English stimuli was .10 while the error rate for the Spanish stimuli was .29. This difference was statistically significant ($t(1) = 5.56$, $p < .01$).

The fact remains that one of the bilingual groups in this experiment, namely, the Equally Proficient group, did show a reliable metaphor interference effect, in Spanish, even with the reduced stimulus set. Although this group was designated as Equally Proficient, this group may have been more proficient in Spanish than the English Dominant group, who, interestingly, did not show a metaphor interference effect in Spanish. However, the Spanish Composite Comprehension Scores between the English Dominant group ($M = 6.47$, $SD = .33$) and the Equally Proficient group ($M = 6.60$, $SD = .23$) were not significantly different ($F(1,24) < 1$). Therefore, it is possible that the non-optional activation of the figurative meanings of metaphor sentences is proficiency-dependent. However, this account does not explain why the English dominant bilinguals did not show metaphor interference in their more dominant language. Nor is there an explanation for why the Equally Proficient group did not show faster responses to the "true" relative to the "false" items in English.

EXPERIMENT 4

The purpose of Experiment 4 was to examine whether procedural variables introduced in Experiment 3 were responsible for the lack of a statistically significant finding in the dominant language (English) for both English Dominant and Equally proficient groups. To accomplish this English Monolinguals were tested using only half of the original materials. This will determine whether the truncated list compromised the sensitivity of the metaphor interference paradigm.

Method

Participants

A group of 17 undergraduate students from Texas A&M University participated in this experiment. Data were excluded from two participants who indicated English was not their native language.

Materials

Two lists were constructed from the original 192 items. The list consisted of 24 High Typical (true), 24 Low Typical (true), 12 Standard False, 6 Scrambled Metaphor and 6 metaphor sentences for a total of 96 items.

Procedure

The procedures were the same as Experiment 3 with the exception that only English items were used.

Results

As with all previous experiments only correct responses were used in the analyses. A paired samples t-test indicated that the responses to the High Typical Sentences that required a true response were significantly faster than the responses to the Low Typical Sentences that also

required a true response ($t(14) = -4.22$, $p < .01$). Therefore, the data for the true sentences were pooled in subsequent analyses.

Nine participants received half of the 192 items while 6 participants received the other half of the 192 items. The difference across the two lists was not statistically significant ($F(1,13) = 2.48$, $p = .14$). Furthermore, the interaction between Sentence Type and List Version was not significant ($F(4,52) = 1.81$, $p = .14$). There fore the data for the List Versions were pooled in subsequent analyses.

The means and standard deviations for each of the sentence types are presented in table 5. The effect for Sentence Type was statistically significant ($F(3,42) = 4.89$, $p < .01$). Planned comparisons were computed to determine whether the responses to True Sentences were faster than those of False responses. This analyses indicated that the responses for the True sentences are *not* significantly faster than to any other type of sentences ($t(42) = -1.42$, $p = .16$). One the other hand, the Metaphor Sentences were significantly slower than to any other sentence that required a false response ($t(42) = 3.49$, $p < .01$).

Discussion

The lack of a statistically significant effect between True Sentences and all other sentence types may support the argument that a shorter list attenuates this effect. On the other hand, and more importantly, the shorter list does not attenuate the metaphor interference effect.

Therefore, based on the results of Experiment 4, one may rule out the possibility that a shorter list compromises the sensitivity of the paradigm and does not attenuate the metaphor interference effect.

GENERAL DISCUSSION AND CONCLUSION

A task such as the metaphor interference task requires participants to decide whether a phrase is literally true or false. If the participants in this study take longer to reject as literally true metaphorical phrases over the control phrases that also require a false response, regardless of proficiency level, it would be concluded that automaticity of metaphorical activation is not contingent on language-familiarity-based factors such as proficiency. Instead, one could infer that the participants rely predominantly on their underlying conceptual system to understand the phrases. If, on the other hand, proficiency level interacts with interference size, one might infer that non-optional activation of metaphoric meanings occurs only, or to a larger degree, in the bilingual's more dominant language.

As reported above, the results from the present set of experiments suggest that language proficiency plays at least some role in determining whether the figurative meanings of metaphor sentences were accessed. However, while one might be inclined to conclude that this study was unsuccessful in trying to assess exactly how language proficiency interacts with obtaining a metaphor interference in the dominant and less dominant language, the results from Experiment 3 do have some light to shed. The metaphor interference was *not* obtained with English Dominant bilinguals; however, it was obtained in the Equally Proficient bilinguals but only in Spanish, their less dominant language.

One might speculate that the proficiency level of Spanish for the English dominant bilinguals was lower than the requisite level (if indeed there is one) necessary to automatically activate the figurative meanings of Spanish metaphoric sentences. On the other hand, the Equally proficient bilinguals were perhaps at the necessary level to automatically activate the figurative meanings of Spanish Metaphor Sentences. Nevertheless, the fact that the metaphor interference

was not obtained in either of the bilingual groups' dominant language is perplexing and might be indicative of alternative explanations outside of the dependency on proficiency in obtaining the metaphor interference. Therefore, some alternative explanations need to be explored.

Both the English Dominant and Equally Proficient Groups showed the typical finding of sentence verification tasks (i.e., responses to high typical true sentences are faster than those of low typical sentences). Therefore, it can be concluded that, at least for the True sentences the participants are behaving in a typical manner (although it should be noted that this was not the case for the Equally Proficient group on English, in Exp. 3). However, there is reason to believe that the same cannot be said about their behavior for the False sentences. The difference between Experiments 1 and 2 and Experiment 3 was the inclusion of the Language Presentation condition. While this condition allows for the comparison of how different bilingual groups perform, inclusion of this condition may have compromised the sensitivity of the paradigm. As indicated above, the error rate is a concern in this experiment primarily because it minimizes the number of items available for the analyses. However, Experiment 4 showed that this may not be the case. A second concern may be the cost of switching from one language to another. While this was controlled by blocking the Language Presentation levels, some participants indicated a difficulty in adjusting to the language switch. This provides a way in which the design of Experiment 3 may be adapted to limit the compromising of the sensitivity. Future studies should be conducted with "buffer" items to allow the participants to adjust to the language switch.

Limitations/Caveats

One initial concern was that some metaphors used in the study may either be language specific or differ in their metaphoricity across languages. That is, because the Spanish stimuli employed in this study were translated from English to Spanish it is possible that what is seen as

metaphorical in English may not always be seen as metaphorical to the same degree in Spanish. However, this issue was empirically addressed by judgments of metaphoricity from native speakers of each language in Experiment 3 and it can be concluded that the stimuli are comparable across languages.

Another limitation of the research is that it did not specifically explore language-related differences in metaphoric conceptualization. In future research it will be of interest to consider whether metaphoric processing associated with one language carries over to influence the interpretation of novel metaphors. Another potential limitation of the present study is that the results may not generalize beyond the particular format of expressions studied here, namely, *some Xs are Ys.* Nevertheless, in view of the fact that there is at present very little experimental work directed at understanding metaphoric processing in bilinguals, the results of this study are of interest and should serve as a springboard for further investigations of other forms of figurative expressions and creative language use.

Theoretical Implications for Models of Bilingual Memory

The results of this study may have some implications for models of bilingual memory representation that postulate a weak link between the second language lexical level and the conceptual level, such as the revised hierarchical model (Kroll & Stewart, 1994). That is, if participants are indeed able to automatically activate metaphorical meanings, one might conclude that such a model is only adequate at the word level and does not extend to the conceptual level. In that event, perhaps other models, such as the conceptual feature model (DeGroot, 1992) that postulate the sharing of some conceptual features across languages while others remain specific to one language, would be better equipped to accommodate such results.

These theoretical accounts of bilingual representational structure can be applied to explain the significant results in Experiment 3. That is, the revised hierarchical model might postulate that the Equally Proficient bilinguals obtained metaphor interference because they were at a developmental level where they would have to mentally translate the sentences from their less dominant language into their more dominant language to access the concepts encapsulated by the Metaphor sentences. However, on this account the English Dominant Bilinguals should also obtain metaphor interference given that they would rely more heavily on this Less Dominant to More Dominant conversion. However, given the perplexing nature of the Experiment 3 results reaching a conclusion as to which theoretical account properly characterizes bilingual memory representation is not possible without further investigations.

Conclusion and Future Studies

Bilingual figurative language processing remains a relatively unexplored terrain. The present study provides some interesting findings with respect to bilingualism and the possible influence of proficiency on figurative meaning activation. Bilinguals showed larger interference effects from metaphoric meanings as compared to mo nolinguals. Moreover, the metaphor interference effect appeared to interact with language. The exact nature of this interaction remains, however, to be clarified with further research. The current studies only explored figurative language processing with English Dominant bilinguals, therefore, future research should investigate how Spanish Dominant bilinguals process figurative language. Finally, it is hoped that the current investigation renews the interest of investigations of bilingual figurative language processing.

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APPENDIX A

Table 1

Mean Reaction Times by Stimulus Type: Experiment 1

	n	*M*	*SD*
Metaphor	33	1493.63	322.62
Scrambled	33	1452.47	279.48
Standard	33	1407.95	266.58
High Typical	33	1319.10	277.44
Low Typical	33	1448.10	277.20
True	33	1383.60	274.34

Table 2

Summary Data of the Language Background Questionnaire for English Spanish Bilinguals

		n	*M*	*SD*
Experiment 2	English Dominant	14	6.51	1.12
	Equally Proficient	19	5.40	1.44
Experiment 3	English Dominant	12	6.90	.26
	Equally Proficient	14	6.56	.29

Table 3

Average Reaction Time Data as a Function of Language Presentation, Bilingual Type and Sentence Type

	Bilingual Type	*n*	*M*	*SD*
Metaphor	English Dominant	14	1843.24	386.90
	Equally Proficient	19	1666.16	403.05
Scrambled	English Dominant	14	1768.96	360.36
	Equally Proficient	19	1592.38	413.99
Standard	English Dominant	14	1598.90	300.15
	Equally Proficient	19	1500.86	309.40
True	English Dominant	14	1566.12	243.61
	Equally Proficient	19	1513.41	294.71

Table 4

Reaction Time Data as a Function of Language Presentation, Bilingual Type and Sentences Type

	Bilingual Type	*n*	*M*	*SD*
English Metaphor	English Dominant	12	1766.50	260.88
	Equally Proficient	14	1695.59	421.68
English Scrambled	English Dominant	12	1714.75	300.19
	Equally Proficient	14	1605.15	271.28
English Standard	English Dominant	12	1713.27	280.37
	Equally Proficient	14	1601.72	300.87
English True	English Dominant	12	1548.42	153.48
	Equally Proficient	14	1604.32	353.43
Spanish Metaphor	English Dominant	12	2441.13	430.53
	Equally Proficient	14	2419.13	485.76
Spanish Scrambled	English Dominant	12	2464.52	517.99
	Equally Proficient	14	2326.61	472.79
Spanish Standard	English Dominant	12	2342.00	319.67
	Equally Proficient	14	2205.89	387.01
Spanish True	English Dominant	12	2134.00	310.87
	Equally Proficient	14	1997.96	292.16

Table 5

Mean Reaction Times by Stimulus Type: Experiment 4

	n	*M*	*SD*
Metaphor	15	1494.45	325.13
Scrambled	15	1377.96	327.15
Standard	15	1346.18	161.54
True	15	1355.50	217.10

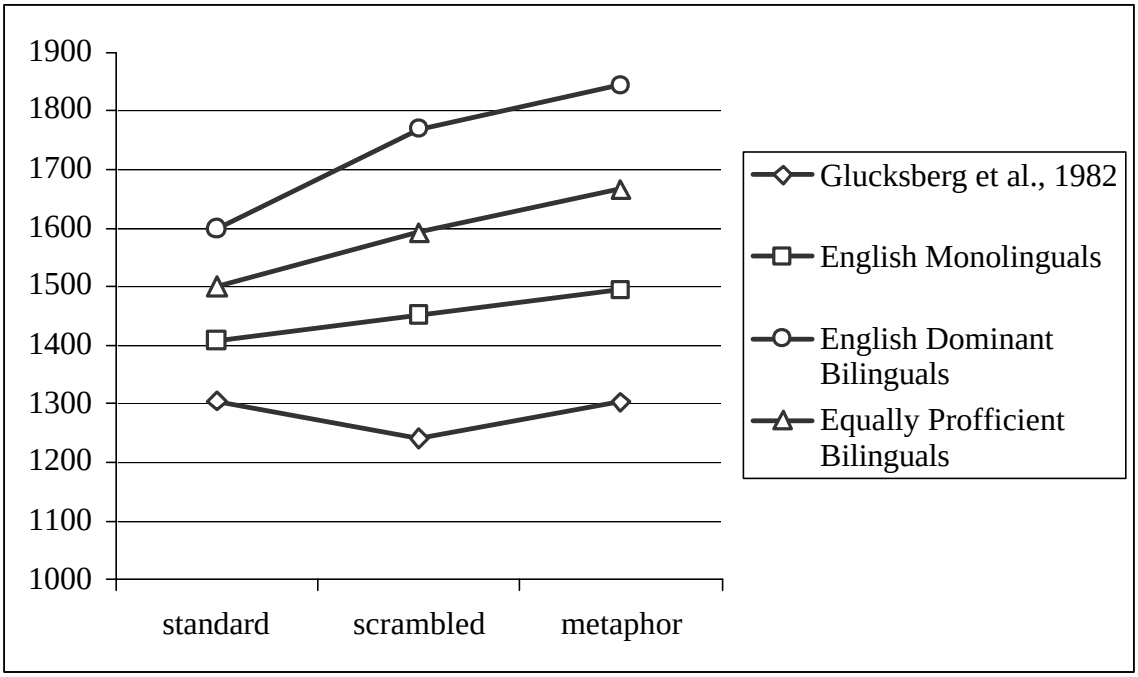

Figure 1 Comparing the Metaphor Interference Effect of Monolinguals and Bilinguals

APPENDIX B

Metaphors and Scrambled Metaphors Used in Experiment 3 of Glucksberg et al., (1982)

Metaphorical Statements	Scrambled Metaphor Statements
Some cats are detectives	Some cats are chains
Some clouds are ice cream	Some clouds are detectives
Some favors are chains	Some favors are rockets
Some feet are wheels	Some feet are spotlights
Some fingers are forks	Some fingers are telescopes
Some hallways are telescopes	Some hallways are wheels
Some hearts are dwellings	Some hearts are ants
Some ideas are food	Some ideas are forks
Some lies are clothing	Some lies are ribbons
Some lives are tapestries	Some lives are clothing
Some marriages are sports	Some marriages are cotton
Some minds are closets	Some minds are worms
Some perfumes are tools	Some perfume are mirrors
Some ponds are mirrors	Some ponds are knives
Some proverbs are spotlights	Some proverbs are diseases
Some questions are levers	Some questions are tapestries
Some roses are kisses	Some roses are levers
Some rumors are diseases	Some rumors are dwellings
Some soldiers are ants	Some soldiers are food
Some subways are worms	Some subways are kisses
Some thoughts are rockets	Some thoughts are ice cream
Some teeth are knives	Some teeth are sports
Some clouds are cotton	Some clouds are tools

Example of Practice Stimuli Used to Familiarize the Participants with the Experimental Task

Item	Sentence Type
Some girls are radios	Metaphor
Some roads are snakes	Metaphor
Some girls are zoos	Scrambled Metaphor
Some schools are snakes	Scrambled Metaphor
Some candies are poodles	Standard False
Some colors are beef	Standard False
Some buildings are apartments	High
Some buildings are hotels	High
Some colors are brown	Low
Some colors are pink	Low

Note – Half of the items were translated from English to Spanish in Experiment 3

English Metaphors and their Spanish Translations

Some cats are detectives	Algunos gatos son detectives
Some clouds are ice cream	Algunas nubes son helados
Some favors are chains	Algunos favores son cadenzas
Some feet are wheels	Algunos pies son ruedas
Some fingers are forks	Algunos dedos son tenedores
Some hallways are telescopes	Algunos vestíbulos son telescopios*
Some hearts are dwellings	Algunos corazones son viviendas
Some ideas are food	Algunas ideas son alimento
Some lies are clothing	Algunas mentiras son artículos de ropa
Some lives are tapestries	Algunas vidas son tapices
Some marriages are sports	Algunos matrimonios son deportes
Some minds are closets	Algunas mentes son gabinetes
Some perfumes are tools	Algunos perfumes son herramientas
Some ponds are mirrors	Algunos estanques son espejos
Some proverbs are spotlights	Algunos proverbios son proyectores
Some questions are levers	Algunas preguntas son palancas
Some roses are kisses	Algunas rosas son besos
Some rumors are diseases	Algunos rumores son enfermedades
Some soldiers are ants	Algunos soldados son hormigas
Some subways are worms	Algunos trenes suterráneos son gusanos
Some thoughts are rockets	Algunos pensamientos son cohetes
Some teeth are knives	Algunos dientes son cuchillos
Some clouds are cotton	Algunas nubes son helados

* Note: The word vestíbulos was replaced by the word pasillos

Language Background Questionnaire

ID (last 5 digits): _____ Name:_____ Phone #:_____
Email:_____ Age:____ Country of Birth:_____
Length of Stay in U.S.: ___ years.
Do you know any languages other than English?_____(specify)
What is your first language, i.e. what you first learned to speak first? (If more than one, state all):
_____
When did you learn your other language(s)? ___ 0-4 yrs ____ 5-8 _____ 9-12 _____ > 12
What was/is the main language of instruction in your:

a. Elementary School _____
b. Middle School _____
c. High School _____
d. College _____

Which hand do use to write with?_____ Any left-handed family members?_____(specify)

What language do you mostly use when speaking with each of the following: (If you use more than one language equally often, indicate that)

a. Your Parents _____
b. Siblings _____
c. Grandparents _____
d. Friends _____
e. Classmates _____
f. Co-workers _____
g. Partner _____
h. Other (specify)

In which language(s) do you/would you typically do each of the following activities(If more than one language is used interchangeably, list all.):

a. Express affection _____
b. Express anger _____
c. Pray _____
d. Dream _____
e. Think to yourself _____
f. Mentally add, multiply _____
g. Tell jokes/ funny stories_____
h. Listen to/read jokes _____
i. Send email _____
j. Curse _____
k. Keep a diary (to write down your thoughts/feelings) _____

In which language do you feel you can communicate most effectively? (If more than one, list all)
_____

Circle one: "When speaking with other bilinguals I switch between languages during a conversation:"
Never Rarely Sometimes Frequently All the time Not Applicable

Please rate your language ability in English and your other language (specify) on a 7 point scale where 1=very little knowledge and 7=use it like a native speaker:

Speak English _____
Read English _____
Write English _____
Understand English _____
Speak Other language _____
Read Other _____
Write Other _____
Understand Other _____

Please check as appropriate: "My general comprehension of English is":

___ As good as that in my _____(specify other language).

___ Better than that in my _____(specify other language).

___ Worse than that in my _____(specify other language).

VITA

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