Bilingual Lexical Access and Cognate Idiom Comprehension

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Abstract

Language transfer can facilitate learning L2 words whose form and meaning are similar to L1 words, or hinder speakers when the languages differ. L2 idioms introduce another layer of challenge, as language transfer could occur on the literal or figurative level of meaning. Thus, the mechanics of language transfer for idiom processing shed light on how literal and figurative meaning is stored in the bilingual lexicon. Three factors appear to influence how language transfer affects idiom comprehension: bilingual fluency, processing of literal-figurative vs. figurative cognate idioms (idioms with the same wording and meaning in both languages, or the same meaning only), and comprehension of literal vs. figurative meaning of a given idiom. To examine the relationship between these factors, this study investigated English-Spanish bilinguals' reaction time on a lexical decision task examining literal-figurative and figurative cognate idioms. The results suggest that fluency increases processing speed rather than slow it down due to language transfer, and that language transfer from L1 to L2 occurs on the level of figurative meaning in L1-dominant bilinguals.

1 Introduction

Speakers learning a new language may be helped or hindered by similarities with their native language. Language transfer—the influence of a speaker's native language (L1) on the new language (L2)—can facilitate learning L2 words whose form and meaning are similar to L1 words, but can confuse speakers when the languages differ (as with false cognates). Thus, understanding the mechanics of language transfer helps to illuminate potential difficulties for language learners.

L2 idioms introduce another challenge, as idioms have both a literal meaning and a figurative one that cannot be fully decomposed from the meanings of the individual words. Whereas experiments involving non-idiom words have investigated language transfer between the visual forms and the literal meanings of words, idioms introduce a third level on which language transfer may occur: that of figurative meaning.

The effects of language transfer provide key insight into questions of idiom representation in the bilingual lexicon. Although some argue that idioms are stored as unanalyzable, fixed units in the lexicon, other studies have suggested hybrid models of idiom compositionality in which idioms may be interpreted both figuratively and literally to different extents depending on factors such as a speaker's familiarity with the idiom (Fellbaum, 2015). Recent studies have investigated how bilingual fluency affects the degree to which literal and figurative meanings are activated during lexical access. L2 learners generally develop the ability to understand the literal meanings of L2 idioms before they can understand their figurative meanings. Other studies preliminarily suggest that language transfer helps L1-dominant bilinguals with comprehension of L2 cognates but may in fact slow down L2-dominant bilinguals (see Section 2).

Three factors appear to influence how language transfer affects idiom comprehension: bilingual fluency, processing of literal-figurative vs. figurative cognate idioms (idioms with the same wording and meaning in both languages, or with only the same meaning), and comprehension of literal vs. figurative

meaning of a given idiom (Figure 1). Previous work has only examined some relationships between these factors, but none have examined either (1) the relationship between bilingual fluency and the processing of literal-figurative and figurative cognate idioms or (2) comprehension of literal vs. figurative meaning for literal-figurative and figurative cognate idioms. This study examines both of those questions by measuring the relationship between bilingual fluency and the speed of processing literal vs. figurative meaning for literal-figurative and figurative cognate idioms.

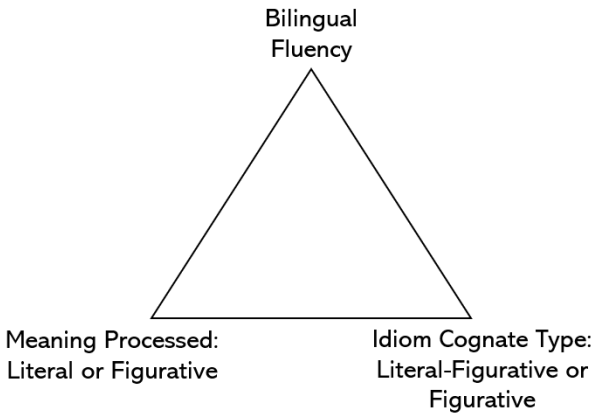

Figure 1: Factors affecting bilingual processing of cognate idioms.

The relationship between processing speed and fluency for different idiom types (literal-figurative cognate or figurative cognate) and target types (literal or figurative processing) shines light on whether increased fluency indeed affects comprehension of literal-figurative cognates compared to figurative cognates, and whether language transfer affects literal or figurative processing more significantly. This study began with the hypothesis that L1-dominant bilinguals would process L2 cognate idioms more quickly than non-cognates, but L2-dominant bilinguals would not, as Heredia et al. (2007) proposed that language transfer slows down processing as fluency increases (see Section 2). It was also hypothesized that processing of literal meaning, as well as processing of figurative meaning, would become faster as fluency increased—i.e., that there is no tradeoff between comprehension of figurative and literal meaning—in keeping with the argument that the literal meanings of idioms, not only figurative ones, may be stored in the bilingual lexicon to some extent. The results suggest that, contrary to Heredia et al.'s hypothesis, fluency sped up processing rather than slow it down because of language transfer. More strikingly, they also suggest that language transfer from L1 to L2 occurs on the level of figurative meaning in L1-dominant bilinguals.

2 Related Work

Language transfer occurs when a speaker's native language influences the acquisition or use of their L2; in particular, it affects the processing of cognate words between the speaker's L2 and L1. Bilinguals process L2 words with L1 cognates more quickly than L2 words without L1 cognates and are more accurate at mapping form to meaning for cognates, but tend to process false friends (L2 words visually or phonetically similar to L1 words but with different meanings) more slowly (Pham et al., 2017; Poort and Rodd, 2017). Thus, language transfer may increase or decrease processing speed depending on whether the forms and meanings of words are aligned between two languages.

Unlike expressions whose meaning can be decomposed from the meanings of individual words, the meaning of idioms is at least partially non-compositional. Thus, idioms may have a literal meaning (*kick the bucket* as in touching a pail with a foot) alongside a figurative one (to die),[1] both of which may be

[1]For the purposes of understanding language transfer on the literal and figurative level, this study excludes idioms that might be said to have a figurative meaning alone; rather, it examines idioms with clear literal and figurative meanings, such as *throw in the towel* or *playing with fire*.

	Literal-Figurative Cognate	**Figurative Cognate**
Spanish Idiom	*tirar la toalla* throw the towel	*de tal palo, tal astilla* from such stick, such splinter
English Equivalent	throw in the towel	the apple doesn't fall far from the tree
Figurative Meaning	"give up"	"the child is similar to the parent"

Table 1: Sample figurative and literal-figurative cognate idioms.

affected by language transfer.

L2 learners generally develop the ability to understand the literal meanings of idioms before they can understand their figurative meanings. Cieślicka (2006) argues that, regardless of the context in which a specific idiom is seen, idioms are interpreted according to their overall salience—the meaning (literal or figurative) that is more readibly accessible in the lexicon due to factors such as familiarity with the idiom and the context in which the idiom has been seen. Thus, as L2 learners see an idiom in more figurative contexts, the figurative meaning becomes more salient and they are more likely to interpret it figuratively regardless of context. In one study, for example, Spanish-dominant English-Spanish bilinguals were slower to process English target words similar in figurative meaning to an English idiom than those similar in literal meaning to the idiom, compared to English-dominant bilinguals (Cieślicka et al., 2017).

Idioms in two languages may be cognates with respect to their literal and/or figurative meanings (Table 1). For example, the English idiom *the apple doesn't fall far from the tree* and the Spanish *de tal palo, tal astilla* ("from that stick, that splinter") have the same figurative meaning but different literal meanings, whereas the English *throw in the towel* and Spanish *tirar la toalla* have the same literal and figurative meanings. We refer to idioms with the same figurative meaning but different literal meanings as figurative cognates, and idioms with the same literal and figurative meanings as literal-figurative cognates.

Two similar studies suggest that language transfer helps L1-dominant bilinguals with comprehension of L2 cognates but slows down L2-dominant bilinguals. Irujo (1986) found that Spanish-dominant bilinguals were more accurate at comprehending literal-figurative cognate idioms in English than non-cognate English idioms. However, Heredia et al. (2007) found that, surprisingly, English-dominant English-Spanish bilinguals were slower at reading literal-figurative cognate idioms in English than figurative cognate idioms. Heredia et al. suggested that language transfer between literally similar English and Spanish idioms might slow down bilinguals as they become more fluent in their L2 (English): whereas different idioms might be stored as single words, literally similar idioms might activate both L1 and L2 lexicons, slowing down processing. However, because Heredia et al. did not examine Spanish-dominant bilinguals, and Irujo did not examine English-dominant bilinguals, there remains the open question of the extent to which language transfer confers an advantage or disadvantage on the processing of literal-figurative cognate idioms as bilingual fluency increases.

Some studies have investigated the relationship between bilingual fluency and the comprehension of literal and figurative meaning, while others have investigated the differences between bilingual processing of literal-figurative and figurative cognate idioms. The relationship between bilingual fluency and the processing of literal and figurative cognate idioms, as well as the comprehension of literal vs. figurative meaning for literal-figurative and figurative cognate idioms, have remained open questions. To address them, this study examines the relationship between bilingual fluency and processing of literal vs. figurative meaning for literal-figurative and figurative cognate idioms.

3 Methods

3.1 Participants

31 English-Spanish bilinguals between the ages of 18 and 22 who began learning Spanish between ages 0 and 17 were recruited. Participants' Spanish ability was measured using the Bilingual Dominance Scale (Dunn and Tree, 2009), which quantifies bilingual dominance in the range ± 30 (where +30 indicates complete Spanish dominance, -30 complete English dominance) using weighted factors including age of acquisition and percent of language use. Participants' bilingual dominance scores ranged from -30 to

Idiom	Literally Congruent Target	Figuratively Congruent Target	Incongruent Target	Nonce Distractor
de tal palo, tal astilla from such stick, such splinter "the apple doesn't fall far from the tree"	*rama* branch	*familia* family	*cielo* sky	*avapa*
tirar la toalla throw the towel "throw in the towel"	*secar* to dry	*vencido* defeated	*pájaro* bird	*frapo*

Table 2: Sample targets for idioms in the CCDMD index.

+24, with a mean score of -11 and median of -14.[2]

3.2 Materials

50 Spanish idiomatic expressions with both a literal and a figurative interpretation were gathered, 25 with literal English cognates and 25 with figurative English cognates.[3] In addition, 25 non-idiomatic control sentences with no close English equivalent were gathered, which acted as fillers. Idioms were gathered from the Quebec Collegial Centre for Educational Materials Development (CCDMD)'s index of trilingual idioms (CCDMD, 2009). Each idiom was then paired with three potential target words: one literally congruent to the idiom (e.g., *rama* "branch" for *de tal palo, tal astilla* "from such a stick, such a splinter"), one figuratively congruent (e.g., *familia* "family" for the same idiom), and one incongruent. The control sentences were paired with a literally congruent target and an incongruent target (Table 2).

Tests were randomly generated by sampling the lists of literal-figurative cognate idioms, figurative cognate idioms, and control sentences. Each test consisted of 12 of each type of idiom, four of which were paired with each type of target (literally congruent, figuratively congruent, or incongruent). For the control sentences, half were paired with (literally) congruent targets and half with incongruent targets. A nonce target (created by randomly generating strings and keeping only those obeying Spanish phonotactic constraints that were not valid Spanish words) was added to each sentence-target pair. The order of the questions and of the nonce and valid target words was randomly shuffled.

3.3 Lexical Decision Task

Oración	Opción 1	Opción 2	Respuesta (1 o 2)
			2
			1
			2
Él guarda una carta en la manga.	naipe	pargen	1

Figure 2: A sample test in progress. The idiom *Él guarda una carta en la manga* ("He has an ace up his sleeve") was paired with the literal target *naipe* ("playing card") and the nonce word *pargen*. The participant then types the number of the correct answer, 1, in the response column.

The experiment was conducted virtually over Google Sheets (Figure 2). Clicking on a cell revealed the priming sentence, after which there was a 3-second delay during which participants were instructed to read the sentence carefully. Then, two answer choices (the valid Spanish target and the random nonce word) appeared for 5 seconds in cells labelled 1 and 2. Participants were instructed to type the number of the valid word as quickly as possible in another cell. All instructions on the test were given in

[2]Reaction time was tested on Spanish idioms and the range of abilities tested was limited from -30 (full English dominance) to +24 (significant Spanish dominance) because of the difficulty of recruiting completely Spanish-dominant speakers.

[3]The full cognate list will be made available at `github.com/efleisig/bilingual-cognate-idiom-study`.

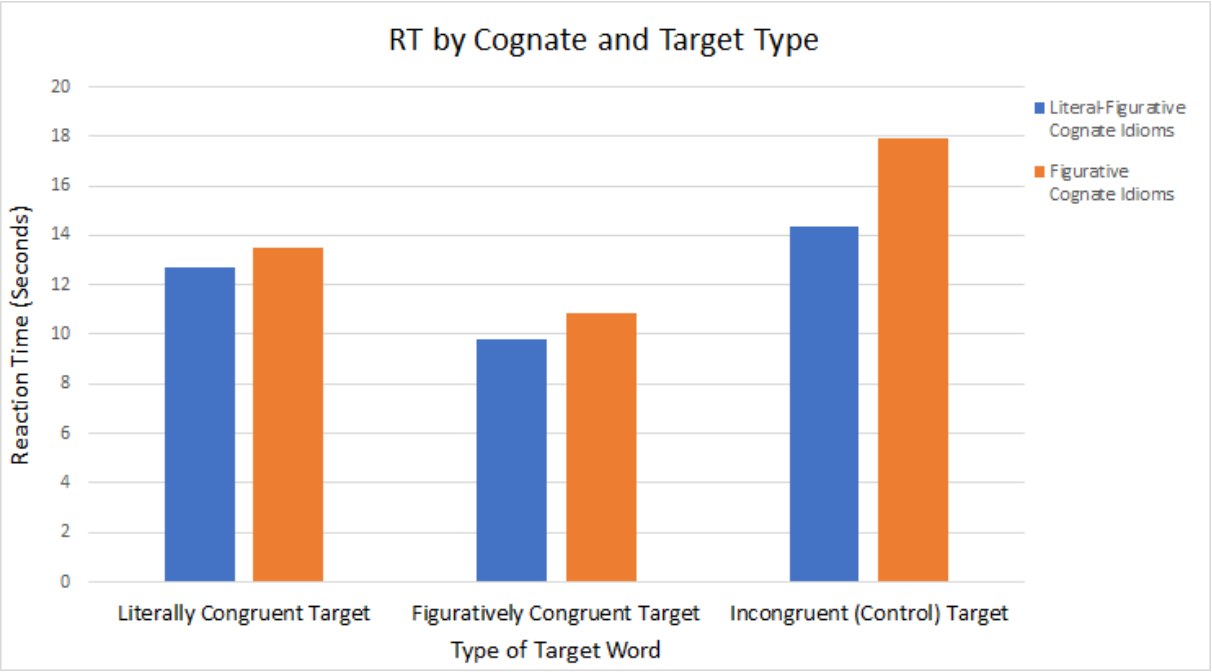

Figure 3: RT by idioms' cognate and target type.

Spanish.[4] To record participants' reaction time (RT), the time when the priming sentence appeared and when participants typed the answer for each idiom after the answer choices appeared was then recorded.

Six results were discarded: one for failing to complete the test, two for not following the directions, and three for participants' Internet lag issues that prevented time from being recorded accurately. Analysis was performed on the remaining 25 participants' responses.

4 Results

4.1 Effect of Cognate and Target Type on Reaction Time

On average, all the bilingual participants processed literal-figurative cognate idioms faster than figurative cognate idioms regardless of the target type (Figure 3). In addition, they processed target words related to both the figurative and the literal meaning of the idiom faster than unrelated target words, and processed target words related to the figurative meaning slightly faster than words related to the literal meaning.

4.2 Effect of Bilingual Dominance on Reaction Time

For each combination of idiom type (literal-figurative cognate, figurative cognate, or control) and target type (literally congruent, figuratively congruent, or incongruent), the relationship between bilingual dominance and RT was measured using Spearman's rank correlation (Table 3).

As Spanish fluency increased (measured by the Bilingual Dominance Scale), reaction time overall decreased (Figure 4), indicating a correlation between fluency and RT (r_s = -0.56, p = .004). There was also a moderate correlation significant at the 0.05 level between Spanish fluency and RT for figurative cognate idioms, for both literally (r_s = -.56, p = .004) and figuratively (r_s = -.47, p = .017) congruent targets (Figures 5 and 6). However, for literal-figurative cognate idioms, there was a significant correlation between Spanish fluency and RT for literally (r_s = -.48, p = .015), but not figuratively (r_s = -.16, p = .43) congruent targets (Figures 7 and 8).

[4] A separate instructions page, not visible during the test itself, was given in Spanish and English in case some participants were unable to fully understand the Spanish instructions.

Cognate-Target Pair	Spearman's Rank Correlation	p-Value
Literal-Figurative Cognate, Literal Target	**-0.4814**	**0.0148**
Literal-Figurative Cognate, Figurative Target	-0.1647	0.431
Literal-Figurative Cognate, Incongruent Target	-0.1147	0.585
Figurative Cognate, Literal Target	**-0.5555**	**0.00394**
Figurative Cognate, Figurative Target	**-0.4735**	**0.0168**
Figurative Cognate, Incongruent Target	-0.3450	0.0913
Control Sentence, Literal Target	-0.2052	0.325
Control Sentence, Incongruent Target	-0.3842	0.0579
Average for All Types	**-0.5553**	**0.00396**

Table 3: Spearman rank correlation for bilingual dominance and RT, for each idiom and target type. Results significant at the 0.05 level are in bold.

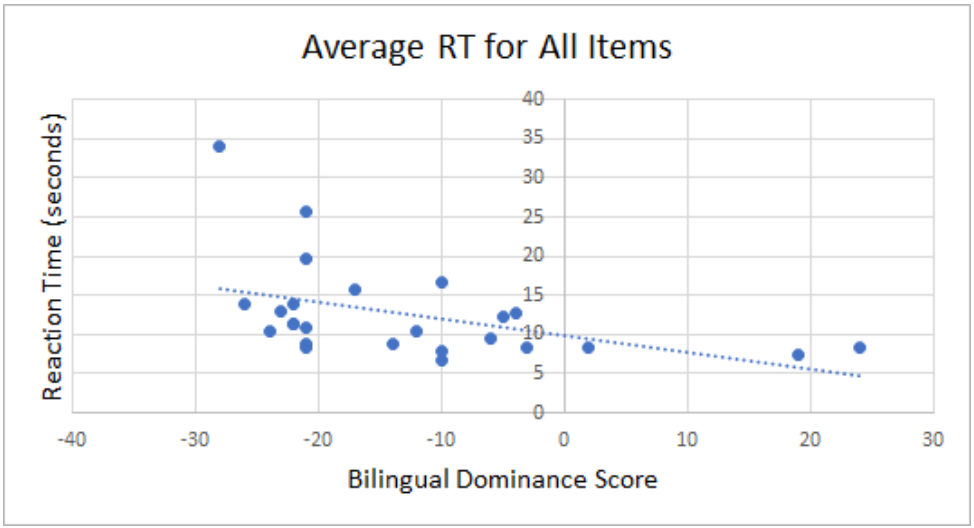

Figure 4: Average RT on all test items by Bilingual Dominance Score.

4.3 Differences between Strongly L1 and L2-Dominant Bilinguals

The differences in performance between the highest and lowest quartiles of Spanish dominance (i.e., the most English-dominant and the most Spanish-dominant bilinguals) were also measured (Figure 9). The Spanish-dominant bilinguals had relatively similar RTs for literal and figurative targets regardless of whether the idioms were literal-figurative or figurative cognates. By contrast, English-dominant bilinguals processed figurative targets faster when the idioms were literal-figurative cognates. This suggests that the fact that bilingual fluency correlates with RT for literal targets for literal-figurative cognate idioms, but not of figurative targets for literal-figurative cognate idioms, is due to effects on English-dominant bilinguals, not Spanish-dominant bilinguals—i.e., English-dominant bilinguals are faster at processing figurative targets than literal targets for literal-figurative cognate idioms.

5 Discussion

5.1 Bilingual Fluency and Processing Speed

In contrast with Heredia et al.'s results, bilinguals processed literal targets for literal-figurative cognate idioms significantly faster as bilingual fluency increased. This finding could suggest that the primary factor affecting bilingual processing of literal targets for literal-figurative cognate idioms is not language transfer that slows down more fluent bilinguals. Rather, increased fluency results in shorter reaction times (RTs) in bilinguals with greater Spanish dominance.

One possibility explaining these results is the languages tested. Both this study and Heredia et al.

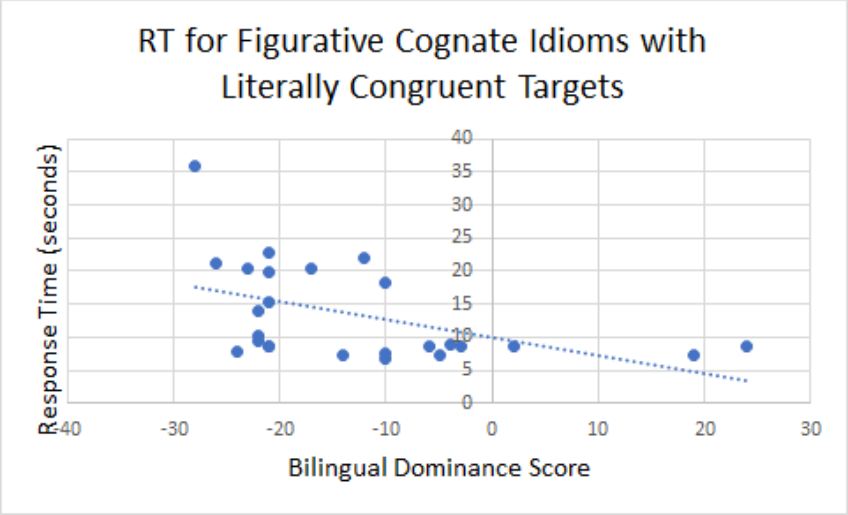

Figure 5: RT for figurative cognate idioms with literally congruent targets.

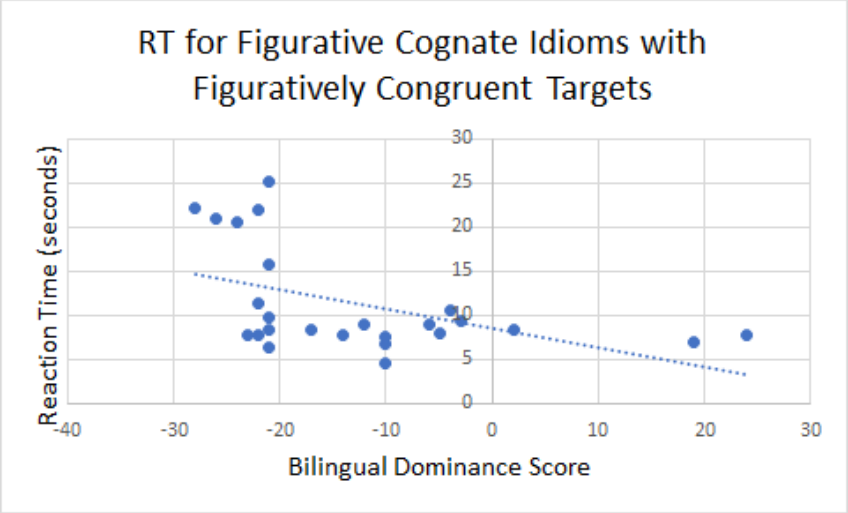

Figure 6: RT for figurative cognate idioms with figuratively congruent targets.

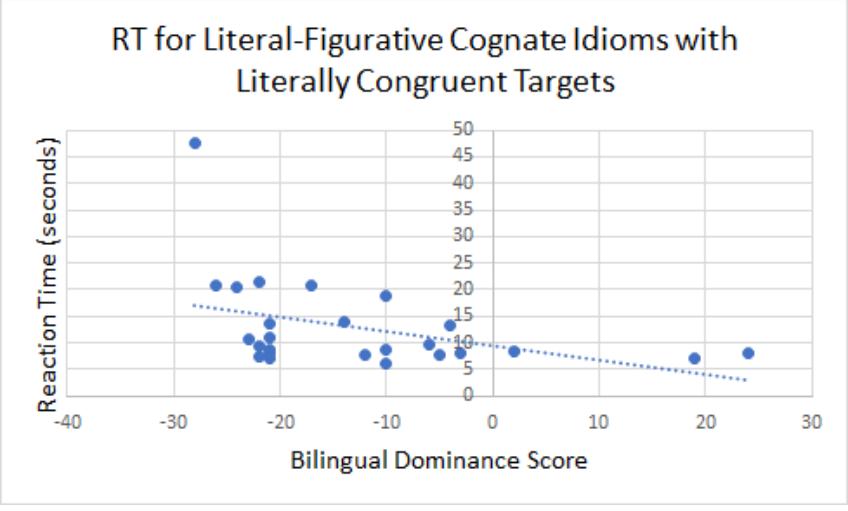

Figure 7: RT for literal-figurative cognate idioms with literally congruent targets.

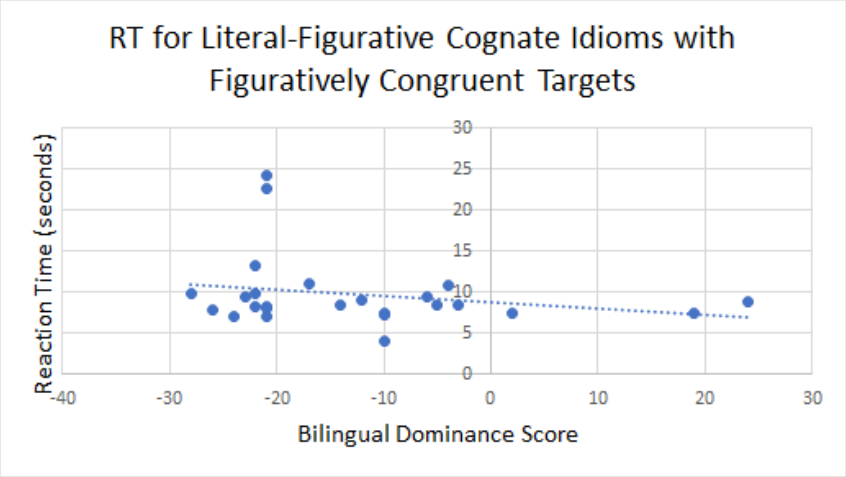

Figure 8: RT for literal-figurative cognate idioms with figuratively congruent targets.

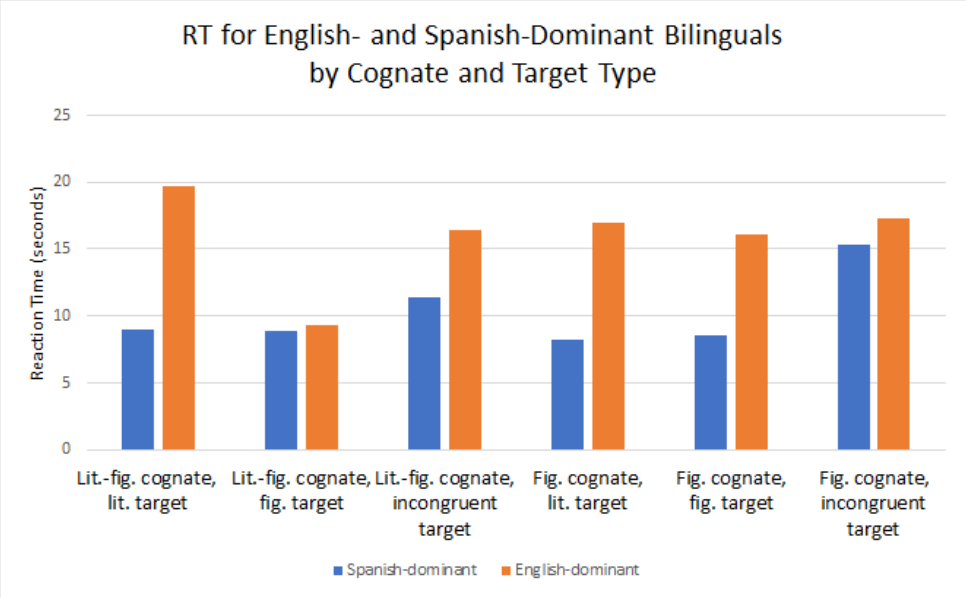

Figure 9: RT by cognate and target type for the most English-dominant and Spanish dominant participants.

tested English-Spanish bilinguals, of whom the most Spanish-dominant bilinguals had learned Spanish earlier in life. However, Heredia et al. tested participants in English, whereas this experiment examined them in Spanish. Thus, in that study, language transfer might result in longer RTs in the tested language, which was learned later on, but in this one, higher fluency resulted in shorter RTs in the tested language, which was learned earlier on. Future work could repeat this study with English idioms to investigate that possibility.

5.2 Transfer of Figurative Meaning

The experiment also found that bilingual fluency results in shorter RTs for both literally and figuratively congruent targets for figurative cognate idioms. This suggests that as bilingual fluency increases, ability to interpret idioms in one language independent of a literal cognate with the other language increases. However, for literal-figurative cognate idioms, there was a significant correlation between Spanish fluency and RT for literally congruent targets, but not figuratively congruent targets. Highly Spanish-dominant bilinguals processed literal and figurative targets for literal-figurative and figurative cognate

idioms at similar speeds, but English-dominant bilinguals were much slower at processing literal targets for literal-figurative cognate idioms than figurative ones.

In terms of bilingual representation of cognates in the mental lexicon, one explanation for this trend is that while Spanish-dominant bilinguals gained little advantage from an idiom's status as a literal-figurative cognate, English-dominant bilinguals were quicker at accessing the figurative meaning of idioms that were literal-figurative cognates with a familiar English idiom. That is, Spanish-dominant bilinguals may have processed idioms quickly regardless of whether they had a literal-figurative cognate idiom in English because their processing of idioms in Spanish had little to no reliance on the English lexicon. By contrast, the figurative meaning of the idiom was more readily accessible to the English-dominant bilinguals when processing a literal-figurative cognate because they were accustomed to seeing the idiom used figuratively in English: the idiom's figurative meaning, interpreted non-compositionally, was more salient in the English lexicon. This suggests that language transfer from L1 to L2 does occur on the figurative level in L1-dominant bilinguals.

Future studies testing other languages on a larger scale are needed to examine whether these preliminary results indeed hold cross-linguistically. In addition, conceding the limitations of examining idioms without context, future work could provide insight into how context affects the speed with which literal or figurative meaning is interpreted. These extensions could provide further insight into idiom representation in the bilingual lexicon.

Acknowledgments

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