

# Context, but not proficiency, moderates the effects of metaphor framing: A case study in India

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## Abstract

Metaphors suffuse language and affect how people think. A meta-analysis of metaphor framing studies conducted between 1983 and 2000 concluded that metaphors are about 6% more persuasive than literal language (Sopory & Dillard, 2002). However, each of these studies was conducted in English with samples drawn from populations of native English speakers. Here, we test whether and how language proficiency moderates the influence of metaphor frames. Sampling from a population of non-native, but generally proficient English speakers from India, we found that metaphor frames systematically affected people who reported using English primarily in informal contexts (i.e., among friends and family and through the media) but not those who reported using English primarily in formal contexts (i.e., for school or work). We discuss the implications of this finding for countries like the US, where English is increasingly a non-native language for its residents, and for theories of language processing more generally.

**Keywords:** Metaphor, framing, analogy, persuasion, political psychology, reasoning

## Introduction

Does the context in which people use a language moderate the influence of metaphor on thought? Are fluent speakers of a language more likely to use metaphors to reason about complex problems than people who are less fluent in the language?

The results of several studies suggest that metaphor frames *can* influence how people think about important socio-political issues (Hauser & Schwarz, 2014; Jia & Smith, 2013; Landau, Keefer, & Rothschild, 2014; McGuire, 2000; Ottati, Rhoads, & Graesser, 1999; Robins & Mayer, 2000; Sopory & Dillard, 2002; Thibodeau & Boroditsky, 2011, 2013, 2015). A meta-analysis of metaphor framing studies conducted between 1983 and 2000 concluded that metaphors are about 6% more persuasive than literal language (Sopory & Dillard, 2002). More recent experiments have found that metaphors can influence how people think about everything from cancer prevention (Hauser & Schwarz, 2014) to immigration (Landau, Sullivan, & Greenberg, 2009) and crime (Thibodeau & Boroditsky, 2011, 2013, 2015).

However, each of these studies was conducted in English with samples drawn from populations of native English speakers. Given the prevalence of metaphor in discussions of socio-political issues and the changing landscape of language demographics in countries like the United States (where the

percentage of people who report speaking a language other than English at home increased 158.2% between 1980 and 2010; Ryan, 2013), there are important practical motivations for investigating whether and how non-native (second or foreign language) speakers are influenced by metaphor frames.

Considering the role of language fluency in metaphoric thinking may also inform how cognitive scientists think about the role of language in reasoning more generally. One possibility is that people think more "systematically" when using a second language (Costa et al., 2014; Keysar, Hayakawa, & An, 2012). Second languages may be less valenced and arousing than first languages (e.g., Ayçiçeği & Harris, 2004; Pavlenko, 2007) and processed less automatically (Favreau & Segalowitz, 1983). If being influenced by a metaphor frame is similar to well-studied decision-making biases (e.g., loss aversion in gain/loss framing), then second language speakers of English may be less likely to be influenced by metaphorical descriptions of social dilemmas.

On the other hand, if metaphor is a core feature of language or if there is nuanced variability in peoples' facility with second languages, then one may expect to find systematic effects of metaphor on decision-making among (at least a subset) of a non-native speaking population (e.g. Harris, 2004).

In the present study, we identify a population of non-native, but generally proficient English speakers from India. We distinguish between individuals who tend to use the language in more formal environments like school and work from individuals who tend to use the language in more informal environments like with friends and family or through media like television and radio. We hypothesized that people who used English with friends and family (i.e., in informal contexts) – or simply more frequently – would be more likely to be influenced by the metaphor frames (Freed, Segalowitz, & Dewey, 2004). Using English in informal settings (or more frequently) may imbue the language with more emotional valence and lead this subgroup to process metaphors more like native English speakers.

## Experiment

### Population and Participants

We recruited participants from India, a country with a diverse population and a rich history of multilingualism (Annamalai, 2004). Although there are more than 150 recognized languages in India and over 500 dialects (Ahmad, 2009), two of the most popular are the two official languages of the country: Hindi and English. As a result, many people who live in India speak both English and Hindi. Importantly though, there is variability in the setting in which people use these languages, the age at which they begin learning these languages, and their level of proficiency with each language.

In addition to providing interesting language demographics, the population of India represents an understudied group in cognitive science (Henrich, Heine, & Norenzayan, 2010). With the increased use of internet-based methodologies (e.g. Amazon’s Mechanical Turk; Buhrmester, Kwang, & Gosling, 2011), however, this population is now much more accessible. A recent survey has found that there are more people on Mechanical Turk in India than any other country (Pavlick, Post, Irvine, Kachaev, & Callison-Burch, 2014).

We asked participants in our sample whether they used English in primarily formal (e.g., school and work) or informal contexts (e.g., at home, among friends, via media), as well as a variety of other questions about their familiarity with and use of English. As expected (see Table 1), participants who reported using English more often in informal settings tended to report learning English at an earlier age ( $p = .059$ ) and using English more frequently overall – in every setting that we asked about (e.g., at home, school/work, and among friends and family); these participants also reported that they understood and could speak English better.

As shown in Table 1, participants who reported using English more often in informal settings tended to be more educated: 41.6% of these participants reported having an advanced degree (Master’s or Doctorate) compared to 24.7% of participants who reported using English primarily in more formal settings. Thus, the difference between groups may be related to differences in education or motivation or intelligence between groups – but not in socioeconomic status, political ideology, or current age. We consider this possibility by including participants’ educational history as a covariate in our analyses.

### Stimuli

Descriptions of 10 socio-political dilemmas were created. For each issue, two metaphor frames were designed to promote different ways of thinking about the dilemma (see Table 2 for domains and frames). For instance, a crime problem was either described as a *VIRUS plaguing* or *BEAST preying* on a community; in a discussion of education, schools were either described as *GARDENS nurturing* or *FACTORIES molding* young minds.

The metaphor frames and candidate responses were adapted from news reports and other descriptions of the target

Table 1: Patterns of English use as a function of where participants most commonly use the language. Asterisks indicate statistically significant differences between groups at the \* $p < .05$  and \*\*\* $p < .001$  levels.

	Informal	Formal
N	209	160
Age of acquisition	8.25	9.49
Frequency*** (1-5)	3.50	3.11
Home*** (1-4)	3.00	2.24
Media*** (1-4)	3.26	2.90
Friends*** (1-4)	3.08	2.71
Family*** (1-4)	2.83	2.11
School*** (1-4)	3.73	3.27
Work*** (1-4)	3.59	3.29
Other*** (1-4)	2.85	2.44
Understand*** (1-5)	4.42	4.07
Speak*** (1-5)	4.31	3.83
Age	31.95	33.44
Education*** (1-7)	6.30	5.92
Ideology(0-100)	49.16	47.73
SES (1-4)	2.31	2.26
Gender: Male*	54%	66%

issues; they were designed to be interpretable by a broad audience (none were about specific issues in the United States, for instance) with common conventional metaphors. Related versions of the stimuli have been used to investigate how metaphors influence thought among native English speakers, thereby providing a point of comparison for the present study (Thibodeau & Gehring, 2015; Thibodeau, in press).

Table 2: Issues and Frames

Issue	Frame A	Frame B
Crime	Virus	Beast
Income Inequality	Destabilize	Split
Education	Gardens	Factories
Environment	Backbone	Gem
Partisan Politics	Theater	Battle
Scientific Research	Puzzle	Summit
Housing	Failing Organ	Blemish
Medicine	Ecosystem	Assembly Line
Cheating	Boxer	Goalkeeper
Sports	Detective	Sniper

A single follow-up question for each issue asked the participant to suggest a policy intervention, attribute blame, or make an inference about the dilemma described. In every case, participants were asked to select between two candidate responses. For instance, after reading about a crime problem, participants were asked which of two policy interventions they thought would be most likely to reduce crime.

For half of the items, the response options were aligned with the metaphor frames; for half of the items, they were not. Consider the following three ways of addressing a crime problem:

- (a) Increase street patrols that look for criminals.
- (b) Reform educational practices and create after school programs.
- (c) Expand economic welfare programs and create jobs.

Prior work has found that “increasing street patrols” is more consistent with a crime BEAST while “reforming educational practices” and “expanding economic programs” are more consistent with a crime VIRUS (Thibodeau & Boroditsky, 2011, 2013). Thus, when a participant is asked to choose between options (a) and (b) or between options (a) and (c), one should expect to find a systematic influence of the frames. Reading about a crime BEAST should make people more likely to suggest “increasing street patrols”; reading about a crime VIRUS should make people less likely to suggest “increasing street patrols” in favor of “education” or “economic” reform. And indeed that is what previous work has found. However, if a participant is asked to choose between options (b) and (c), one should not expect to find a systematic influence of the frames (i.e., because both options are either congruent or incongruent with the metaphor frame).

The present experiment was designed so that each participant would encounter five issues for which the response options mapped clearly onto the metaphor frames (e.g., option *a* contrasted against option *b*) and five issues for which the response options did not map onto different frames (e.g., option *b* contrasted against option *c*).

Since there were only two metaphor frames for each issue, the distinction between *well-aligned* and *non-aligned* refers to a manipulation of the response options. For instance, response options (a) “increase patrols” and (b) “education reform” were considered *well-aligned* to the metaphor frames for the crime dilemma, while response options (b) “education reform” and (c) “economic reform” were considered *non-aligned* to the metaphor frames for the crime dilemma, regardless of whether crime was framed as a BEAST or VIRUS. Each participant read one of the four versions (one of the two metaphor frames; one of the two pairs of response options) of each of the 10 dilemmas.

This distinction between *well-aligned* and *non-aligned* items was validated in a previous study. Thibodeau and Gehring (2015) operationalized this distinction by presenting participants with two metaphor frames and two response options for the 10 issues listed in Table 2 ( $N = 100$  per item). Participants were instructed to match the frames to response options. The degree to which the sample matched response options to frames consistently was taken to reflect the clarity or congruence of conceptual mappings.

For instance, one group of participants was told that two politicians were using different metaphors (BEAST and

VIRUS) to argue for different approaches to a city’s crime problem: one was encouraging the city to “Increase street patrols that look for criminals” while the other was encouraging the city to “Reform educational practices and create after school programs.” For this item, Thibodeau and Gehring (2015) found that 77% of participants matched “patrols” to BEAST and “education” to VIRUS, suggesting that these two response options were *well-aligned* with the frames. Another group of participants was asked to match the same frames with different approaches to the city’s crime problem: “Reforming educational practices and create after school programs” and “Expanding economic welfare programs and create jobs.” For this item, participants showed less agreement: 59% matched “education” to BEAST and “economy” to VIRUS, suggesting that these two response options were *not well-aligned* with the frames.

Items designated *well-aligned* yielded patterns of matching that were significantly more consistent ( $M = .778$ ,  $SD = .086$ ) than items designated *not well-aligned* ( $M = .575$ ,  $SD = .056$ ),  $t(9) = 11.605$ ,  $p < .001$ ,  $d = 3.670$  (Thibodeau & Gehring, 2015).

Including this manipulation yielded 40 items: 10 issues, each with two metaphor frames, paired either with responses that mapped clearly onto the frames (*well-aligned*) or with responses that did not map clearly onto the frames (*non-aligned*).

## Procedure

Data from 400 participants were recruited from Amazon Mechanical Turk. Participants were required to live in India and have a good performance record on previous tasks. Participants were instructed to participate only if they were at least 18 years old.

The task involved reading and answering questions about 10 metaphorically framed dilemmas – of which five included response options that were *well-aligned* with the frames and five that included response options that were *not well-aligned*. An embedded timer recorded how long participants spent reading and responding to the dilemmas. Data from participants who spent less than 5 seconds on average or more than a minute on average reading and responding to the dilemmas were excluded ( $n = 31$ ), leaving data from 369 participants for analysis.

After reading and answering questions about the 10 dilemmas, participants were asked about their familiarity with English (i.e., “How frequently do you use English?” “How would you rate your English speaking ability?” “How would you rate your English comprehension ability?”; all rated along 5-point scales), about the context in which they primarily used the language (*formal*: school, work; or *informal*: among friends and family, through media like TV and radio), and about the age at which they began learning English. Participants were also asked about the frequency with which they used English overall and in specific settings (i.e., with friends, family, at school, at work, at home, in media consumption, and in other contexts). They responded to these questions

using a 4-point scale that ranged from “never” to “very frequently.”

Finally, participants were asked a set of more general demographic questions, including their age, educational history, socio-economic status, political ideology, and gender. Summary statistics related to the language history and demographics of the sample are shown in Table 1.

### Analysis

Responses were coded as “congruent” or “incongruent” with the frame they were presented with. For instance, in the context of the crime example, “Increase street patrols” was coded as congruent with the BEAST frame and incongruent with the VIRUS frame for the *well-aligned* version (i.e., when the response options contrasted “increasing street patrols” with “education reform”); for the *non-aligned* version (i.e., when “education reform” was contrasted against “economic reform”), “economic reform” was coded as congruent with a crime VIRUS and incongruent with a crime BEAST.<sup>1</sup> This approach captures the joint effects of the pairs of metaphor frames and is consistent with prior work on metaphor framing (e.g., Robins & Mayer, 2000; Thibodeau & Boroditsky, 2011, 2013).

One advantage of such a coding scheme is that it provides a clear metric for interpreting the degree to which metaphors influence judgments. Metaphor frames that do not systematically influence the way people think about an issue will yield a congruence score close to .5; metaphor frames that influence people to choose the response option that is consistent with the frame’s entailments will yield a congruence score above .5; and metaphors that influence people to choose the response option that is inconsistent with the frame’s entailments will yield a congruence score less than .5.

### Results

Separate averages were computed by participant for the proportion of congruent responses to the *well-aligned* items and for the *non-aligned* items. Then a mixed-ANOVA was fit to these scores with two predictors: a within-subjects factor for item type (*aligned* or *not*) and a between-subjects factor for the context in which participants’ reported they used English predominantly (2 levels: in *formal* settings like school or *informal* settings like at home). The model revealed a statistically significant interaction between item type and context,  $F(1, 367) = 4.406, p = .037, \eta^2 = .012$ . There were no main effects of item type or English usage context,  $F_s < 2.1, p_s > .15$ .

As illustrated in Figure 1, participants who reported using English in informal settings were systematically influenced by the metaphor frames when the response options were *well-aligned* with the frames ( $M = .544, 95\%CI = [.503, .585]$ ). Responses were no different from chance in the other three

<sup>1</sup>Although patterns of matching were less systematic for *non-aligned* items, they were different from chance,  $M = .575, 95\%CI = [.54, .61]$ ; range = [.52, .68], allowing us to code responses as congruent or incongruent with the frame.

cases – including for participants who reported using English in formal settings for items that were *well-aligned* (see Figure 1).

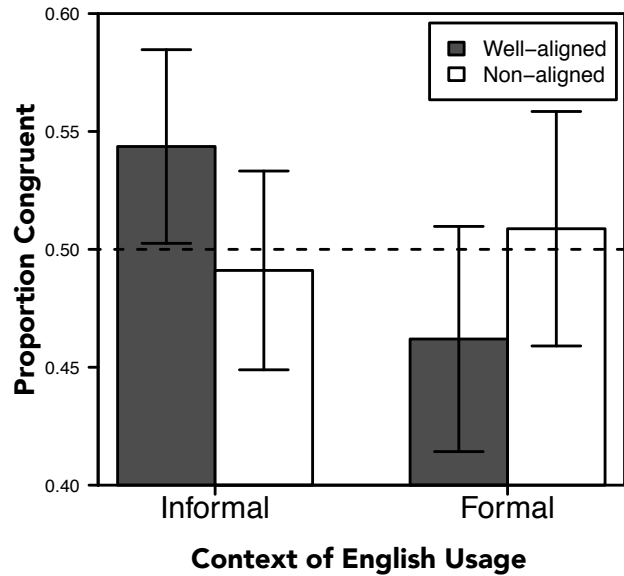


Figure 1: Congruent responding by item type (*aligned* or *not*) and where the participant reported using English. Error bars denote 95% confidence intervals.

The percentage of congruent responses by issue for *well-aligned* items are shown in Table 3. One indication that the metaphors affected people who used English in an informal context more than for people who used English in a formal context can be seen in the variability in congruence for the two groups. For participants who reported using English in an informal context, the proportion of congruent responses was more consistent across items ( $SD = .055, 95\%CI_{SD} = [.038, .100]$ ) than for participants who reported using English in a formal context ( $SD = .082, 95\%CI_{SD} = [.056, .150]$ ).

Table 3: Percentage of congruent responses by issue for *well-aligned* items by English usage context.

Issue	Informal	Formal
Crime	52	41
Income Inequality	55	36
Education	51	48
Environment	55	44
Partisan Politics	64	62
Scientific Research	59	51
Housing	46	57
Medicine	57	38
Cheating	47	53
Sports	54	49

As noted earlier, participants who reported using English

primarily in informal settings tended to be better educated than participants who reported using English primarily in formal settings. To test whether this difference could account for the effect of usage context, we added participants' educational history to the ANOVA. In this analysis, the interaction between usage context and item type was consistent with that of the previous model,  $F(1, 365) = 4.445, p = .036$ . The model did not reveal a main effect of education or interactions (either 2- or 3-way) between education, item type, and usage context,  $F_s < 3, p_s > .08$ . However, we did find a marginally significant interaction between education and item type,  $F(1, 365) = 2.969, p = .086$ . Controlling for where participants reported using English, the model suggested that more educated participants were somewhat less likely to give a response that was congruent with how the *well-aligned* dilemmas were framed,  $B = -.017, SE = .012$  (for comparison,  $B = .025, SE = .012$ , for the interaction between item type and usage context).<sup>2</sup>

We also tested whether language usage frequency, a scalar measure, rather than the setting in which participants reported using English most often, moderated the influence of the metaphor frames. A two-way mixed ANOVA revealed no interaction between item type (*aligned* or *not*) and English usage frequency,  $F(1, 367) = 2.115, p = .147$ , suggesting that the setting in which people use language impacts how people process metaphor frames—and not just how frequently they use the language.<sup>3</sup>

## Discussion

The present study was designed to test whether language proficiency moderates the effects of metaphor framing on reasoning. Consistent with our hypothesis, we found that Indian participants who reported using English in informal settings – at home, with friends and family, and through the media – as opposed to in formal settings like school and work were most likely to show a systematic influence of the metaphor frames. As predicted (and consistent with prior research), this effect was restricted to items for which there was a clear alignment between the frames and response options.

There are several important implications of this finding. First, it represents an initial step toward understanding how non-native speakers process and use metaphors that commonly suffuse discussions of socio-political issues. We found a shift of about 9 percentage points toward the congruent response among participants who reported using English in informal settings, for *well-aligned* items. The magnitude of this effect is similar to what was found with these stimuli among native English speakers: a shift of about 6 percentage points.

<sup>2</sup>Substituting the measure of education for English usage context revealed no significant main effects or interactions:  $F(1, 367) = 1.637, p = .202$  for the interaction between item type and education in this model.

<sup>3</sup>A model with all three predictors revealed a significant interaction between item type and language context,  $F(1, 365) = 4.437, p = .036$ , consistent with the initial analysis reported, and no other significant main effects or interactions.

This finding suggests that the context in which we learn and use a language can influence how we interpret linguistic information and how the language affects decision-making. Rather than simply distinguishing between native and non-native speakers of a language or between people who are more or less proficient in the language, we found that usage context affected behavior. On this view, “foreign language effects” (Costa et al., 2014; Keysar et al., 2012) may result from differences in where and how multilinguals use the languages they speak.

Studies of where and how people use language support this interpretation (Marian, Blumenfeld, & Kaushanskaya, 2007). First languages tend to be learned primarily through interactions with friends and family and through media (in relatively informal contexts), whereas second languages are often learned in classroom environments (in comparatively formal contexts).

Of course, it is difficult to distinguish the general influence of language proficiency from the more nuanced influence of contextual factors, as these variables are highly related. People who tend to use a language in familial or social settings tend to consider themselves more proficient in the language. However, an analysis of our data, in which a measure of language fluency was substituted for the measure of usage context, revealed no statistically significant effects, suggesting that the context in which people reported using English mattered more than their self-reported fluency with the language. That said, future work should seek to obtain more objective measures of language proficiency in order to more carefully examine these relationships.

The present work also complements ongoing cross-linguistic investigations of metaphor in conceptual representation. Cognitive linguists have identified remarkable similarity in the kinds of metaphors used for abstract domains like emotions, mental states, and time in different languages (Yu, 1998; Ferreira, 2008). For instance, HEAT is a common metaphor for ANGER in English, as well as in Chinese and Portuguese.

To our knowledge, there has not been systematic investigation of the kinds of conventional metaphors commonly used to discuss socio-political issues across languages. Crime, for instance, may or may not be commonly discussed as a VIRUS or BEAST in places other than the US and in languages other than English. However, our findings suggest that people who use English informally — to talk with friends and family and through the media — are affected by metaphor frames in ways that are quantitatively similar to native English speakers.

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