Comparing Metaphors Reveals their Persuasive Capacity

Paul H. Thibodeau (paul.thibodeau@oberlin.edu)
Karlyn Gehring (karlyn.gehring@oberlin.edu)
Oberlin College, Department of Psychology
120 W Lorain St; Oberlin, OH 44074, USA

Abstract

Metaphors pervade discussions of sociopolitical issues and influence the way we think. One challenge facing researchers, however, is that it can be difficult to make principled predictions about exactly how metaphors will influence thought. Here, we use an explicit comparison task to quantify the persuasive capacity of metaphors. In Experiment 1, people were given two metaphors and two policy responses. They were asked to match one policy to each metaphor. In Experiment 2, people read metaphorically framed issues and chose between policy responses. We found that data from the explicit comparison task predicted behavior from another group of participants on the metaphor framing task; a measure of linguistic association from LSA did not predict behavior on the framing task. These results suggest a relationship between explicit analogical comparison and more implicit natural language metaphor processing. It also provides a method for measuring the conceptual entailments of metaphors.

Keywords: metaphor; analogy; relational reasoning; comparison; framing; decision making

Introduction

Metaphors pervade discussions of social and political issues and powerfully influence the way we think and act. At a mechanistic level, metaphors can shape thought in a variety of ways. For instance, metaphors can explicitly influence how people process information. Deliberately invoked, instructive metaphors can make novel concepts seem more familiar and encourage elaboration (Ottati, Rhoads, & Graesser, 1999). However, metaphors can also play a more implicit role in how people process information by shaping the way people build representations of complex problems (e.g., Thibodeau & Boroditsky, 2011, 2013). In this way, metaphors are especially powerful tools for persuasion (cf. Petty & Cacioppo, 1986).

A fundamental premise of this work is that metaphors provide structure (Lakoff & Johnson, 1980). They encapsulate systems of entailments from a source domain in the form of relations between attributes that facilitate thinking about a target domain (Gentner, 1983). Indeed, some have argued that metaphorical mappings from embodied domains like SPACE are fundamental for thinking about abstract ideas like TIME (e.g., Boroditsky, Fuhrman, & McCormick, 2010; Clark, 1973; Traugott, 1978).

Prior work has revealed that relational structure conveyed though metaphor frames can systematically affect patterns of inference (e.g., Hauser & Schwarz, 2014; Landau, Sullivan, & Greenberg, 2009; Thibodeau & Boroditsky, 2011, 2013). For instance, in one study, people who read that crime was a *virus* were 18% more likely to suggest reducing crime by instituting social reform programs than people who had read that crime was a *beast*. Those who read the *beast* version were more likely to suggest reducing crime through increased law enforcement and prison sentences.

A Challenge for Research on Conceptual Metaphor

One challenge facing researchers who study the role of metaphor in reasoning is that it can be difficult to quantify the entailments of metaphors. That is, is there a way to make principled predictions about how metaphors will influence the way people think about the domains they describe?

The most common approach has been to use intuition--either the researcher's own intuitions or intuitions based on detailed linguistic analyses (e.g., Hauser & Schwarz, 2014; Hauser & Schwarz, 2014; Landau, Sullivan, & Greenberg, 2009; Thibodeau & Boroditsky, 2011, 2013). For instance, it seems like describing the economy as a *stalled vehicle* should make people more likely to infer that the economy is in need of large-scale financial stimulus – a metaphorical *jumpstart*; it seems like describing the economy as a *stunted plant* should make people more likely to think about sustainable economic practices – metaphorical *sunlight, water,* and *nutrients*.

However, using intuition as a foundation for prediction can be problematic because people have limited access to higher order cognitive processes (cf. Nisbett & Wilson, 1977). Different people may have different intuitions about the inferences that a given metaphor should support (Keysar & Bly, 1995). Further, it can be difficult to predict the extent to which metaphors encourage particular inferences.

In the current paper, we offer a method for making principled predictions about the persuasive capacity of metaphor frames, using an explicit metaphor comparison task. We present the results of two experiments. In the first, people compared two metaphors for a target domain like the educational system (e.g., schools are *factories*, *molding* or *gardens*, *nurturing* young minds) and two policy responses (e.g., underperforming schools should "adopt a common curriculum" or "increase opportunities for extracurricular activities like music and athletics"). Participants were asked to match one of the policies to one metaphor and the other policy to the other metaphor.

In the second experiment, a separate group of participants made judgments about metaphorically framed issues. In this case, a single metaphor was embedded in the description of the issue (e.g., an underperforming school was framed as a *factory* or a *garden*). Participants were asked to choose which of two policy responses (e.g., "adopting a common

curriculum" or "increasing opportunities for extracurricular activities"), in their opinion, would lead to a better outcome.

Our hypothesis was that judgments from the first experiment – the explicit comparison task – would predict the persuasive influence of the metaphors in the second experiment – the metaphor framing task. Such a finding would be valuable for key theoretical and practical reasons.

On theoretical grounds, the finding would suggest a relationship between explicit analogical comparison and relatively implicit metaphor processing (Bowdle & Gentner, 2005; Kurtz & Gentner, 2013). Indeed, one alternative hypothesis was that we would not find a relationship between patterns of behavior on the two experiments because processing metaphors in natural language engages different mechanisms than deliberate comparison (Keysar, Shen, Glucksberg, & Horton, 2000; but see Thibodeau & Durgin, 2008). Reading conventional metaphors in natural language may not sufficiently evoke the conceptual entailments of the frames.

This method also allows us to test the possibility that metaphors influence thought because of their linguistic associations rather than conceptual entailments (McGlone, 2011). To predict behavior on the metaphor framing task, we pit judgments from the metaphor comparison task against a measure of semantic association, gathered from Latent Semantic Analysis (LSA; Landauer, Foltz, & Laham, 1998). We predicted that patterns of behavior from the explicit comparison task would be more strongly related to patterns of behavior on the metaphor framing task because natural language metaphors are more than linguistic primes (Thibodeau & Boroditsky, 2011, 2013). On this view, metaphors instantiate conceptual structure, which influences how people build representations of target issues.

There are also several practical advantages to quantifying the persuasive capacity of metaphor frames with an explicit comparison task. For instance, this method avoids idiosyncratic biases that may be associated with any individual conducting a linguistic analysis. It also provides a means of quantifying the degree to which a metaphor frame lends support for a target issue. Larger differences between the metaphors on the explicit comparison task should indicate more persuasive metaphor frames.

Methods

Participants

We sampled 600 participants in the first experiment and 1,200 participants in the second experiment. Roughly 100 participants were exposed to each stimulus item in each experiment. We recruited and paid people $1.00 in exchange for participation through Mechanical Turk. We used Turk's exclusion criteria to ensure that participants lived in the United States and had a good performance record (at least 90% approval on previous tasks). We also required that participants be at least 18 years old.

In Experiment 1, data from 3 participants were excluded because an incorrect completion code was submitted. In Experiment 2, data from 125 participants were excluded because an incorrect completion code was submitted or because they had participated in Experiment 1.

In both experiments our samples included slightly more males (56% and 51%) than females. The average age of participants was 34.4 (*sd* = 12.2) in Experiment 1 and 32.4 (*sd* = 10.3) in Experiment 2.

Materials & Design

Ten descriptions of socio-political issues were created for the two experiments. For each issue, we designed two metaphor frames and four policy responses. The two metaphor frames seemed to have different conceptual entailments. The four policies for each issue were chosen to reflect real world proposals; some were constructed to be more consistent with the entailments of one of the metaphors and others were constructed to be more consistent with the entailments of the other (e.g., "adopting a common curriculum" seemed to be more consistent with a *factory* metaphor for education, whereas "increasing opportunities for extracurricular activities like music and athletics" seemed to be more consistent with a *garden* metaphor).

In Experiment 1, participants read each issue and matched policy proposals to metaphors in an explicit comparison task. In Experiment 2, participants read each issue and were asked to judge which of the policies seemed best (in their opinion). In Experiment 2, unlike Experiment 1, a single metaphor frame was embedded in the description of the issue. Participants in this experiment were only exposed to one of the two metaphors for each domain. We used data from the first experiment to predict behavior on the second experiment.

The order of the stories and response options were randomized between participants in both experiments. The full instructions for the two experiments and example stimuli are shown below.

Experiment 1: The Comparison Task In the comparison task (Experiment 1), people were presented with a description of an issue (e.g., education) and a pair of metaphor frames (e.g., *factory* and *garden*). The description of the education issue read:

> Norwalk is a city with an education problem. Historically, the schools have been excellent. Unfortunately, in recent years, there have been cuts to the budget, which have forced the city to fire teachers and eliminate extracurricular activities. Each year a smaller and smaller number of students have graduated who meet the standards that city officials hope to achieve. A recent assessment found that a minority of students were able to read at their grade level and that more and more are dropping out.

Participants were told that different metaphors were being used to support different policy interventions. For instance:

> The city's officials know that they have to change certain policies in response to the problem, but they aren't sure which policies to change or how much to change them. Two of the city's officials are leading this debate and they tend to talk about the problem in different ways.
>
> One argues that "Schools are factories, attempting to mold young minds."
>
> The other argues that "Schools are gardens, attempting to nurture young minds."

The participant's task was to match an intervention to each metaphor. The instructions for this part read:

> What should officials emphasize to improve school performance? Pick the item that you think is most consistent with the factory expression, then drag and drop that item into the 'Factory' box. Do the same with the proposal that is most consistent with the garden expression and drag and drop it into the 'Garden' box.

We designed four policy responses for each issue. For example, the following four options were adapted from current real-world policy proposals for education:

1. Increase extracurricular opportunities like music and athletics
2. Increase the diversity of the student-body
3. Adopt a common curriculum
4. Conduct more rigorous teacher assessments

Participants in the comparison task were presented with a subset of two of the four possible response options. This created six versions of each stimulus item. Each participant read one version per domain (i.e. everyone read and responded to 10 issues).

Experiment 2: The Metaphor Framing Task The metaphor framing task (Experiment 2) was a between-subjects test of the persuasive capacity of the metaphors. Participants in this experiment read issues with metaphor frames embedded in the text. The metaphor was not highlighted in Experiment 2, nor were participants instructed to choose responses that they thought were consistent with the metaphors they were given. For instance, the education story read:

> Schools are {factories/gardens}, attempting to {mold/nurture} young minds. Norwalk is a city with an education problem. Historically, the schools have been excellent. Unfortunately, in recent years, there have been cuts to the budget, which have forced the city to fire teachers and eliminate extracurricular activities. Each year a smaller and smaller number of students have graduated who meet the standards that city officials hope to achieve. A recent assessment found that a minority of students were able to read at their grade level and that more and more are dropping out.
>
> The city's officials know they must make policy changes in response to the problem. Which of the following should officials emphasize to improve school performance?

Participants were asked to choose between two interventions. There were 12 versions of each stimulus item in the metaphor framing task (six for each metaphor frame). Each participant read one version of each stimulus item (i.e. everyone read and responded to 10 issues).

Using LSA to Measure Lexical Association We used LSA to measure the lexical association between the metaphor frames and response options. We did this three ways, computing the relationship between:

1. The metaphoric words and policy descriptions.
2. The sentence that contained the metaphor(s) and policy descriptions.
3. The entire metaphorically framed report and policy descriptions.

The three methods for quantifying semantic association were significantly correlated with each other ($r[78] = .740$, between methods 1 and 2; $r[78] = .423$, between methods 1 and 3; $r[78] = .779$, between methods 2 and 3; all ps $< .001$). Here, we report analyses using the first method because it maximized the variability of the scores between metaphor conditions. The results were similar when we used methods 2 and 3.

Results

The results of Experiment 1 revealed substantial variability in the degree to which policy interventions were associated with metaphors. On average, there was a 39.803 percentage point difference in the associations between metaphors and policies ($sd = 21.895$; range: 4.4 to 81.6). In some cases, there was overwhelming agreement in how the responses should be paired with the metaphors. For instance, almost all participants (84.6%) thought that "adopting a common curriculum" was a better fit to a *factory* metaphor for the educational system and that "increasing extracurricular opportunities for students" was a better fit to a *garden* metaphor; only 15.4% of participants thought that "adopting

Intervention 1:	Intervention 2:	Comparison Task			Framing Task		
		Garden	Factory	**Diff**	Garden	Factory	**Diff**
Extracurricular opportunities	Common curriculum	.846	.154	**.692**	.593	.490	**.103**
Extracurricular opportunities	Student diversity	.620	.380	**.24**	.871	.879	**-.008**

Table 1. The proportions of participants who chose Intervention 1 ("Increase extracurricular opportunities like music and athletics") over Intervention 2 in the Comparison Task (Experiment 1) and the Framing Task (Experiment 2). Correlations were run on the difference scores from the two experiments.

a common curriculum" was better fit to the *garden* metaphor and that "increasing extracurricular opportunities" was a better fit to the *factory* metaphor[1] (a difference of 69.2 percentage points; 84.6 – 15.4).

In other cases, there was less agreement as to how the response options paired with the metaphors. For instance, a small majority of participants (62.0%) thought that "increasing the diversity of the student body" was a better fit to a *factory* metaphor and that "increasing extracurricular opportunities" for students was a better fit to a *garden* metaphor for the educational system (a difference of 24.0 percentage points; 62.0 – 38.0) (see Table 1).

Similarly, the results of Experiment 2 revealed substantial variability in the degree to which the metaphors influenced people's policy preferences. On average, changing the metaphor frame led to a 7.112 (*sd* = 6.223) percentage point shift in policy preference (range: 0.1 to 34.1). For instance, those who read that the educational system was a *factory* were almost equally likely to think that schools should "increase extracurricular opportunities for students" (49.0%) as to think that schools should "adopt a common curriculum". However, people who read that the educational system was a *garden* were more likely to think that schools should "increase extracurricular opportunities for students" (59.3%) over "adopting a common curriculum". In this case, changing the metaphorical frame for the educational system from *factory* to *garden* led to a shift in 10.3 points (or 21%) in participants' preference for these two policies (see Table 1).

However, changing the metaphor for the school system did not seem to affect whether people preferred "increasing the diversity of the student body" compared to "increasing extracurricular opportunities for students". When the educational system was framed as a *factory*, 87.9% of participants thought the schools should "increase extracurricular opportunities for students"; when the educational system was framed as a *garden*, 87.1% of participants thought the schools should "increase extracurricular opportunities for students." In this case changing the metaphor for the educational system from *factory* to *garden* led to a shift in .8 points (less than 1%) in participants' preference.

We used the difference scores from the two experiments to compute a correlation between patterns of behavior on the two tasks. For instance, people were 69.2 percentage points more likely to think that "increasing extracurricular opportunities" (compared to "adopting a common curriculum") was a better fit to the *garden* than *factory* metaphor in the comparison task; a separate group of people were 10.3 percentage points more likely to endorse this policy response for an underperforming school that was framed as a *garden* compared to when the underperforming school was framed as a *factory* (see the "Diff" columns of Table 1).

Consistent with our hypothesis, the results of the two experiments were significantly correlated, $r[58] = .290$, $p = .025$. That is, the metaphor frames showed a larger effect on policy preferences in Experiment 2 when they were judged as better fits to a given metaphor in Experiment 1 (see Figure 1).

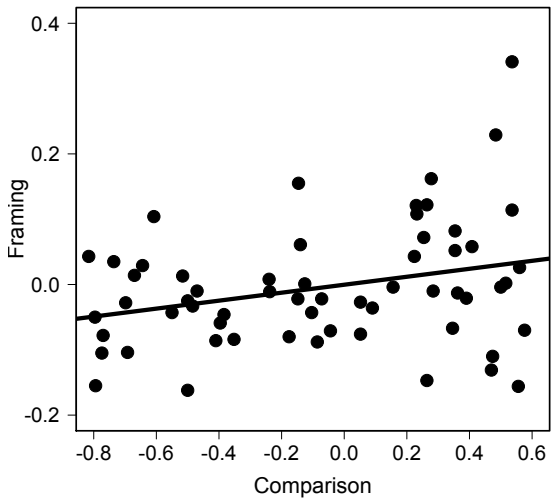

Figure 1. Scatterplot of the relationship between difference scores from the Comparison and Framing Tasks (Experiment 1 and Experiment 2).

For some issues, the correlation between the results of the two experiments was particularly strong. For instance, descriptions of a relatively mundane story about pool

[1] Because there are two metaphors and two response options in this task, the percentage of responses that matched the first intervention to the first metaphor is equal to the percentage of responses that matched the second intervention to the second metaphor (i.e. in this case, 84.6% of people matched "common curriculum" to *factory* and matched "extracurricular opportunities" to *garden*; in contrast, 15.4% of people matched "extracurricular opportunities" to *factory* and "common curriculum" to *garden*).

players showed a remarkably high correlation across experiments, $r[4] = .651$, $p = .161$. In contrast, the relationship between the results of the two experiments was virtually zero for the stories relating to the educational system, $r[4] = .018$, $p = .974$.

One explanation for this variability is that people were more persuaded by the metaphors for relatively mundane issues (e.g., pool: in which a billiards player was compared to a *sniper* or *detective*; science: in which conducting research was compared to *climbing a mountain* or *solving a puzzle*) and less persuaded by the metaphors for relatively important real world issues (e.g., education, crime, cheating: in which an administrator was compared to a *boxer fighting* for or a *goalkeeper defending* the integrity of tests like the SAT).

Another possibility is that some of the metaphors may have been more apt (Jones & Estes, 2006) or conventional (Bowdle & Gentner, 2005) than others (or more clearly related to the policy responses), leading people to be better able to access the conceptual entailments of the frames.

Issue	Comparison	LSA
Cheating	0.084	-0.426
Clinic	-0.206	0.205
Crime	0.235	0.066
Education	0.018	-0.798
Income inequality	0.563	-0.843
Nature	0.494	-0.736
Real estate	0.517	-0.780
Politics	0.701	-0.131
Pool	0.651	0.694
Science	0.459	0.057

Table 2. The first column shows correlations between the data from the comparison and metaphor framing tasks by issue; the second column shows correlations between the measure of semantic association from LSA and behavior on the metaphor framing task by issue.

Although the correlations are positive for nine of the 10 issues, we did find a negative correlation between data from the two tasks for one issue: a description of a health clinic. We think this may be because the words used to represent the metaphors for that issue in Experiment 1 may have misled participants. In that case, the clinic was described as a *manufacturing plant* or *ecosystem* that had a breakdown in the *assembly line* or *network*. We used the words *assembly line* and *network* rather than *manufacturing plant* and *ecosystem* to reference the two metaphors in the comparison task (i.e. "Pick the item that you think is most consistent with the assembly line / network"). For each of the other issues we used the first word or phrase that instantiated the metaphors, which, in this case would have been *manufacturing plant* and *ecosystem*. In addition to being the first words that instantiate the two metaphors, these words seem to better reflect the underlying conceptual metaphors that were instantiated for this issue (e.g., the word *network* seems like it could reference a *manufacturing plant* or an *ecosystem*). When data from this item are excluded, the correlation between data from the two tasks increases to $r[52] = .468$, $p < .001$.

Lexical Association

We also used a measure of semantic association from LSA to predict behavior on the metaphor framing task. This allowed us to test the possibility that the metaphors influence patterns of behavior on Experiment 2 because of low-level lexical associations between the frames and policies. For instance, the word *factory* may be more semantically related to "common curriculum" and the word *garden* may be more semantically related to "extracurricular actives." If this were the case, then the persuasive capacity of the metaphors may be grounded in a spreading activation mechanism (e.g., McGlone, 2011) rather than the deeper conceptual entailments of the metaphors.

We tested this possibility by computing the difference in semantic associations between the metaphor frames and each pair of policy responses. For instance, the *factory* metaphor for education was .28 LSA units more associated with "adopting common curriculums" (.52) than "increasing extracurricular opportunities" (.24). In contrast, the *garden* metaphor for education was .32 LSA units more associated with "adopting a common curriculum" (.61) than "increasing extracurricular opportunities" (.29). Then we computed the difference between the degree to which the metaphor frames were associated with the policies. In this case the LSA scores predicted that people would be more likely to select "adopting a common curriculum" (over "increasing educational opportunities") after reading the *garden* metaphor by .04 LSA units (.32 - .28). Across the full range of stimuli, this measure ranged from 0 to .18 ($M = .041$, $sd = .038$).

We found that there was no relationship between this measure of semantic association and behavior on the metaphor framing task, $r[58] = .076$, $p = .562$ (see Table 2 for correlations between this measure and behavior on the metaphor framing task by issue).

When both measures – data from the comparison task and scores from LSA – were included as predictors in a linear regression model to predict behavior on the metaphor framing task, we only saw an effect of data from the comparison task. Patterns of behavior from the comparison task were predictive of patterns of behavior on the framing task, $\beta = .333$, $SE = .131$, $p = .014$. Scores from LSA were not predictive of patterns of behavior on the framing task, $\beta = .155$, $SE = .132$, $p = .247$. There was no interaction between these measures, $\beta = .071$, $SE = .134$, $p = .599$.

In other words, variability on the metaphor framing task was positively predicted by judgments from the explicit comparison task while the measure of semantic association was not predictive of behavior on the metaphor framing

task. This suggests that the conceptual entailments of metaphors, and not their low-level linguistic associations, influence the way people think about the target issues.

General Discussion

To study how metaphors influence thought, we ran two experiments: an explicit comparison task and a metaphor framing experiment. We also collected data on the lexical association between metaphors and policy interventions.

We found that the degree to which the metaphors were viewed as supporting a particular policy response (in contrast to another), predicted the extent to which they were persuasive in the metaphor framing task. This relationship was particularly strong for more mundane issues, although future work will aim to measure other important variables that may also play a role (e.g., the aptness and conventionality of the metaphors).

We found that a measure of lexical association was not related to the persuasive capacity of the metaphors. Together, these findings suggest a relationship between explicit analogical comparison and relatively implicit metaphor processing (Bowdle & Gentner, 2005; Kurtz & Gentner, 2013). Reading conventional metaphors in natural language seems to evoke the conceptual entailments of the frames and influence the way that people build representations of the target domain, although people may not be aware of this process (Thibodeau & Boroditsky, 2011, 2013).

Along with the theoretical implications of the work, the method that we have presented offers a practical technique for making principled predictions about the persuasive influence of metaphor frames. Importantly, gathering intuitions from the sample population about the entailments of metaphors in a comparison task avoids idiosyncratic biases that may be associated with any individual conducting a linguistic analysis. It also provides a means of quantifying the degree to which a metaphor frame lends support for a target issue. Larger differences between the metaphors on the explicit comparison task suggest more persuasive metaphor frames.

This work also represents an important step toward building a broader and more representative stimulus base for work on metaphor and inference.

References

Boroditsky, L., Fuhrman, O., & McCormick, K. (2010). Do English and Mandarin speakers think differently about time? *Cognition.* doi:10.1016/j.cognition.2010.09.010

Bowdle, B. F., & Gentner, D. (2005). The career of metaphor. Psychological review, 112(1), 193.

Clark, H.H. (1973). "Space, time, semantics, and the child," in *Cognitive Development and the Acquisition of Language*, ed. T. E. Moore (New York, NY: Academic Press), 27–63.

Gentner, D. (1983). Structure mapping: A theoretical framework for analogy. Cognitive Science, 7(2), 155-170.

Hauser, D. J., & Schwarz, N. (2014). The War on Prevention Bellicose Cancer Metaphors Hurt (Some) Prevention Intentions. *Personality and Social Psychology Bulletin,* 0146167214557006.

Keysar, B., & Bly, B. (1995). Intuitions of the transparency of idioms: can one keep a secret by spilling the beans?. Journal of Memory and Language, 34(1), 89-109.

Keysar, B., Shen, Y., Glucksberg, S., & Horton, W. S. (2000). Conventional language: How metaphorical is it?. Journal of Memory and Language, 43(4), 576-593.

Kurtz, K. J., & Gentner, D. (2013). Detecting anomalous features in complex stimuli: The role of structured comparison. Journal of Experimental Psychology: Applied, 19(3), 219.

Lakoff, G., & Johnson, M. (1980). *Metaphor we live by*. Chicago: University of Chicago Press.

Landau, M. J., Sullivan, D., & Greenberg, J. (2009). Evidence that self-relevant motives and metaphoric framing interact to influence political and social attitudes. Psychological Science, 20(11), 1421-1427.

Landauer, T. K., Foltz, P. W., & Laham, D. (1998). An introduction to latent semantic analysis. Discourse processes, 25(2-3), 259-284.

McGlone, M. S. (2011). Hyperbole, Homunculi, and Hindsight Bias: An Alternative Evaluation of Conceptual Metaphor Theory. Discourse Processes, 48(8), 563-574.

Murphy, G. L. (1996). On metaphoric representation. Cognition, 60(2), 173-204.

Nisbett, R.E., & Wilson, T.D. (1977). Telling more than we can know: Verbal reports on mental processes. Psychological Review, 84(3), 231-259.

Ottati, V., Rhoads, S., & Graesser, A. C. (1999). The effect of metaphor on processing style in a persuasion task: A motivational resonance model. Journal of Personality and Social Psychology, 77(4), 688.

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. Advances in experimental social psychology, 19, 123-205.

Thibodeau, P., & Durgin, F. H. (2008). Productive figurative communication: Conventional metaphors facilitate the comprehension of related novel metaphors. Journal of Memory and Language, 58(2), 521-540.

Thibodeau, P.H., & Boroditsky, L. (2011). Metaphors we think with: The role of metaphor in reasoning. *PLoS ONE, 6*(2): e16782.

Thibodeau, P.H., & Boroditsky, L. (2013). Natural language metaphors covertly influence reasoning. *PLoS ONE, 8*(1): e52961.

Traugott, E. C. (1978). In J. H. Greenberg, On the expression of spatiotemporal relations in language, Word structure, Universals of human language, vol. 3. (pp. 369-400). Stanford, CA: Stanford University Press.