

THE BENEFITS OF METAPHORIC THINKING: USING INDIVIDUAL DIFFERENCES IN  
METAPHOR USAGE TO UNDERSTAND THE UTILITY OF CONCEPTUAL METAPHORS

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**Title**

The Benefits of Metaphoric Thinking: Using Individual Differences in  
Metaphor Usage to Understand the Utility of Conceptual Metaphors

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North Dakota State University's regulations and meets the accepted standards  
for the degree of

**DOCTOR OF PHILOSOPHY**

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## ABSTRACT

Metaphor representation theory posits that people often think, rather than merely speak, metaphorically. Particularly, concrete domains (e.g., tactile experiences) are recruited to represent abstract concepts (e.g., love). Based upon this theory, three assumptions can be derived. The first assumption is that metaphors should be common in speech and are not relegated to the realm of poetics. Second, the manipulation of metaphoric mappings should activate associated domains. The final assumption is that the use of conceptual metaphors facilitates the *understanding* of concepts with no physical referents (e.g., emotion). Research has supported the first two assumptions. The current studies were the first empirical test of the third assumption. A metaphor usage measure was developed and validated in the first study. Two additional studies directly tested the third assumption. Study 2 demonstrated that the metaphor usage measure predicted emotional understanding. Study 3 demonstrated that low metaphor usage predicted dysfunctional responses to negative daily events to a greater extent than high metaphor usage. Those scoring higher in metaphor usage also showed the established sweetness-pro-sociality metaphor effect to a greater extent than those low in metaphor usage. These findings empirically support the idea that metaphor use is associated with an increased understanding of concepts lacking physical referents, an important theoretical question in the metaphor literature. A foundation for future research is provided.

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## INTRODUCTION

Metaphor representation theory was originally outlined by Lakoff and Johnson (1980; 1999). They posited that metaphors are not artifacts of colorful language, but rather are tools used for the communication and interpretation of abstract concepts. Specifically, concrete domains or source domains (e.g., sights, smells, bodily states) are recruited to represent abstract concepts or target domains (e.g., emotions; Kövecses, 2000; Meier & Robinson, 2005). The fields of cognitive linguistics and social psychology have tested the various assumptions inspired by metaphor representation theory. Particularly, it has been shown that metaphors are not artifacts of colorful language, are common in speech, and likely universal (Gibbs, 1994; Kövecses, 2006). In addition, metaphors are an associative mapping of source and target domains; when one domain is primed, the other domain is activated (Landau, Meier, & Keefer, 2010). However, there seems to be a gap in the empirical evidence. That is, while metaphors are thought to aid in the *understanding* of abstract concepts (Crawford, 2009; Lakoff, 1987a), there has been little research to directly support this claim. The current studies address this gap in the evidence.

### Metaphor Representation Theory

Based upon metaphor representation theory, originally outlined by Lakoff and Johnson (1980), contemporary research has primarily been concerned with two main assumptions. The first assumption is that metaphors are not poetic language used by the elite, but instead everyday language used by nearly all humans for a common purpose (Gibbs, 1994). This common purpose is to represent abstract concepts – i.e., concepts that cannot be seen, felt, or touched – by recruiting concrete domains – i.e., tactile or sensory information (Kövecses, 2002). To investigate this assumption, cognitive linguists have accessed the database of language use.

From the language people use, inferences about how common metaphors are, how they operate, and sources of cultural variation and universality can be studied. Within their landmark book *Metaphors We Live By*, George Lakoff and Mark Johnson (1980) drew attention to common linguistic expressions and pointed out a common structure of metaphors. They suggested that metaphors are structured in a way such that source domains (concrete referents) provide meaning for target domains (abstract concepts), but not vice versa. For example, we may say that a person is “sweet”, but one would not say that a sweet food (e.g., caramel roll) has person-like attributes. Following these methods of linguistic analysis, numerous researchers have contributed to the validation of this first assumption of metaphor representation theory.

If metaphors only served a poetic purpose, one would not expect non-poets to use them with regularity. However, an analysis of everyday linguistic expressions suggests just how commonly metaphors are manifested (Gibbs, 1994; Kövecses, 2002; Lakoff & Johnson, 1980). In one study, analyzing the frequency of metaphors in television programs, Graesser, Mio, and Millis (1989) found that people used a unique metaphor approximately every 25 words (Gibbs, 1994). Metaphors are not only common, but appear to be universal (Kövecses, 2006; Lakoff, 1987a). Kövecses (2002) makes a compelling case for this universality by pointing to the ubiquity of metaphor use across numerous cultures. Kövecses (2000) also cites the work of Heine, Claudi, and Hunnemeyer (1991), whose initial interest was in studying the universality of certain grammar structures, a systematic effort that led them to study hundreds of languages. In doing so, these investigators were also struck by the apparent universality of metaphors in speech.

Even with the apparent common use and universality of metaphor use, some have sometimes suggested that metaphors are actually confusing and indirect ways of understanding



the attributes of objects or concepts (Gibbs, 1994). There is some intuitive appeal to this criticism of metaphor usage. However, research has shown that people process metaphoric sentences and their corresponding literal sentences with equal speed (Gibbs, 1994). Furthermore, it has been shown that providing literal interpretations of metaphoric sentences interferes with the comprehension of those sentences. For example, consider the phrase “I am feeling down”. When Glucksberg, Gildea, and Bookin (1982) asked individuals to interpret the sentence literally – i.e., in terms of a lower vertical position – they had a difficult time doing so. In other words, metaphoric phrases are interpreted automatically in their metaphoric, rather than literal, terms.

As noted above, two main assumptions have been tested. The second assumption is that we think rather than merely speak metaphorically (Kövecses, 2000; Lakoff & Johnson, 1980; 1999). This assumption has been increasingly supported in experimental social psychology. To test such an assumption, experimental social psychologists have relied upon various priming techniques. That is, by priming a given concept (versus control or comparison concepts), one can study its potential impact on cognition and behavior. In the realm of metaphors, a metaphor-consistent thought or experience (e.g., warmth) can be primed to discern whether it results in metaphor-consistent consequences (e.g., perceptions of social closeness).

In one of the earliest metaphoric priming studies, following positive-is-up/negative-is-down metaphors (e.g., “I’m feeling up”, “I’m feeling down”), Meier and Robinson (2004) randomly assigned words to higher or lower vertical positions. Consistent with these vertical metaphors for valence, positive words were categorized as positive in valence more quickly when placed in their metaphor-consistent “up” location, whereas negative words were categorized as negative in valence more quickly when placed in their metaphor-consistent “down” location. Following this research, additional studies providing evidence for a facilitated

processing of emotion were conducted related to “anger is red” (Fetterman, Robinson, & Meier, in press) and “good is light/bad is dark” (Meier, Robinson, Crawford, & Ahlvers, 2007) metaphors, providing further support for a social cognitive basis of metaphor.

In addition to these findings, metaphoric processes can also be observed in visual perception and social judgments. In the former case, for example, Fetterman, Robinson, Gordon, and Elliot (2011) found that when primed with anger concepts and when anger was induced, individuals were more likely to perceive a degraded color as red, even when it was not. In the latter case, consider the influential example of Williams and Bargh’s (2008) experiment. In this experiment, participants were given a warm or cold drink to carry before interviewing a candidate (a confederate). Participants rated the candidate as “nicer” after holding the warm drink as opposed to the cold drink. There is now a vibrant literature exploring these metaphorically enriched effects on social cognition (for a review, see Landau et al., 2010).

While social psychologists have contributed the most to our knowledge of metaphoric influence through the use of experimental techniques (Landau et al., 2010), personality psychologists have also begun to suggest that examining metaphors related to personality should possess value in informing how people differ from each other (Robinson & Fetterman, in press). In one example, Meier, Moeller, Riemer-Peltz, and Robinson (2012) demonstrated a significant relationship between sweet taste preferences and agreeableness/agreeable behavior across five studies. In another set of studies, Fetterman and Robinson (in press) investigated the relationship between where people locate their self (head or heart) and individual differences in emotionality and rationality. Specifically, those that located the self in the heart scored higher on traits related to emotionality, whereas those that located the self in the head scored higher on measures related to rationality. Across 7 studies locating the self in the head versus the heart reliably predicted

decision making, mental ability, and responses to daily life events. These examples provide evidence that consensual metaphors do, in fact, exhibit relevance in thinking about individual differences.

The evidence reviewed above has provided impressive support for two of the major assumptions of metaphor representation theory. However, one important assumption has received insufficient attention. Specifically, metaphor representation theory posits that metaphors facilitate the *understanding* of abstract concepts. For example, several commentators have suggested that emotions are difficult concepts to conceptualize without using metaphors as a tool (Kövecses, 2000; Lakoff & Johnson, 1980; Meier & Robinson, 2005). Presumably, this is because emotions are intrapsychic events that lack clear physical referents (Crawford, 2009). Indeed, we do know that many metaphors occur in the realm of emotion (e.g., “feeling down”: Lakoff & Johnson, 1999). Further, we know that conceptual metaphors are evident in cognitive and perceptual tasks involving affective processing (Crawford, 2009; Meier & Robinson, 2005). However, none of these considerations or sources of evidence have demonstrated that metaphors facilitate the *understanding* of concepts like emotions.

#### Investigating the Beneficial Effects of Metaphor Use

With the above considerations in mind, theoretical reasoning makes it seem likely that we use metaphors to aid in the understanding of entities that we cannot directly touch or see (Lakoff & Johnson, 1999; Meier & Robinson, 2005). Emotions are just such an entity. Emotions are non-verbal, non-physical, and intrapsychic phenomena (Crawford, 2009), yet play a crucial role in our psychological well-being. While emotions themselves are not abstract concepts, the processing, interpretation, or understanding of emotions greatly benefits from our ability to represent emotion concepts (Izard, 2009).

This suggestion is consistent with a body of work on what has been called “referential processing” – the translation of non-verbal experiences into verbal content (Schultheiss, 2008). In numerous studies, Paivio (1986) has shown that there are two mental representation systems, one that works by imagery and feelings, and the other that works by propositions and logic. Furthermore, according to Paivio (see also Epstein, 1994), there is great need for communication between these systems. People high in referential competence have the ability to easily translate from one system to the other, a skill thought to be important in affective processing (Schultheiss, 2008). Research has shown that higher levels of referential competence predict greater congruence between implicit and explicit motives (Schultheiss, Patalakh, Rawolle, Liening, & MacInnes, 2011), as well as emotional understanding and progress in psychotherapy (Bucci, 1995). In addition, there is support for the latter ideas. Specifically, difficulties verbalizing non-verbal feelings are associated with alexithymia, a condition that is extremely problematic to successful social functioning (Sifneos, 1973).

In the current framework, it is proposed that metaphor plays an important role in referential processing. In this proposed role, metaphor is the vessel in which the intrapsychic qualia of emotion are transferred to conscious interpretation and communication. As such, metaphors would play an important role in helping people understand emotion. More broadly, the often asserted claim that metaphors aid in the understanding of concepts with no physical referents (Kövecses, 2000; Lakoff & Johnson, 1980) would seem viable. The current studies were an attempt to test this purported benefit of metaphor in the emotion domain. In order to do so, the most important innovation was the creation of a scale to measure individual differences in metaphor use. After some initial development (Study 1), relations between the scale and

emotional intelligence (Study 2) and daily functioning (Study 3) were investigated. The rationale and purpose for each study will be discussed in relation to the specific study.

## STUDY 1

In order to test the assumption that the use of metaphor facilitates the understanding of emotions, a direct route would be to measure metaphor usage. A useful way of doing so is to adopt an individual differences perspective. Nearly any measured construct – e.g., height, attitudes, behaviors, neural responses – will exhibit differences between individuals that can be utilized in theory testing (Kosslyn et al., 2002). Most metaphor scholars tend to emphasize the idea that everybody uses metaphors (e.g., Gibbs, 1994). Even so, it is almost certainly the case that metaphors are not used with equal frequency between individuals. In other words, it is quite likely that some people are more metaphorical in their language than are others. According to metaphor representation theory, such individual differences should be important. Indeed, we might expect that those who use metaphors to a greater extent than others exhibit greater insights into concepts like emotion. Therefore, the purpose of Study 1 was to introduce a measure of individual differences in metaphor usage. To do so, I created a measure in which participants had to choose which statement – a metaphoric statement or its matched literal statement – they more often use in everyday communication.

Study 1 initially tested 60 matched literal and metaphoric statements in order to select a manageable set of valid and internally reliable items for the metaphor usage measure. Item selection procedures commenced using item-total correlations and an exploratory principle components factor analysis. In order to be a valid measure, the metaphor usage measure should be predictive of *actual* metaphor use. As noted above, people tend to use a unique metaphor every 25 words (Graesser et al., 1989). Therefore, if participants are given the task of writing for a relatively short amount of time, they are likely to write a number of metaphors, with a detectable amount of variance between individuals. As such, participants completed an 8 minute

writing task. If the metaphor usage measure is valid, then there should be a moderate correlation between it and metaphor in writing.

It is also important to establish a relationship between the metaphor usage measure and theoretically relevant variables. Above, I argued that metaphors are based upon mental imagery (see also Pinker, 1994) and are utilized in referential processing. If this is true, then those that use mental imagery to a greater extent should also use metaphors to a greater extent. Therefore, participants completed the Style of Processing scale (Childers, Houston, & Heckler, 1985), which measures preferences for using mental imagery in processing information.

It is also important to establish that the metaphor usage measure is representing a unique construct that is not already measured by traditional individual differences scales. In order to test for discriminant validity, then, participants completed a measure of the Big 5 personality traits (Costa & McCrae, 1992). These traits have become the gold standard in trait psychology and are thought to encompass nearly all personality types (McCrae & Costa, 1999). As such, any new individual differences measure of importance should be relatively independent of any single Big 5 factor. There is no particular reason to believe that the metaphor usage measure will significantly overlap with any of the 5 major factors (i.e., extraversion, agreeableness, neuroticism, conscientiousness, and openness).

Finally, I sought to establish further discriminant validity by relating the metaphor usage measure to intelligence-related measures. There is some reason to believe that metaphor usage is related to intellect. Those who score high on measures of intelligence often have larger vocabularies and enjoy poetics and literature (Jensen, 1998). However, as noted by Gibbs (1994), metaphors are not used solely by poets and intellectuals, but by everyone. Therefore, while it is

possible that there may be some relationship between measures of intellect and metaphor usage, I did not predict such a relationship.

## Method

### *Participants*

Participants ( $N = 132$ ; 44 female; 45 male; 43 unreported) were recruited using the SONA research platform. The sample was comprised primarily of introductory psychology students at North Dakota State University (NDSU). They received course credit in return for participation. Participants completed the study via desktop computers in private cubicles.

### *Materials and Procedures*

*Metaphor usage measure.* Participants were first asked to respond to 60 items intended to measure whether they are more likely to use metaphoric or literal statements in normal conversation. Specifically, they were asked: “Which would YOU be more inclined to say, think, or write in everyday life?” Following this question were pairs of sentences. One sentence was literal (e.g., She makes rational decisions) and one was metaphoric (e.g., She uses her head). Not all of the items were related to emotion, as I wanted to measure a general tendency toward metaphor usage. When a participant chose a metaphoric response they received a “2” for that item or a “1” if they chose the literal statement. After item selection occurred, a single metaphor usage score was calculated for each participant by averaging scores across items (after items were reverse scored) with higher scores reflecting higher levels of metaphor usage. The final 30-item measure was internally reliable, the mean was nearly centered and there was decent variance ( $\text{Alpha} = .83$ ,  $M = 1.51$ ,  $SD = .19$ ; see the appendix for a finalized list of items). In addition, there were no problems of skew or kurtosis ( $\text{Skew} = -.24$  &  $\text{Kurtosis} = -.74$ ), thus suggesting a normal distribution (Tabachnick & Fidell, 2007).



### *Measuring Predictive and Convergent Validity*

*Actual metaphor use.* In order to test the predictive validity of the new measure, participants' actual propensity for metaphor use was measured. To do so, participants wrote for eight minutes and their writing was coded for metaphor use. Specifically, participants were instructed to write about their life, continuously, for eight minutes. Suggestions for general topics were provided (e.g., "write about your friends", "write about your time at NDSU", etc.). Recall that we use a unique metaphor every 25 words (Graesser et al., 1989). Therefore, it was important to have a sufficiently large writing sample from each participant in order to detect a significant amount of variance in metaphors used. As such, participants were told that it is very important to continue writing for the entire eight minutes and to not worry about content. I set the writing time in hopes that participants would write at least 250 words and the mean was acceptably close to this goal ( $M = 270.55$ ,  $SD = 86.71$ ).

After the data was collected, the writing samples were coded by the current author and an independent rater. Together, we designed a coding system that provided an adequate metric of metaphor usage. First, we looked at each phrase and decided whether or not it was metaphoric in nature. If it was metaphoric in nature, we added one point to the participants' total actual metaphor use score. We did this for each phrase separately. I then used an intraclass correlation (ICC) analysis to test the consistency *and* agreement between our ratings (Shrout & Fleiss, 1979). There was moderate to high agreement,  $r = .66$ ,  $p < .01$ , and so I averaged our scores. There was an average of 7.45 ( $SD = 4.16$ ) metaphors per essay and when considered with the average amount of words used, this suggests that the participants used approximately 1 metaphor for every 36 words (similar to the findings of Graesser et al., 1989). I then calculated a corrected actual metaphor use score for each participant by dividing their metaphor count by their word

count and multiplying by 1000 (Winter, 1994) for each of our ratings separately, and then averaged across coders ( $M = 27.13$ ,  $SD = 12.56$ ). In addition, we gave each participant a subjective perceived metaphor rating (“How metaphoric is this person?” 1 = *not metaphoric at all* to 7 = *very metaphoric*). These ratings were also reliable (ICC  $r = .60$ ,  $p < .01$ ) and averaged across coders ( $M = 3.19$ ,  $SD = 1.42$ ).

*Imagery Preference.* To measure imagery preference, I used the Style of Processing scale (SOP; Childers et al., 1985). The SOP consists of 11 items measuring preference for “visual” processing. Participants rated the truthfulness of statements (e.g., “I find it helps to think in terms of mental pictures when doing things”) using a 1 (*always false*) to 4 (*always true*) scale. I then reverse scored and averaged the items to compute SOP scores for each participant ( $M = 3.15$ ,  $SD = .40$ ). This scale has been shown to have good internal and external validity in predicting individual differences in imagery-based processing (Childers et al., 1985), and was also reliable in the present study (Alpha = .78).

#### *Measuring Discriminant Validity*

*The Big 5.* Participants then completed Goldberg’s (1999) broad-bandwidth 50-item scale. This scale measures each of the Big 5 personality factors, using 10-items each. Individuals were asked to determine the extent (1 = *very inaccurate* to 5 = *very accurate*) to which items reflective of extraversion (e.g., “I am the life of the party”), agreeableness (e.g., “I make people feel at ease”), neuroticism (e.g., “I get stressed out easily”), conscientiousness (e.g., “I am exacting in my work”), and openness to experience (e.g., “I have a vivid imagination”) generally describe the self. This measure has been shown to correlate strongly with the NEO-PI scale (Costa & McCrae, 1992) and has been shown to be highly reliable and valid (Goldberg et al., 2006). Reliability in the current study was also strong for extraversion (Alpha = .88,  $M = 3.45$ ,

$SD = .79$ ), agreeableness (Alpha = .85,  $M = 4.01$ ,  $SD = .56$ ), neuroticism (Alpha = .89,  $M = 2.72$ ,  $SD = .84$ ), conscientiousness (Alpha = .82,  $M = 3.51$ ,  $SD = .62$ ), and openness (Alpha = .80,  $M = 3.42$ ,  $SD = .59$ ). I ran a correlation analysis with the Big 5 factors and the metaphor usage measure for discriminant purposes.

*GPA and ACT scores.* To discriminate the metaphor usage measure from individual differences in intellect, participants reported on their current and high school GPA and ACT scores. GPA and ACT scores are necessarily indicators of academic performance. I examined correlation statistics for both high school GPA ( $M = 3.37$ ,  $SD = .57$ ) and college GPA ( $M = 2.95$ ,  $SD = .72$ ) with metaphor use, both independently and in aggregate ( $M = 3.16$ ,  $SD = .56$ ). I did the same for ACT scores ( $M = 23.32$ ,  $SD = 3.41$ ).

## Results

The metaphor usage measure utilized 60 items to maximize the chances of selecting the best set of items, acknowledging the unlikeliness that all 60 items would be retained. Therefore, I subjected the metaphor usage measure to item selection techniques in order to solidify the items included in the measure. First, the main analysis was item-total correlations. In this analysis, I calculated a total score across all sixty of the original items. Then, I investigated the correlations between each item and said total score. A large correlation coefficient ( $> +/- .25$ ) indicates a reliable item (Everitt, 2002) whereas a small correlation coefficient indicates that the item should be dropped. Thus, I ranked the item-total correlations by strength and established a cut-off score (.25) in order to reduce the measure to the final 30 reliable items. I ran a Chronbach's Alpha on the finalized items and found them to be internally reliable (Alpha = .84). Based on these considerations I adopted the 30-item solution.

I then ran a principle components factor analysis on the finalized items to test for any sub-factors and sufficient factor loading. The purpose of a principal components analysis is to extract the greatest amount of variance for each potential component, with the first component extracting the most (Tabachnick & Fidell, 2003). Since the goal was to measure a single metaphor usage factor and I expected no sub-factors, this analysis was deemed the most proper (see Tabachnick & Fidell, 2003). In examining the scree plot (Figure 1), one factor stood out among the others with an eigenvalue of 5.32. All the items sufficiently loaded onto the first factor (i.e., at .25 or higher). The next largest eigenvalue was 1.85 and a series of small factors were extracted. As can be seen in scree plot, after the first factor there is little change (or slope) between the following, smaller, factors. Additionally, items did not load on any additional factors in an interpretable way. Therefore, I was able to conclude that a single factor solution was preferable.

To test for construct and convergent validity, I ran a correlation analysis on the metaphor usage measure with the actual metaphor use scores, metaphoric-rating scores, and the scores on the SOP scale. If the new measure does indeed measure individual differences in metaphor usage, it should be predictive of actual metaphor use. This was the case,  $r = .22, p = .01$ . As for the SOP scale, if metaphors are based on mental imagery and the metaphor usage measure is a valid one, then metaphor use should be correlated with the SOP scores. This was also the case,  $r = .31, p < .01$ . Together, then, the metaphor usage measure appears to be a valid one in predicting individual differences in metaphor use and processing.

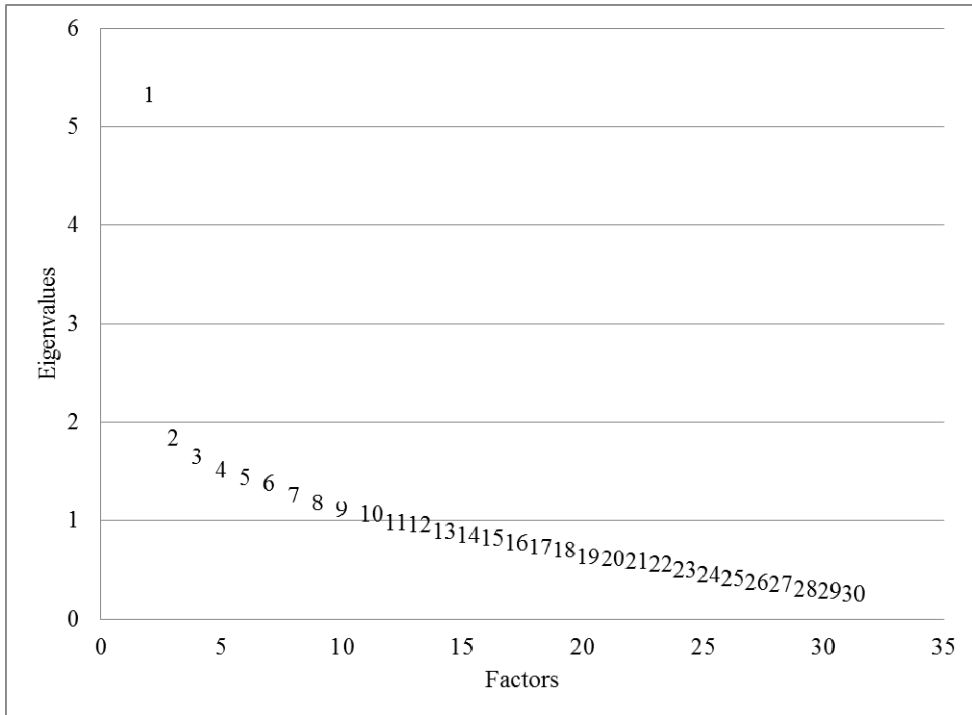


Figure 1. Scree Plot for the Exploratory Principal Components Factor Analysis

To test for discriminant validity, I ran a correlation analysis on the metaphor usage measure and the Big 5 factor scores, GPA, and ACT scores. If the new measure predicts phenomena outside of already established personality scales, it should not be excessively correlated with any of the Big 5 factors. Indeed, the 30-item metaphor usage measure was not significantly correlated with any of the Big 5 measures (all  $ps > .30$ ), aside from a marginal negative relationship to conscientiousness ( $r = -.16, p = .07$ ). There was no correlation with GPA scores, separately considered or combined, nor with ACT scores (all  $ps > .68$ ). For a full correlation matrix, see Table 1. The metaphor usage measure was not a significant predictor of sex ( $r = -.11, p = .32$ ) and, as such, none of its predictive ability can be attributed to sex.

Table 1  
*Study 1: Correlation Matrix*

	1	2	3	4	5	6	7	8	9	10
1. Metaphor Usage	-									
2. Actual Use	.22*	-								
3. Metaphor Rating	.25**	.82**	-							
4. Imagery Preference	.31**	.30**	.38**	-						
5. Extraversion	.03	-.07	-.09	.14	-					
6. Agreeableness	.00	.04	.17†	.33**	.28**	-				
7. Neuroticism	.02	.01	.17*	.02	-.37**	-.09	-			
8. Conscientiousness	-.16†	.02	0.1	.08	-.02	.25**	-.02	-		
9. Openness	.09	.13	0.11	.33**	.14	.25**	-.28**	.14	-	
10. GPA	.01	.12	.18*	.11	-.07	.15†	.03	.24**	0.11	-
11. ACT	.04	.07	.07	.30**	-.54	.02	-.03	-.04	.25**	.29**

Note. \* = < .05; \*\* = < .01; † = < .10

## Discussion

The purpose of Study 1 was to create a reliable and valid measure of metaphor usage. A 30-item measure was created. I found the measure to have high internal reliability, sufficient variance, and scores appeared to be normally distributed (i.e., no problems of skew or kurtosis). In addition, I was able to provide evidence for predictive, convergent, and discriminate validity for the measure. The measure predicted actual metaphor use in a writing task and was significantly related to a self-reported preference for using mental imagery, a key component in referential processing (Paivio, 1986). On the other hand, it did not significantly overlap with any of the Big 5 factors, nor did it predict measures related to intelligence. With these considerations in mind, I next attempted to provide evidence for the third assumption: That metaphor use may be involved in the understanding of concepts with no physical referents.

## STUDY 2

In Study 2, I sought to provide preliminary evidence for the assumption that metaphors aid in the understanding of concepts with no physical referents (Lakoff & Johnson, 1999; Meier & Robinson, 2005). As noted above, one main area of research on metaphors focuses on emotional processing (Crawford, 2009; Meier & Robinson, 2005) and I made a case that metaphors might play a role in the translation of emotional qualia to communicable entities. Therefore, emotional understanding, as measured by emotional intelligence tasks, seemed a proper criterion to test this theoretically important third assumption.

Emotional intelligence is often defined as a set of abilities (Mayer & Salovey, 1997). That is, certain people are better at, or more competent in, recognizing, interpreting and regulating their own and others' emotions (Mayer, Salovey, & Caruso, 2004). Some theorists (e.g., Petrides & Furnham, 2003) investigate emotional intelligence as a trait, while others strongly insist testing it as ability (i.e., using ability-based tests; Mayer, Salovey, & Caruso, 2008). I adopted the latter approach for the current purposes and decided that the use multiple tests of emotional intelligence would best capture the understanding of emotion. Thus, two ability-based tests of emotional intelligence were completed in Study 2.

I first used MacCann and Roberts' (2008) Situational Test of Emotional Understanding (STEU) scenario-based ability test of emotional intelligence. This test measures one's ability to infer the likely emotional states of others by presenting a scenario in which a character should feel a specific emotion. This test has been shown to be predictive of multiple outcomes (e.g., emotion-decoding skills; Moeller, Robinson, Wilkowski, & Hanson, 2012). I predicted that the metaphor usage measure would be significantly related STEU. An additional scenario-based measure (North Dakota Emotional Abilities Test; NEAT; Krishnakumar, Hopkins,

Szmerekovsky, & Robinson, 2013) was administered. The NEAT measures 3 branches of emotional abilities: Emotion perception, emotional understanding, and management of emotions. Consistent with the assumption that metaphors help people *understand* emotions (Lakoff & Johnson, 1999; Meier & Robinson, 2005), I predicted that the metaphor usage measure would be particularly predictive of the *understanding* branch of the NEAT.

## Methods

### *Participants*

Participants ( $N = 82$ ; 55 female; 27 male) were recruited using the SONA research platform. Participants were primarily introductory psychology students at NDSU. They received course credit in return for participation. Participants completed the study on computers in private cubicles.

### *Materials and Procedures*

Upon entering the lab, participants completed an informed consent form and were assigned a unique participant number. Participants then reported on their demographic information and began the experiment. The 30-item validated metaphor usage measure was administered and again showed good internal reliability, variability ( $\text{Alpha} = .83$ ,  $M = 1.51$ ,  $SD = .19$ ), and did not show problems of skew or kurtosis ( $\text{Skew} = .10$  &  $\text{Kurtosis} = -.37$ ).

*Situational Test of Emotional Understanding (STEU)*. Participants then completed the first scenario-based emotional inference task (MacCann & Roberts, 2008). Participants were presented with 42 scenarios (e.g., “Something unpleasant is happening. Neither the person involved, nor anyone else can make it stop. The person involved is most likely to feel?”). Presented below each scenario were five choices in which the participants were to infer which emotion the character would likely feel (e.g., for the previous example, 1 = guilty; 2 = distressed;



3 = sad; 4 = scared; 5 = angry). I scored the measure by giving a correct score one point for each item if the participant chose the normed response as determined by emotion theorists and experts (for the previous example, “distressed”) or a 0 if they did not. I then calculated an emotional inference accuracy score for each participant by calculating the percentage of correct inferences across the items ( $M = 55\%$ ,  $SD = 13\%$ ).

*North Dakota Emotional Abilities Test (NEAT)*. Participants then completed the NEAT scenario-based measure of emotional abilities (Krishnakumar et al., 2013). This measure was created specifically for measuring emotional intelligence within the job sector, but I deemed its three-branch structure optimal for the current purposes because it distinguishes emotional understanding from other emotionally intelligent abilities. Participants read 30 scenarios pertaining to the amount of emotion the subject of each scenario would feel (e.g., “Cassidy successfully finished a project that took months to accomplish. Rate the extent to which Cassidy would experience the following emotions in this situation”), the likelihood of a combination of emotions felt in a situation (e.g., “Brenda found an employee engaged in unethical and immoral behavior. For each of the following pairs of emotion, rate the likelihood with which Brenda would experience both emotions simultaneously”), the likelihood of which an emotional change would occur (e.g., “Anastasia’s co-worker takes several coffee breaks throughout the day. Indicate the likelihood that Anastasia’s emotions would transition (change) from the first emotion to the second emotion indicated”), and the apparent effectiveness of a set of actions in response to an emotional event (e.g., “Chloe was demoted at her job. Rate the effectiveness of the following ways of dealing with the situation”).

After each scenario, participants were presented with four emotions (e.g., Joy, Hope, Relief, & Gratitude), combinations of emotions (e.g., Disgust and Sadness, Pride and Relief,

Guilt and Regret, & Frustration and Anxiety), changes in emotions (e.g., Frustration, then Forgiveness; Empathy, then Anger; Irritation, then Sadness; & Curiosity, then Irritation) or emotion management actions (Coast in the new position, Seek other work, Blame the management, & Quietly continue to work and cry later) depending on the branch in which they were completing. They were to rate the strength of each emotion listed (e.g., 1 = not at all; 5 = very strongly), the likelihood of each of the listed combinations and changes in emotions (e.g., 1 = not likely; 5 = very likely), and the effectiveness of each of the actions presented (e.g., 1 = not at all effective; 5 = very effective).

I adopted a consensus scoring technique in order to score the test (see Barchard & Russell, 2006; Legree, Pstotka, Tremble, & Bourne, 2005; MacCann, Roberts, Matthews, & Zeidner, 2004 for different techniques). Specifically, I elected to use a technique described by Legree et al. (2005) and calculated an average score for the entire sample for each item (note that each scenario had a set of four items). I then correlated the ratings for each set of items made by the participant with the average scores of the entire sample for that set. These correlations coefficients represent how similar to the entire sample the individual responded to each set of items for each scenario and served as the participants score for each scenario. I then averaged the correlation coefficients for each participant across the scenarios within each branch of the NEAT. Higher scores reflected more ability in emotion perception ( $M = .60, SD = .19$ ), emotional understanding (the combination and change items combined:  $M = .59, SD = .17$ ), and emotion management ( $M = .71, SD = .19$ ). In addition, I calculated a total emotional intelligence score by averaging across all scenarios ( $M = .63, SD = .14$ ). This measure has been well validated and has been found to be reliable (Krishnakumar et al., 2013).

## Results

In order to test the hypothesis that individual differences in metaphor usage is predictive of an understanding of the emotions that one should feel in specific situations, I ran a correlation with the metaphor usage measure and scores on the Situational Test of Emotional Understanding (STEU). If using metaphors helps us to *understand* our emotions, then there should be a significant positive correlation between metaphor use and STEU scores. Indeed, this was the case,  $r = .28, p = .01$ . This marks the first evidence of the benefits of metaphors in emotion understanding.

In order to test the hypothesis that individual differences in metaphor usage is predictive of an understanding of emotion processes, I also ran correlations between the metaphor usage measure and the NEAT subscale consensus scores and total consensus scores. Scores on the metaphor usage measure did not significantly correlate with scores on either the perception or management subscales of the NEAT ( $ps > .22$ ). However, as predicted, scores on the metaphor usage measure did significantly positively predict scores on the NEAT understanding subscale,  $r = .23, p = .04$ . Additionally, the metaphor usage measure was marginally predictive of the total NEAT scores as well,  $r = .20, p = .07$ . For a full correlation matrix, see Table 2.

Table 2  
*Study 2: Correlation Matrix*

	1	2	3	4	5
1. Metaphor Usage	-				
2. STEU	.28*	-			
3. NEAT-Perception	0.14	.32**	-		
4. NEAT-Understanding	.23*	.37**	.40**	-	
5. NEAT-Management	0.07	.41**	.27**	.43**	-
6. NEAT-Total	.20^	.48**	.71**	.78**	.78**

Note. \* =  $< .05$ ; \*\* =  $< .01$ ; ^ =  $< .10$

## Discussion

Study 2 was the first study to provide empirical support for the claim that metaphors aid in the understanding of abstract concepts or concepts with no physical referents (e.g., emotions: Lakoff & Johnson, 1999), thus filling a major gap in the literature. It did so using two different ability tests of emotional understanding. I consider this an important first step in a new direction for metaphor representation theory. That being said, I considered it important to show that the metaphor usage measure is predictive of emotional functioning in daily life, a hypothesis tested in Study 3.

### STUDY 3

If metaphor use is of substantial importance in predicting emotional understanding, it should do so in terms of functional responses to negative events in daily life (Bolger, Davis, & Rafaeli, 2003; Tennen, Affleck, Armeli, & Carney, 2000). According to emotional intelligence theorists (e.g., Mayer & Salovey, 1997), those that have a clearer understanding of their emotions are more skilled at reducing the effects of negative events on their moods or behavior (see also Mikolajczak et al., 2008). This is often measured by investigating people's responses to negative events in their daily life (Compton et al., 2008; Suls & Martin, 2005). Therefore, I measured individual differences in metaphor usage in an initial lab session. Subsequently, a daily experience sampling protocol was adopted in order to measure functional responding in daily life. For this I measured daily feelings of agreeableness (niceness) and conscientiousness (thoughtful behavior and responsibility). It was predicted that those who are highly metaphoric would show lower levels of dysfunctional behaviors on days with numerous negative daily events, whereas those who are less metaphoric would show higher levels dysfunctional behaviors.

A secondary goal of Study 3 was to further test the idea that the metaphor usage measure is actually measuring what I think is: a "metaphoric mind". That is, to the extent that one uses more metaphors, and that this indicates a better understanding of abstract concepts or concepts without physical referents, I have assumed that they *think* more metaphorically. If this is the case, then they should perhaps show stronger metaphor transfer effects (Landau et al., 2010). That is, those effects in which the priming of a concept in one domain activates metaphorically related cognition or behavior in another domain. In a series of recent studies, Meier et al. (2012) showed that agreeable people reported liking sweet foods to a greater extent than other foods.

They also showed that after tasting a sweet candy participants acted in a more pro-social (i.e., agreeable) way (e.g., volunteering). In this case, they found that the priming sweetness led to pro-social behavior and suggested that the taste of sweetness transfers from the domain of taste and activates pro-social behavior. Therefore, I predicted that those who score higher in metaphor use, and thus have a “metaphoric mind”, would report being nicer and more pro-social, relative to those low in metaphor usage, on days in which they ate more sweets.

## Methods

### *Participants*

Participants were 145 (73 female; 72 male) were recruited from a pool of undergraduates from NDSU. Participants could choose whether to receive course credit or monetary (up to \$25, pro-rated for the amount of responses collected) compensation. Participants completed an initial laboratory session and subsequently responded to daily questionnaires every night for 14 days.

### *Materials and Procedures*

Within the initial lab session, participants completed the individual differences in metaphor usage measure. The measure was again found to be reliable, variable, and did not show problems of skew or kurtosis (Skew = .02 & Kurtosis = -.31; Alpha = .78,  $M = 1.52$ ,  $SD = .17$ ). In addition, the experimenters collected e-mail addresses in order to track and match responses to the daily questionnaires. The Monday following the initial lab session marked the beginning of the daily portion of the study. Participants accessed the daily surveys via a website and reported on negative daily events for the primary hypothesis and the amount of sweet food they consumed for the secondary hypothesis. They also reported on their daily levels of agreeableness, conscientiousness, and the amount of pro-social behaviors they performed during the day. The surveys were available from 5pm and 3am to ensure that the responses were in relation to the day

in question. I sent daily reminders to facilitate compliance. Nine participants completing less than 9 daily surveys were automatically dropped for a final sample of 136, a standard practice in our lab (see Fetterman & Robinson, in press). Participants completed 88% of the daily surveys on average.

*Daily measures for the primary hypothesis.* The daily surveys were designed to be brief in order to increase the likelihood of participants completing each of the surveys (Bolger et al., 2003). Daily negative events were measured by having participants rate how true the following statements were for the past 24 hours: “Today, something bad happened to me” and “Today, I experienced lots of unpleasant events”. Responses were made on a 1 to 4 scale (1 = *not at all true today*, 4 = *very much true today*). Participants did not experience a lot of negative events overall and the scale was reliable (Alpha = .87,  $M = 1.50$ ,  $SD = .38$ ).

For functional responding to negative daily events, I measured a daily analogue of two Big 5 traits – i.e., agreeableness and conscientiousness. If high, relative to low, metaphor usage participants are better able maintain a functional disposition, negative events should have an attenuated effect on their overall friendliness (agreeableness) and impulsivity or thoughtfulness (conscientiousness). Participants reported their daily agreeableness by responding to how accurate (1 = *very inaccurate* to 5 = *very accurate*) the statement “Today, I was agreeable” was for that particular day ( $M = 3.61$ ,  $SD = .51$ ). Using the same scale, participants reported their daily conscientiousness by assessing the accuracy of the statement “Today, I was conscientious” for that particular day ( $M = 3.37$ ,  $SD = .61$ ). Similar procedures and questions have been of high utility in past research (e.g., Fetterman & Robinson, in press; Wilkowski, Robinson, & Troop-Gordon, 2010).

*Daily measures for the secondary hypothesis.* Meier et al. (2012) had participants taste sweet versus sour foods in a lab session and found that those who had tasted sweet candies were more pro-social. Thus, participants simply responded to the questions within the daily survey, “How much sweet food did you eat today?” They responded on a 4 point scale (1 = *none* to 4 = *a lot*) scale. Responses were right around the middle ( $M = 2.15$ ,  $SD = .47$ ).

If high metaphor users do have a more “metaphoric mind”, they should show stronger metaphor-consistent effects. In other words, eating sweet foods should lead to more pro-sociality in daily life (Meier et al., 2012) for those that score higher in metaphor usage. Pro-sociality was measured in two ways. First, agreeableness (which was already being measured for the primary hypothesis) is a trait reflecting high levels of pro-sociality (McCrae & Costa, 1999) and was also utilized for the secondary hypothesis. Second, participants indicated the frequency (0 = *never* to 4 = *very often*) in which they “helped someone”, “did a favor for someone” and “expressed gratitude to someone” during that day. There was a moderate level of pro-sociality as measured in behaviors and the measure was reliable ( $\text{Alpha} = .80$ ,  $M = 1.37$ ,  $SD = .50$ ).

## Results

To analyze the daily survey data I followed standard multi-level linear modeling procedures. These procedures are particularly suited to analyze such data (Christensen, Barrett, Bliss-Moreau, Lebo, & Kaschub, 2003). Specifically, I followed Singer’s (1988) recommendations for using SAS PROC MIXED procedures for multi-level analyses. I person-centered and standardized the negative daily events and daily sweet food consumption measures, or “level 1” variables, such that each participant’s mean across all the days was 0 with a standard deviation of 1 (Enders & Tofighi, 2004). These represented the within-person, or day-to-day, predictors. I also z-scored the metaphor usage measure, the “level 2” predictor, as recommended



by Aiken and West (1991) when testing interactions with continuous between-person predictors. The specific multi-level modeling analyses that I examined was daily variations in agreeableness and conscientiousness as a function of negative daily events, metaphor usage, and a cross-level interaction of both of these two predictor variables. I used the same analysis procedures to examine daily variations in pro-sociality – i.e., daily agreeableness and pro-social behaviors – as a function of daily sweet food consumption, individual differences in metaphor usage, and a cross-level interaction of both of these two predictor variables.

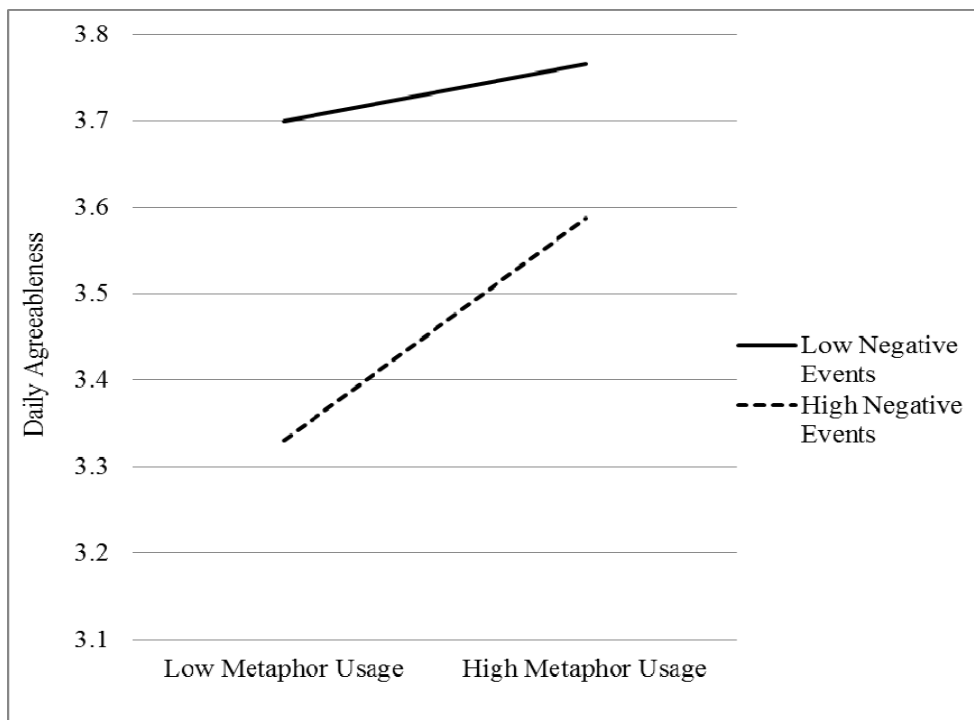
### *Primary Hypothesis Results*

The first multi-level model tested variation in daily agreeableness as a function of negative daily events, metaphor usage, and a cross-level interaction between the two. Consistent with the idea that negative events lead individuals to be less friendly (Berkowitz, 1993), there was a significant main effect of Negative Daily Events on daily agreeableness levels,  $b = -.14$ ,  $t = -5.90$ ,  $p < .01$ , such that individuals were less agreeable on days with high negative events. There was also a marginal main effect of Metaphor Usage on daily agreeableness,  $b = .08$ ,  $t = 1.80$ ,  $p = .07$ , such that higher metaphor users tended to be slightly more agreeable in their daily lives. This trend, though not significant here, may be related to the fact that emotionally intelligent individuals tend to be friendlier in their daily lives (Goleman, 2006). Again, this finding was not statistically significant, but should be considered in future studies. However, the more important question is how high versus low metaphor users behave on days in which there are more versus less negative daily events. The hypothesized cross-level interaction was significant,  $b = .05$ ,  $t = 2.04$ ,  $p = .04$ .

To further investigate the interactive pattern, I calculated estimated means for those low ( $-1 SD$ ) and high ( $+1 SD$ ) in metaphor usage as a function of days with low ( $-1 SD$ ) and high ( $+1$

*SD*) occurrences of negative events (Aiken & West, 1991). Figure 2 displays these means.

Simple slopes analyses (Bauer, Preacher, & Gil, 2006) revealed that while there was a significant negative relationship between negative events and daily agreeableness at low ( $-1 SD$ ) levels of metaphor usage,  $b = -.18, t = -5.67, p < .01$ , there was a smaller relationship between these variables at high ( $+1 SD$ ) levels of metaphor usage,  $b = -.08, t = -2.66, p = .01$ . Therefore, it appears that while all participants become less agreeable when they experience negative events (Berkowitz, 1993), this was somewhat blunted for those that use metaphors to a greater extent.



*Figure 2.* Interactions between Negative Daily Events and Metaphor Usage in Predicting Daily Agreeableness.

A second multi-level model tested variations in daily conscientiousness as a function of negative daily events, metaphor usage, and a cross-level interaction between the two. There was a marginal main effect of Negative Daily Events on daily conscientiousness levels,  $b = -.03, t = -$

1.84,  $p = .07$ , such that participants were somewhat less conscientious on days with high negative events. There was no main effect of Metaphor Usage on daily conscientiousness,  $b = .01$ ,  $t = .17$ ,  $p = .87$ . This indicates that high metaphor users are not more thoughtful or controlled in their daily lives. However, the more important question is how high versus low metaphor users behave on days in which there are more versus less negative daily events. The hypothesized cross-level interaction was significant,  $b = .04$ ,  $t = 2.03$ ,  $p = .04$ .

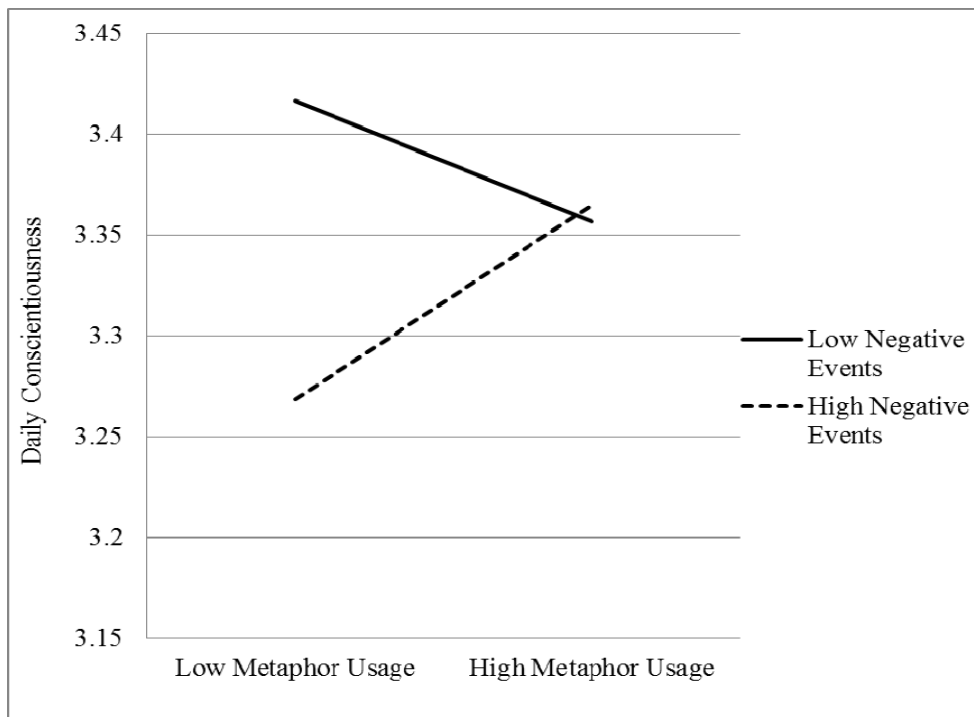
To further investigate the interactive pattern, I calculated estimated means (Aiken & West, 1991) and Figure 3 displays these means. Simple slopes analyses (Bauer et al., 2006) revealed that while there was a significant negative relationship between negative events and daily conscientiousness at low ( $-1 SD$ ) levels of metaphor usage,  $b = -.07$ ,  $t = -2.76$ ,  $p = .01$ , there was no relationship between these variables at high ( $+1 SD$ ) levels of metaphor usage,  $b = .00$ ,  $t = .15$ ,  $p = .88$ . These findings suggest, as predicted, that those who use metaphors to a greater degree do not report being less conscientious on days in which more negative events occur.

### *Secondary Hypothesis Results*

I tested the secondary hypothesis, that the metaphoric effect of eating more sweets leading to more pro-sociality (Meier et al., 2012) should be stronger among high metaphor users, using two MLM analyses. One of these used daily agreeableness as an outcome and the other used pro-social behavior as an outcome.

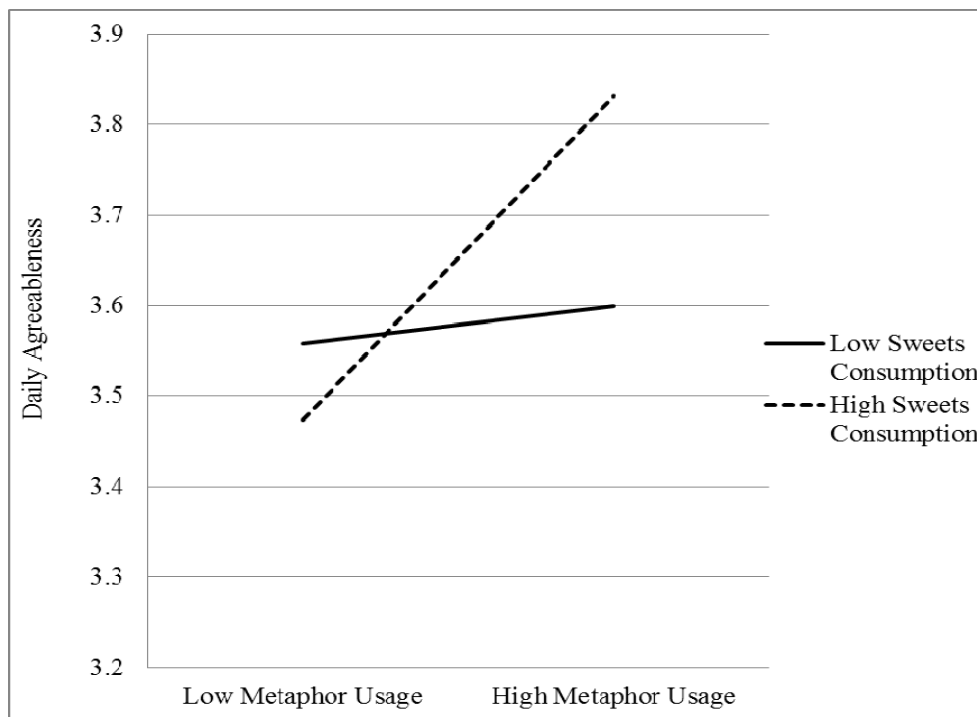
The first multi-level model tested variations in daily agreeableness as a function of daily sweets consumption, metaphor usage, and a cross-level interaction between the two. Consistent with the idea that eating sweet foods makes one nicer (Meier et al., 2012), there was a significant main effect of Daily Sweets Consumption on daily agreeableness levels,  $b = .04$ ,  $t = 1.98$ ,  $p = .05$ , such that individuals were more agreeable on days in which they reported eating more sweet

foods. This main effect is important because it conceptually replicates the positive relationship between the consumption of sweets and agreeableness as found by Meier et al. (2012), albeit using an ecologically valid daily protocol. There was also a main effect of Metaphor Usage on daily agreeableness,  $b = .10$ ,  $t = 2.19$ ,  $p = .03$ , such that higher metaphor users tended to be more agreeable in their daily lives. This positive relationship between metaphor use and daily agreeableness was only marginally significant in the primary model presented above and therefore should be investigated further in future research. However, the more important question is how high versus low metaphor users behave on days in which they consume more versus less sweet foods. The hypothesized cross-level interaction was significant,  $b = .08$ ,  $t = 4.20$ ,  $p < .01$ .



*Figure 3.* Interactions between Negative Daily Events and Metaphor Usage in Predicting Daily Conscientiousness.

To further investigate the interactive pattern, I calculated estimated means (Aiken & West, 1991) as with the previous analyses. Figure 4 displays these means. Simple slopes analyses (Bauer et al., 2006) revealed that there was not a significant positive relationship between sweet food consumption and daily agreeableness at low ( $-1 SD$ ) levels of metaphor usage,  $b = -.04$ ,  $t = -1.61$ ,  $p = .11$ . There was, however, a positive relationship between these variables at high ( $+1 SD$ ) levels of metaphor usage,  $b = .12$ ,  $t = 4.36$ ,  $p < .01$ . Therefore, it appears that the metaphoric effect of sweet foods on agreeableness (Meier et al., 2012) was only found for those that use metaphors to a greater extent.



*Figure 4.* Interactions between Daily Sweets Consumption and Metaphor Usage in Predicting Daily Agreeableness.

A second multi-level model tested variation in daily pro-social behavior as a function of sweets consumption, metaphor usage, and a cross-level interaction between the two. There was a

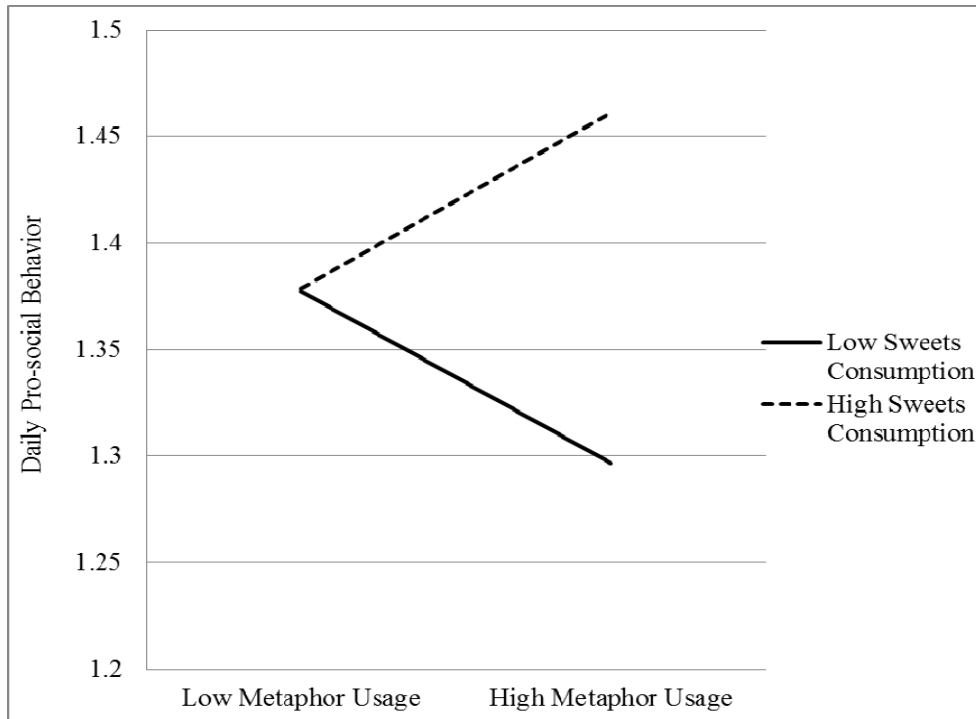
main effect of Daily Sweets Consumption on daily pro-social behaviors,  $b = .04$ ,  $t = 2.76$ ,  $p = .01$ , such that individuals reported more pro-social behavior on days in which they reported eating more sweet foods. Again, this main effect is an important because it conceptually replicates the positive relationship between sweets and pro-social behavior found by Meier et al. (2012). There was no main effect of Metaphor Usage on daily pro-social behaviors,  $b = .00$ ,  $t = .01$ ,  $p = .99$ . This indicates that high metaphor users do not act more pro-socially in their daily lives. However, the more important question is how high versus low metaphor users behave on days in which there are more versus less daily sweets consumed. The hypothesized cross-level interaction was significant,  $b = .04$ ,  $t = 2.67$ ,  $p = .01$ .

To further investigate the interactive pattern, I calculated estimated means (Aiken & West, 1991) and Figure 5 displays these means. Simple slopes analyses (Bauer et al., 2006) revealed that while there was not a significant relationship between daily sweets consumption and daily pro-social behaviors at low ( $-1 SD$ ) levels of metaphor usage,  $b = .00$ ,  $t = .03$ ,  $p = .97$ , there was a positive relationship between these variables at high ( $+1 SD$ ) levels of metaphor usage,  $b = .08$ ,  $t = 3.81$ ,  $p < .01$ . These findings suggest that those that those who use metaphors more often show well established metaphoric effects, while those low in metaphor use do not.

## Discussion

Negative events in our daily lives can have substantial effects on our disposition (Bolger et al., 2003; Tennen et al., 2000). People become less friendly (Berkowitz, 1993) and less thoughtful or irresponsible in their behavior (David & Suls, 1999; Liu & Kleiman, 2012). However, those that have a greater understanding of their emotions have smaller reactions of this type (Mayer & Salovey, 1997; Mikolajczak et al., 2008). Study 3 found that those high in metaphor use are similar in their ability to maintain their composure on days with more negative

events. This further supports the hypothesis that metaphor use is related to emotional understanding and, consequently, supports the third assumption of metaphor representation theory in an empirical manner. In addition, it was also found that those high in metaphor use showed the metaphoric sweetness-niceness effect shown by Meier et al. (2012), but those low in metaphor use did not.



*Figure 5.* Interactions between Daily Sweets Consumption and Metaphor Usage in Predicting Daily Pro-social Behaviors.

## GENERAL DISCUSSION

Metaphor representation theory contends that conceptual metaphors are not mere figures of speech, but important tools used to communicate and interpret abstract concepts and concepts with no physical referents (Lakoff & Johnson, 1980; 1999). The goal of the current set of studies was to test the theoretical assumption that metaphors are beneficial in that they facilitate the *understanding* of concepts such as emotion. This claim has been asserted by a number of theorists (e.g., Lakoff & Johnson, etc.) and is often used to explain why we have such ubiquitous metaphors to communicate our emotions (e.g., Crawford, 2009; Meier & Robinson, 2005). Thus, I constructed a measure of individual differences in metaphor usage. In Study 1, I selected items by creating 60-items and then reduced them to a 30-item measure. I then validated the scale by showing that the measure predicted actual metaphor use and preference for imagery processing (i.e., predictive validity) and is not related to the Big 5 or intelligence (i.e., discriminant validity).

Study 2 was the first to empirically test the third assumption of metaphor representation theory. If metaphor use is of benefit to emotional understanding, then increased metaphor usage should be associated with increased emotional intelligence and this is exactly what was found. The metaphor usage measure was shown to predict two different situational ability tests of emotional understanding (i.e., the STEU and the NEAT). These findings provided the first step toward supporting the theoretically important assumption that metaphors facilitate the understanding of abstract concepts or concepts without physical referents.

Study 3 furthered this first step by showing that those that used metaphors less often became less friendly and less thoughtful, or impulsive, on days with more negative events. The relationship between daily negative events and such outcomes were smaller or non-existent for those that use metaphors to a greater extent. These findings provide evidence that those who use



metaphors to a greater extent understand their emotions better and are able to respond in a more emotionally intelligent manner to negative daily events (Mayer & Salovey, 1997; Mikolajczak et al., 2008).

Finally, Study 3 had a secondary goal. If the metaphor usage measure was indeed measuring one's level of metaphoric thinking, those scoring high on it should show greater metaphoric influences on their thoughts, feelings, and behavior (i.e., metaphor transfer effects: Landau et al., 2010). Following the work of Meier et al. (2012), Study 3 found that those scoring higher in metaphor usage became more friendly and performed more pro-social behaviors on days in which they ate more sweet food. Those scoring low on this measure did not show this effect. This, indeed, suggest that metaphor users, as measured using the metaphor usage scale, have a more metaphoric mind.

In total, these findings provide the important first empirical support for the idea that those with “metaphoric minds” have a better understanding of emotions – which are concepts with no physical referents (Kövecses, 2000). Emotion and affect are commonly the focus of metaphor research (Crawford, 2009; Landau et al., 2010; Meier & Robinson, 2005). However, until the present research, no one has ever empirically tested the idea that metaphor use is associated with an increased *understanding* of emotions, or other more abstract concepts. Aside from this theoretical contribution, the current work has broader theoretical contributions. Following this, additional considerations and future directions will be discussed.

#### Measuring and Conceptualizing Individual Differences in Metaphor Use

An innovation of the current findings and a contribution to the metaphor literature is the addition of the individual differences in metaphor usage measure. As opposed to coding metaphors in hundreds of essays, this measure is relatively simple to assess. In fact, as shown in

Study 1, scores on the measure were significantly related to such essay coding procedures. In addition, the measure had high and consistent Cronbach's Alpha scores indicating a high level of internal reliability (Nunnally, 1978). Moreover, means were consistent across studies (indeed, a there was no significant differences across studies,  $p = .85$ ), standard deviations were nearly identical, and the distributions appeared to be normal (i.e. no problems of skew or kurtosis; Tabachnick & Fidell, 2007). Together, this measure appears to be quite stable. As such, this simple new measure shows promise as a useful tool for the metaphor literature.

The metaphor usage measure might also be useful in other literatures as well. For example, it might be of good use in determining the processes involved in the understanding emotions. Studies 2 and 3 found that those scoring higher in metaphor usage also scored higher in emotional understanding and showed less dysfunctional behaviors on days in which they had experienced negative events. Some work has been done on the speed in which individuals come to infer an emotion (Moeller et al., 2012). Perhaps the metaphor usage measure may also account for such effects because metaphoric connections allow for quicker processing of such emotional information. Such directions are certainly advocated.

However, the metaphor representation literature has the most to gain. Much of the empirical metaphor research has focused on the social cognitive effects of metaphoric processing (Landau et al., 2010) and more recently on metaphor informed personalities (e.g., the personality of head versus heart self-locators; Fetterman & Robinson, in press; Robinson & Fetterman, in press). The metaphor usage measure, on the other hand, suggests that there are individual differences in the extent to which people think metaphorically. That is, one might wonder what exactly the measure is assessing. It could be conceptualized in terms of measuring the extent to which people use metaphors in their language or it could be measuring how metaphorically

constructed one's mind is. I think it is the latter because Study 3's secondary focus found that high metaphor users showed a greater metaphoric effect of eating sweet food – i.e., were more pro-social on days in which they had consumed more sweets (Meier et al., 2012). The metaphor literature has yet to find a moderating effect of this type (Robinson & Fetterman, in press). Therefore, research should investigate whether this measure moderates other metaphor effects. This would strengthen the case that some peoples' minds are metaphorically mapped to a greater extent than others.

#### Additional Considerations and Future Directions

Although the current work makes an important contribution, it is admittedly correlational. However, our lab tends to focus on individual differences in relation to social cognition (see Robinson & Fetterman, in press; Robinson & Wilkowski, in press) and my approach to the current investigation was inspired by such a focus. That said, one should adopt experimental methods to show a causal link between metaphor use and emotional understanding in future studies. Particularly, a metaphoric training versus control design should be utilized to investigate differential increases in emotional understanding as a result of the training. Aside from investigating such causal processes, there are number of other future directions to consider.

#### *Metaphor Use and Mental Imagery*

A case was made that metaphors are involved in the translation of the intrapsychic qualia of emotion to conscious interpretation and communication – also known as “referential processing” (Schultheiss, 2008). These emotional intrapsychic qualia are often thought of in terms of mental imagery (Lang, 1979). There is some proposed relationship between metaphor and mental imagery as metaphors seemingly involve such imagery (Lakoff & Johnson, 1999).

Indeed, in validating the measure (Study 1), a significant relationship was found between individual differences in metaphor usage and a preference for imagery-based processing.

In addition to a body of work on emotion (e.g., Holmes and Mathews, 2005; Lang & Bradley, 2010; Lang, Kozak, Miller, Levin, & McLean, 1980), there is also a body of work on mental imagery in memory. Mental imagery has been shown to benefit memory storage (Paivio, 1969) and retrieval (Marks, 1973). In these cases, simply having participants make a mental picture of what they are to remember facilitates such achievements. Because there may be some systematic relationship between metaphors and mental imagery (Lakoff & Johnson, 1999), one might also expect people who think metaphorically to have some benefits in storing and retrieving information. Metaphors are in part wide-ranging associations between diverse stimuli (Landau et al., 2010), and associative networks have been shown to play an important role in creating and retrieving memories (Crawford, Margolies, Drake, & Murphy, 2006; Smith, 1998). Thus, future directions involving individual differences in metaphorical thinking may be informative in the realm of memory.

Although mental imagery and metaphorical thinking may be related (Lakoff & Johnson, 1999), they cannot be viewed as identical constructs. Mental imagery relates to specific objects, events, or stimuli, whereas metaphors capture a *relationship* between a target domain and a source domain. Lakoff (1987b) also makes the suggestion that imagery is typically voluntary and perhaps requires some effort. By contrast, conceptual metaphors tend to be automatically acquired and formed without effort (Williams, Huang, & Bargh, 2008). In addition, mental images most often represent concrete objects or events, whereas metaphors are most often used to represent abstract concepts. In post-traumatic stress disorder research, for example, the images involved are concrete, representing physical occurrences that actually happened (Brewin &

Holmes, 2003). Indeed, while the metaphor usage measure was significantly related to preference for imagery-based processing in Study 1, the relationship was moderate. That said, future research should investigate the relationship between mental imagery and metaphor use.

#### *Potential Negative Consequences of Metaphoric Thinking*

The metaphor representation theory was fairly ambitious, particularly because prior theories of metaphor have suggested that metaphors represent imprecision in thinking (reviewed in Gibbs, 1994). Therefore, it is by no means certain that metaphor should always be functional. There are some realms in which metaphoric thinking would seem to be problematic.

Thinking too metaphorically may disrupt real-world decision making. This speculation is bolstered by the erroneous influences that conceptual metaphors have in several social cognitive and behavioral realms (Landau et al., 2010). For example, Meier, Hauser, Robinson, Friesen, & Schjeldahl (2007) found that when pictures of individuals were displayed at a higher vertical position, the pictured individuals were seen as more religious. Of what utility would it be to base inferences of spirituality on erroneous vertical positions? This is a rather silly thing to do. Even more perniciously, it is certainly possible that black/bad metaphors underlie forms of racial prejudice (Meier & Robinson, 2005). There may also be some reasons for thinking that metaphoric thinking renders one more vulnerable to false memories, as mental imagery is also implicated in these processes (Hyman & Pentland, 1996).

In addition, it seems possible that metaphoric thinking may play a role in irrational thought processes. This makes sense in that the literal meaning of metaphoric phrases are not based in reality – e.g., there is no actual relationship between a nice person and a packet of sugar. Likewise, “loose” or remote associations have been implicated in several disorders – schizotypal personality disorder (Green, Boyle, & Raine, 2008), paranoid personality disorder (Blaney,

2009), and schizophrenia (Minzenberg, Yoon, & Carter, 2011). Thus, one might expect some relationship between metaphor usage and symptoms of irrational, magic thinking. Similarly, it would be interesting to examine potential relationships between metaphor usage and superstitious thinking or supernatural beliefs.

In all, while conceptual metaphor theory strongly argues for the benefits of metaphoric thinking (Lakoff & Johnson, 1999), metaphoric thinking might have downsides as well. With the new investigative instrument of metaphor usage presented here, such potential downsides can be examined. Potential curvilinear effects should also be looked at. Having made all these points, I believe that metaphoric thinking is generally beneficial, as shown in the current investigation.

#### *Other Ways of Examining Whether Metaphoric Thinking is Adaptive*

Theorists agree that emotions are important in conveying information about the environment and preparing us for action (Darwin, 1872; Ekman, 2003; Lazarus, 1991). In addition, there are good indications that emotions play an important and perhaps functional role in decision making (Damasio, 1994; Oatley & Johnson-Laird, 1987). For these reasons, the proper interpretation of our own and others' emotions is crucial to our survival (Ekman, 2003). Therefore, if conceptual metaphors aid in the interpretation of emotions (Kövecses, 2000), then it may be reasonable to think that metaphoric thinking is part of our evolutionary heritage. The ubiquity of conceptual metaphors certainly argues against the idea that metaphoric thinking can be likened to poetry – interesting to some, but essential to no one (Gibbs, 1994).

The first way of examining the potential adaptive value of metaphoric thinking follows from the results investigated in the current studies. That is, if metaphor usage is evolutionarily adaptive, then greater use of it should be associated with beneficial outcomes. Most specifically, it may produce greater insight into one's own emotions and those of others (Kövecses, 2002). On

the basis of such considerations, a positive relationship between metaphor usage and emotional understanding was predicted and supported.

There are other domains in which to examine this hypothesis, though. Understanding the emotions of one's partner is very important in relationship functioning (Mikulincer & Shaver, 2005). If metaphoric thinking facilitates emotional understanding, then one might expect that metaphor users tend to have better relationships. It is certainly the case that emotional intelligence has been shown to predict social competence (Brackett, Rivers, Shiffman, Lerner, & Salovey, 2006) and relationship quality (Brackett, Warner, & Bosco, 2005) and, interestingly, metaphors are often used in couples counseling (Rider, 2011). Metaphor usage might therefore contribute to relationship success, an important evolutionary force (Dawkins, 1976; Miller, 2000).

Evolutionary processes work through genes. Therefore, if there is some potential adaptive value of metaphoric thinking, one might expect to find a genetic basis to it. One way to do so is through twin studies (Segal, 1999). While fraternal twins share 50% of their genes, identical twins share 100% of their genes. A genetic contribution to a trait is supported to the extent that identical twins are more similar in that trait than are fraternal twins (Plomin, DeFries, & McClearn, 1990). It would certainly bolster an adaptive viewpoint of metaphor to show that the frequency of its usage does have at least a small or moderate level of heritability.

Another way of understanding adaptive value is to demonstrate the presence of the trait in other species. Although metaphoric speech may be uniquely human, metaphoric thinking should not be uniquely human (Lakoff & Johnson, 1999). In fact, there is some emerging evidence for metaphor-like thinking in other animals. For example, Merritt, Casasanto, and Brannon (2010) found that monkeys think metaphorically about time and space, though such metaphors are more

rudimentary than ours. Further, the basis of conceptual metaphors is quite often likely to involve associations that occur frequently throughout the natural world. For example, there is a reason why sexual excitement is linked with the color red in both primates (Setchell & Wickings, 2004) and humans (Elliot & Niesta, 2008). Similarly, it is well established that primates use size as a cue to social dominance, even in realms that do not involve physical confrontations (de Waal, 2002). Thus, there is no reason for thinking that metaphoric thinking is uniquely human and may therefore have an evolved basis.

Finally, evolutionary adaptations work through genes that affect activity in the central nervous system (Wolf & Linden, 2012). Therefore, it would be useful to discern a central nervous system correlate of metaphor usage. Along these lines, it could be that one area of the brain is particularly active in metaphoric cognition. Alternatively, and perhaps more intuitively, metaphoric thinking may involve connections between different neural systems. For example, fear metaphors (e.g., “frozen with fright”) may recruit processing connecting the amygdala (involved with fear response; Olsson & Phelps, 2007) to language areas, thereby facilitating a cognitive-affective hybrid that enhances people’s understanding. What we know so far is that there is a bilateral hemispheric response to metaphors (Cardillo, Watson, Schmidt, Kranjec, & Chatterjee, 2012) and that the brain sometimes acts metaphorically, for example by recruiting perceptual areas involved in tactile processing when comprehending texture-based metaphors (Lacey, Stilla, & Sathian, 2012).

There is probably no one way to establish an adaptive evolutionary basis to any trait (Buss, 1991). However, these lines of research would further support the assertion that metaphoric thinking is adaptive (Lakoff & Johnson, 1999), while representing interesting areas



of research in their own right. The individual difference assessment of metaphor usage investigated in the current work would have value in many of these research directions.

### Concluding Remarks

Metaphor representation theory contends that conceptual metaphors are not mere figures of speech, but important tools used to communicate and interpret concepts with no physical referents. These conceptual metaphors consist of a mapping between target and source domains that help us to understand what the target domain is “like”. Much research has been done to show that these mappings not only exist (Lakoff & Johnson, 1980), but also have an effect on our thoughts, behaviors, and attitudes (Landau et al., 2010). In addition, there are individual differences in the adoption of different metaphors for the self that have widespread consequences (Robinson & Fetterman, in press). Yet, a crucial source of knowledge was lacking in this literature. Specifically, no one had yet demonstrated that metaphoric thinking is either functional or adaptive. I investigated and supported these claims in the current studies. The present research was by no means exhaustive and thus should inspire a fruitful new direction for the investigation of conceptual metaphors.

## REFERENCES

- Aiken, L., & West, S. (1991). *Multiple regression: Testing and interpreting interactions*. Thousand Oaks, CA: Sage Publications, Inc.
- Barchard, K. A., & Russell, J. A. (2006). Bias in consensus scoring, with examples from ability emotional intelligence tests. *Psicothema, 18*, 49-54.
- Bauer, D. J., Preacher, K. J., & Gil, K. M. (2006). Conceptualizing and testing random indirect effects and moderated mediation in multilevel models: New procedures and recommendations. *Psychological Methods, 11*, 142-163.
- Berkowitz, L. (1993). *Aggression: Its causes, consequences, and control*. New York: McGraw-Hill Book Company.
- Blaney, P. H. (2009). Paranoid and delusional disorders. In: P. H. Blaney, & T. Millon (Eds.), *Oxford textbook of psychopathology* (2nd ed.) (pp. 361-396). New York: Oxford University Press.
- Bolger, N., Davis, A., & Rafaeli, E. (2003). Diary methods: Capturing life as it is lived. *Annual Review of Psychology, 54*, 579-616.
- Brackett, M. A., Rivers, S. E., Shiffman, S., Lerner, N., & Salovey, P. (2006). Relating emotional abilities to social functioning: A comparison of self-report and performance measures of emotional intelligence. *Journal of Personality and Social Psychology, 91*, 780-795.
- Brackett, M. A., Warner, R. M., & Bosco, J. S. (2005). Emotional intelligence and relationship quality among couples. *Personal Relationships, 12*, 197-212.
- Brewin, C. R., & Holmes, E. A. (2003). Psychological theories of posttraumatic stress disorder. *Clinical Psychology Review, 23*, 339-376.

- Bucci, W. (1995). The power of the narrative: A multiple code account. In: J. W. Pennebaker (Ed.), *Emotion, disclosure, & health* (pp. 93-122). Washington, DC: American Psychological Association.
- Buss, D. M. (1991). *Evolutionary personality psychology. Annual Review of Psychology*. Palo Alto, CA: Annual Reviews, Inc.
- Cardillo, E. R., Watson, C. E., Schmidt, G., Kranjec, A., & Chatterjee, A. (2012). From novel to familiar: Tuning the brain for metaphors. *NeuroImage*, *59*, 3212-3221.
- Childers, T. L., Houston, M. J., & Heckler, S. E. (1985). Measurement of individual differences in visual versus verbal information processing. *Journal of Consumer Research*, *12*, 125-134.
- Christensen, T., Barrett, L., Bliss-Moreau, E., Lebo, K., & Kaschub, C. (2003). A practical guide to experience-sampling procedures. *Journal of Happiness Studies*, *4*, 53-78
- Compton, R. J., Robinson, M. D., Ode, S., Quandt, L. C., Fineman, S. L., & Carp, J. (2008). Error-monitoring ability predicts daily stress regulation. *Psychological Science*, *19*, 702-708.
- Costa, P. T., & McCrae, R. R. (1992). *Revised NEO Personality Inventory (NEO PI-R) and NEO Five-Factor Inventory (NEO-FFI). Professional manual*. Lutz, FL: Psychological Assessment Resources.
- Crawford, L. (2009). Conceptual metaphors of affect. *Emotion Review*, *1*, 129-139.
- Crawford, L., Margolies, S. M., Drake, J. T., & Murphy, M. E. (2006). Affect biases memory of location: Evidence for the spatial representation of affect. *Cognition and Emotion*, *20*, 1153-1169.

- Damasio, A. (1994). *Descartes' error. Emotion, reason, and the human brain*. New York: G.P. Putnam's Sons.
- Darwin, C. (1872). *The expression of the emotions in man and animals*. London, England: John Murray.
- David, J. P., & Suls, J. (1999). Coping efforts in daily life: Role of big five traits and problem appraisals. *Journal of Personality*, 67, 265–294.
- Dawkins, R. (1976). *The selfish gene*. New York: Oxford University Press.
- de Wall, F. D. M. (2002). Apes from Venus: Bonobos and human social evolution. In: F. D. M de Wall (Ed.) *Tree of origin: What primate behavior can tell us about human social evolution* (pp. 39-68). Cambridge, MA: Harvard University Press.
- Ekman, P. (2003). *Emotions revealed: Recognizing faces and feelings to improve communication and emotional life*. New York: Times Books/Henry Holt and Co.
- Elliot, A., & Niesta, D. (2008). Romantic red: Red enhances men's attraction to women. *Journal of Personality and Social Psychology*, 95, 1150-1164.
- Enders, C. K., & Tofighi, D. (2007). Centering predictor variables in cross-sectional multilevel models: A new look at an old issue. *Psychological Methods*, 12, 121-138.
- Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. *American Psychologist*, 49, 709-724.
- Everitt, B.S. (2002). *The Cambridge dictionary of statistics*. Cambridge: Cambridge University Press.
- Fetterman, A. K., & Robinson, M. D. (in press). Do you use your head or follow your heart? Self-location predicts personality, emotion, decision making, and performance. *Journal of Personality and Social Psychology*.

- Fetterman, A. K., Robinson, M. D., Gordon, R. D., & Elliot, A. J. (2011). Anger as seeing red: Perceptual sources of evidence. *Social Psychological and Personality Science*, 2, 311-316.
- Fetterman, A. K., Robinson, M. D., & Meier, B. P. (in press) Anger as “seeing red”: Evidence for a perceptual association. *Cognition and Emotion*, 26, 1445-1458.
- Gibbs, R. W. (1994). *The poetics of mind: Figurative thought, language, and understanding*. Cambridge: Cambridge University Press.
- Glucksberg, S., Gildea, P., & Bookin, H. B. (1982). On understanding nonliteral speech: Can people ignore metaphors? *Journal of Verbal Learning and Verbal Behavior*, 21, 85–98.
- Goldberg, L. R. (1999). A broad-bandwidth, public domain, personality inventory measuring the lower-level facets of several five-factor models. In: I. Mervielde, I. Dreary, F. De Fruyt, & F. Ostendorf (Eds.), *Personality psychology in Europe* (Vol. 7, pp. 7-28). Tilburg, The Netherlands: Tilburg University Press.
- Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., et al. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality*, 40, 84-96.
- Goleman, D. (2006). *Emotional intelligence*. New York: Bantam Dell.
- Graesser, A., Mio, J., & Millis, K. (1989). Metaphors in persuasive communication. In: D. Meutsch & R. Viehoff (Eds.), *Comprehension and literary discourse: Results and problems of interdisciplinary approaches* (pp. 131-154). Berlin, Germany: De Gruyter.
- Green, M. J., Boyle, G. J., & Raine, A. (2008). Schizotypal personality models. In: G. J. Boyle, G. Matthews, & D. H. Saklofske (Eds.), *The SAGE handbook of personality theory and*

- assessment, Vol 1: Personality theories and models* (pp. 399-419). Thousand Oaks, CA: Sage Publications, Inc.
- Heine, B., Claudi, U., & Hünemeyer, F. (1991). *Grammaticalization: A conceptual framework*. Chicago, IL: University of Chicago Press.
- Holmes, E. A., & Mathews, A. (2005). Mental imagery and emotion: A special relationship? *Emotion, 5*, 489–497.
- Hyman, I. E., & Pentland, J. (1996). The role of mental imagery in the creation of false childhood memories. *Journal of Memory and Language, 35*, 101–117.
- Izard, C. E. (2009). Emotion theory and research: Highlights, unanswered questions, and emerging issues. *Annual Review of Psychology, 6*, 01-25.
- Jensen, A. R. (1998). *The g factor: The science of mental ability*. Westport, CT: Praeger Publishers.
- Kosslyn, S. M., Cacioppo, J. T., Davidson, R. J., Hugdahl, K., Lovallo, W. R., Spiegel, D., et al. (2002). Bridging psychology and biology: The analysis of individuals in groups. *American Psychologist, 57*, 341-351.
- Kövecses, Z. (2000). *Metaphor and emotion: Language, culture, and body in human feeling*. Cambridge: Cambridge University Press.
- Kövecses, Z. (2002). *Metaphor: A practical introduction*. New York: Oxford University Press.
- Kövecses, Z. (2006). *Language, mind, & culture: A practical introduction*. New York: Oxford University Press.
- Krishnakumar, S., Hopkins, K., Szmerkovsky, J., & Robinson, M. D. (2013). Development and validation of an ability measure of emotional intelligence for the workplace. *Manuscript submitted for publication*.

- Lacey, S., Stilla, R., & Sathian, K. (2012). Metaphorically feeling: Comprehending textural metaphors activates somatosensory cortex. *Brain and Language*, *120*, 416-421.
- Lakoff, G. (1987a). *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago, IL: University of Chicago Press.
- Lakoff, G. (1987b). Image metaphors. *Metaphor and Symbolic Activity*, *2*, 219-222.
- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: University of Chicago Press.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenge to Western thought*. New York: Basic Books.
- Landau, M. J., Meier, B. P., & Keefer, L. A. (2010). A metaphor-enriched social cognition. *Psychological Bulletin*, *136*, 1045-1067.
- Lang, P. J., (1979). A bio-informational theory of emotional imagery. *Psychophysiology*, *16*, 495–512.
- Lang, P. J., & Bradley, M. M. (2010). Emotion and the motivational brain. *Biological Psychology*, *84*, 437-450.
- Lang, P. J., Kozak, M. J., Miller, G. A., Levin, D. N., & McLean Jr., A. (1980). Emotional imagery: Conceptual structure and pattern of somato-visceral response. *Psychophysiology*, *17*, 179–192.
- Lazarus, R. S. (1991). *Emotion and adaptation*. New York: Oxford University Press.
- Legree, P. J., Pstka J., Tremble, T. R. & Bourne, D. (2005). Using consensus based measurement to assess emotional intelligence. In: R. Schulze & R. Roberts (Eds.), *International handbook of emotional intelligence*. (pp 99–123). Berlin, Germany: Hogrefe & Huber.

- Liu, R. T., & Kleiman, E. M. (2012). Impulsivity and the generation of negative life events: The role of negative urgency. *Personality and Individual Differences, 53*, 609-612.
- MacCann, C., & Roberts, R. D. 2008. New paradigms for assessing emotional intelligence: Theory and data. *Emotion, 8*, 540-551.
- MacCann, C., Roberts, R. D., Matthews, G., & Zeidner, M. (2004). Consensus scoring and empirical option weighting of performance-based Emotional Intelligence (EI) tests. *Personality and Individual Differences, 36*, 645-662.
- Marks, D. F. (1973). Visual imagery differences in the recall of pictures. *British Journal of Psychology, 64*, 17-24.
- Mayer, J. D., & Salovey, P. (1997). What is emotional intelligence? In: P. Salovey, & D. J. Sluyter (Eds.), *Emotional development and emotional intelligence: Educational implications* (pp. 3-34). New York: Basic Books.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2004). A further consideration of the issues of emotional intelligence. *Psychological Inquiry, 15*, 249-255.
- Mayer, J. D., Salovey, P., & Caruso, D. R. (2008). Emotional intelligence: New ability or eclectic traits? *American Psychologist, 63*, 503-517.
- McCrae, R. R., & Costa, P. R. (1999). The five-factor theory of personality. In: O. P. John, R. W. Robins, L. A. Pervin, O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality psychology: Theory and research* (pp. 159-181). New York: Guilford Press.
- Meier, B., Hauser, D., Robinson, M., Friesen, C., & Schjeldahl, K. (2007). What's 'up' with God? Vertical space as a representation of the divine. *Journal of Personality and Social Psychology, 93*, 699-710.



- Meier, B. P., Riemer-Peltz, M., Moeller, S. K., & Robinson, M. D. (2012). Sweet taste preferences and experiences predict prosocial inferences, personalities, and behaviors. *Journal of Personality & Social Psychology, 102*, 163-174.
- Meier, B. P., & Robinson, M. D. (2004). Why the sunny side is up: Associations between affect and vertical position. *Psychological Science, 15*, 243-247.
- Meier, B. P., & Robinson, M. D. (2005). The metaphorical representation of affect. *Metaphor and Symbol, 20*, 239-257.
- Meier, B. P., Robinson, M. D., Crawford, L. E., & Ahlvers, W. J. (2007). When 'light' and 'dark' thoughts become light and dark responses: Affect biases brightness judgments. *Emotion, 7*, 366-376.
- Merritt, D. J., Casasanto, D., & Brannon, E. M. (2010). Do monkeys think in metaphors? Representations of space and time in monkeys and humans. *Cognition, 117*, 191-202.
- Mikolajczak, M., Nelis, D., Hansenne, M., & Quoidbach, J. (2008). If you can regulate sadness, you can probably regulate shame: Associations between trait emotional intelligence, emotion regulation and coping efficiency across discrete emotions. *Personality and Individual Differences, 44*, 1356-1368.
- Mikulincer, M., & Shaver, P. R. (2005). Attachment theory and emotions in close relationships: Exploring the attachment-related dynamics of emotional reactions to relational events. *Personal Relationships, 12*, 149-168.
- Miller, G. (2000). *The mating mind: How sexual choice shaped the evolution of human nature*. New York: Doubleday & Co.

- Minzenberg, M. J., Yoon, J. H., & Carter, C. S. (2011). Schizophrenia. In: R. E. Hales, S. C. Yudofsky, & G. O. Gabbard (Eds.), *Essentials of psychiatry* (3rd ed.) (pp. 111-150). Arlington, VA: American Psychiatric Publishing, Inc.
- Moeller, S. K., Robinson, M. D., Wilkowski, B. M., & Hanson, D. M. (2012). The Big Chill: Interpersonal coldness and emotion labeling skills. *Journal of Personality, 80*, 703-724.
- Nunnally, J. C. (1978). *Psychometric theory* (2nd ed.). New York: McGraw-Hill.
- Oatley, K., & Johnson-Laird, P. N. (1987). Towards a cognitive theory of emotions. *Cognition and Emotion, 1*, 29-50.
- Olsson, A., & Phelps, E. A. (2007). Social learning of fear. *Nature Neuroscience 10*, 1095–1102
- Paivio, A. (1969). Mental Imagery in associative learning and memory. *Psychological Review, 76*, 241-263.
- Paivio, A. (1986). *Mental representations: A dual coding approach*. Oxford, England: Oxford University Press.
- Petrides, K. V., & Furnham, A. (2003). Trait emotional intelligence: Behavioural validation in two studies of emotion recognition and reactivity to mood induction. *European Journal of Personality, 17*, 39-57.
- Pinker, S. (1994). *The language instinct*. New York: Harper Perennial Modern Classics.
- Plomin, R., DeFries, J. C., & McClearn, G. E. (1990). *Behavioral genetics: A primer* (2nd ed.). New York: W. H. Freeman
- Rider, K. V. (2011). Using a metaphor to help couples rebuild trust after an affair. *Journal of Family Psychotherapy, 22*, 344-348.

- Robinson, M. D., & Fetterman, A. K. (in press). Toward a metaphor-enriched personality psychology. In: M. Landau, M. D. Robinson, & B. P. Meier (eds.) *Metaphor and Social Life*. Washington, DC: American Psychological Association.
- Robinson, M. D., & Wilkowski, B. M. (in press). Personality processes and processes as personality: A cognitive perspective. In: M. Mikulincer & P. R. Shaver (Eds.), *APA handbook of personality and social psychology*. Washington, DC: American Psychological Association.
- Schultheiss, O. C. (2008). Implicit motives. In: O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research (3rd ed.)* (pp. 603-633). New York: Guilford Press.
- Schultheiss, O. C., Patalakh, M., Rawolle, M., Liening, S., & MacInnes, J. J. (2011). Referential competence is associated with motivational congruence. *Journal of Research in Personality, 45*, 59-70.
- Segal, N. L. (1999). *Entwined lives: Twins and what they tell us about human behavior*. New York: Plume.
- Setchell, J. M., & Wickings, E. (2004). Sexual swelling in mandrills (*Mandrillus sphinx*): A test of the reliable indicator hypothesis. *Behavioral Ecology, 15*, 438-445.
- Shrout, P. E., & Fleiss, J. L. (1979) Intraclass correlations: Uses in assessing rater reliability. *Psychological Bulletin, 2*, 420-428.
- Sifneos, P. E. (1973). The prevalence of 'alexithymic' characteristics in psychosomatic patients. *Psychotherapy and Psychosomatics, 22*, 255-262.

- Singer, J. D. (1998). Using SAS PROC MIXED to fit multilevel models, hierarchical models, and individual growth models. *Journal of Educational and Behavioral Statistics*, 23, 323-355.
- Smith, E. R. (1998). Mental representation and memory. In: D. T. Gilbert, S. T. Fiske, & G. Lindzey (Eds.), *The handbook of social psychology, Vols. 1 and 2* (4th ed.) (pp. 391-445). New York: McGraw-Hill.
- Suls, J., & Martin, R. (2005). The daily life of the garden-variety neurotic: Reactivity, stressor exposure, mood spillover, and maladaptive coping. *Journal of Personality*, 73, 1485-1510.
- Tabachnick, B. G., & Fidell, L. S. (2007). *Using multivariate statistics* (5th ed.). Boston, MA: Allyn & Bacon/Pearson Education.
- Tennen, H., Affleck, G., Armeli, S., & Carney, M. (2000). A daily process approach to coping: Linking theory, research, and practice. *American Psychologist*, 55, 626-636.
- Williams, L. E., & Bargh, J. A. (2008). Experiencing physical warmth promotes interpersonal warmth. *Science*, 322, 606-607.
- Williams, L. E., Huang, J. Y., & Bargh, J. A. (2009). The scaffolded mind: Higher mental processes are grounded in early experience of the physical world. *European Journal of Social Psychology*, 39, 1257-1267.
- Wilkowski, B. M., Robinson, M. D., & Troop-Gordon, W. (2010). How does cognitive control reduce anger and aggression? The role of conflict monitoring and forgiveness processes. *Journal of Personality and Social Psychology*, 98, 830-840.
- Winter, D. G. (1994). *Manual for scoring motive imagery in running text* (4th ed.). Self published manuscript, Department of Psychology, University of Michigan, Ann Arbor.

Wolf, C. C., & Linden, D. J. (2012). Biological pathways to adaptability—Interactions between genome, epigenome, nervous system and environment for adaptive behavior. *Genes, Brain & Behavior*, *11*, 3-28.

## APPENDIX. RESEARCH INSTRUMENT

Which would YOU be more inclined to say, think, or write in everyday life?

- |    |   |  |
|----|---|--|
| 01 | A. I feel like jumping for joy          | B. I feel very happy                     |
| 02 | A. The test was difficult               | B. The test sucked                       |
| 03 | A. I am impatient                       | B. I am fed up                           |
| 04 | A. I see what you mean                  | B. I understand your point               |
| 05 | A. The sale have increased dramatically | B. The sales have skyrocketed            |
| 06 | A. She uses her head                    | B. She makes rational decisions          |
| 07 | A. He is deep                           | B. He is very thoughtful                 |
| 08 | A. I am burning up                      | B. I am very hot                         |
| 09 | A. She thinks outside the box           | B. She is very creative                  |
| 10 | A. She is very nice                     | B. She is a saint                        |
| 11 | A. This is a big deal                   | B. This is very important                |
| 12 | A. Time is dragging                     | B. Time is moving slow                   |
| 13 | A. I won the match                      | B. I destroyed them                      |
| 14 | A. I cannot get it across to him        | B. I cannot get him to understand        |
| 15 | A. We are in deep trouble               | B. We did something very wrong           |
| 16 | A. I am very happy                      | B. I am on top of the world              |
| 17 | A. I hate it                            | B. That makes me sick                    |
| 18 | A. I feel like crap                     | B. I am sick                             |
| 19 | A. She blew up                          | B. She got very angry                    |
| 20 | A. I can't cram any more into my head   | B. I can't memorize any more information |
| 21 | A. I'm drained                          | B. I'm tired                             |

- |    |                                |                                   |
|----|--------------------------------|-----------------------------------|
| 22 | A. I slept like a rock         | B. I slept well                   |
| 23 | A. He's on the right track     | B. He is doing well               |
| 24 | A. He has a big heart          | B. He is caring                   |
| 25 | A. He got wasted               | B. He got very drunk              |
| 26 | A. My heart was broken         | B. I was very sad                 |
| 27 | A. She was crushed by the news | B. She was very upset by the news |
| 28 | A. I am very tired             | B. I am dead tired                |
| 29 | A. He ran like the wind        | B. He ran very fast               |
| 30 | A. Be happy                    | B. Cheer up                       |