Comparison, Categorization, and Metaphor Comprehension

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Abstract

One of the prevailing questions in current metaphor research has been whether and to what extent conventionality of a metaphor influences its processing. The career of metaphor hypothesis (Bowdle & Gentner, 2005; Gentner & Bowdle, 2001) suggests that conventional metaphors are processed through categorization whereas novel ones are processed through comparison. The dual reference theory (Glucksberg & Haught, 2006a, 2006b), on the other hand, proposes that it is the grammatical form of a figurative statement that determines how it will be processed. More specifically, metaphors which share the grammatical form of literal categorizations are processed through categorization and similes which share the grammatical form of literal comparisons are processed through comparison. The present study investigated the claims of these theories and found support for the career of metaphor hypothesis by showing that conventional figurative statements appeared to be processed through categorization whereas novel statements appeared to be processed through comparison.

Key Words: Metaphor; conventionality; categorization; comparison.

Introduction

Traditionally, theories regarding the processing of metaphors have been divided into those that view it as a form of comparison (e.g., Miller, 1979; Ortony, 1979; Johnson & Malgady, 1979) and those that view it as a form of categorization (e.g., Glucksberg & Keysar, 1990; Shen, 1989). Comparison- based theories suggest that when processing a nominal metaphor (e.g., Jealousy is a tumor), we align the properties of the target term (jealousy) with those of the base term (tumor) and look for an overlap (e.g., both grow uncontrollably). In contrast, categorization-based theories suggest that we create an ad hoc category (e.g., anything that grows uncontrollably) that encompasses both the target term and the base term, with the base term as a more representative member. According to this view, the metaphor Jealousy is a tumor is interpreted as a statement that jealousy belongs in the category anything that grows uncontrollably, which is denoted by tumor.

The career of metaphor hypothesis (Bowdle & Gentner, 2005; Gentner & Bowdle, 2001) unifies the comparison and categorization theories of metaphor processing. According to this hypothesis, novel metaphors (e.g., A child is a snowflake) are understood through comparison. The properties of the target are mapped onto those of the base, and an overlap is sought. In contrast, conventional metaphors can be understood through categorization. A conventional metaphor has a base term that has become strongly associated with a certain ad hoc category through repeated use and thus has acquired a secondary, figurative meaning. For instance, as a consequence of being repeatedly compared with different targets to convey similar meanings (e.g., This garage sale is a goldmine, A college education is a goldmine), the term goldmine has come to be associated with the category anything that is a source of something valuable. Once this process of conventionalization has taken place, any further metaphors with goldmine in the base position can be understood as categorization statements. Instead of interpreting the metaphor by seeking an overlap of properties between the target and base, we can interpret it as a statement that the target term belongs to the category represented by the base term.

Bowdle and Gentner (2005) found that novel metaphors are preferred more strongly in the simile form (A is like B), whereas conventional metaphors are equally acceptable in either the metaphor form (A is B) or the simile form. The simile form has the same grammatical structure as literal comparison (e.g., A dog is like a cat), so a preference for the simile form might indicate processing through comparison. In contrast, the metaphor form has the same grammatical structure as literal categorization (e.g., A dog is a carnivore), so a preference for the metaphor form might indicate processing through categorization. According to Bowdle and Gentner (2005), the simile form and the metaphor form are both acceptable for conventional figurative statements because such statements can be processed either through comparison, by mapping the target onto the primary, literal meaning of the base, or through categorization, by mapping the target onto the secondary, figurative meaning of the base. The finding that novel statements are preferred in simile form, whereas conventional statements are equally acceptable in either simile or metaphor form, was also replicated by Gokcesu and Bowdle (2003).

Bowdle and Gentner (2005) further showed that novel figurative statements were processed more rapidly in the simile form than in the metaphor form. Their studies also showed that conventionalizing a set of novel base terms in the lab resulted in a shift towards categorization in the processing of further statements containing these base terms.

Glucksberg and Haught (2006a, 2006b), put forth the dual reference theory, which is a variation of the categorization approach to metaphor comprehension that focuses on grammatical form. Bowdle and Gentner (2005) pointed out that for conventional figurative statements that can be processed either through categorization or comparison, the grammatical form of the statement can determine which

route is selected. In contrast, the dual reference theory suggests that for all figurative statements, regardless of conventionality, grammatical form might determine processing. Specifically, metaphors should invite categorization as they share the grammatical form of literal categorizations. According to dual reference theory, in processing the metaphor My job is a jail, an ad hoc metaphoric category is created (e.g., anything that is confining). This category is selected such that the base term is a more representative member of it than the target term. The metaphor is processed as a statement that my job belongs in the category of things that are confining represented by jail. Similes, on the other hand, share the grammatical form of literal comparison statements. When processing the simile My job is like a jail, the properties of my job and jail are retrieved and an overlap is sought

According to dual reference theory, conventionality does not play a crucial role in metaphor processing. In support of this claim, Glucksberg and Haught (2006a) showed that when the base term of a metaphor is paired with a modifier which indicates that it can only refer to a metaphoric category (e.g., My lawyer is a well-paid shark), participants always prefer the metaphor form over the simile form, even for statements with novel base terms. Glucksberg and Haught (2006a) suggested that the findings of Bowdle and Gentner (2005), which show a significant effect of conventionality on grammatical form preference, might have been due to the fact that the conventional statements Bowdle and Gentner used in their stimuli (e.g., A gene is a blueprint) were more apt than the novel statements they used (e.g., A fisherman is a spider). Glucksberg and Haught argued that aptness, rather than conventionality, might have been responsible for the differences Bowdle and Gentner found between conventional and novel figurative statements. Specifically, novel figurative statements might have been preferred in the simile form because participants found it difficult to produce an appropriate metaphoric category for a figurative statement that was not apt.

In support of the idea that aptness rather than conventionality determines how a nominal metaphor is processed, Chiappe, Kennedy, and Smykowski (2003) showed that the degree of aptness in figurative statements correlates strongly with a preference for the metaphor form, whereas degree of conventionality does not. Similarly, Jones and Estes (2006) found that aptness, rather than conventionality, determines whether a given figurative statement is preferred in the metaphor form or the simile form (but see Bowdle (2008) for an alternative account). While these studies appear to suggest that aptness, rather than conventionality, might have caused the differences Bowdle and Gentner report between novel and conventional statements, they cannot account for the finding that the grammatical form preference for novel bases that were conventionalized in the laboratory shifted from simile to metaphor. Furthermore, a series of post hoc analyses conducted on the aptness and grammatical form preference ratings of the Gokcesu and Bowdle (2003) data made it seem improbable that the effect of conventionality they found was due to a difference in the degree of aptness between novel and conventional statements. The present study set out to test the claims of the career of metaphor hypothesis and dual reference theory on a set of conventional and novel statements that were matched in terms of aptness ratings. Experiment I collected interpretations of novel and conventional metaphors presented in either the metaphor form or the simile form. The interpretations were coded for grammatical cues that indicate processing through comparison or categorization. Experiment II manipulated the order of the target and the base terms in each figurative statement and prompted subjects to indicate their preference between the two orders. Experiment III was a reaction time task which involved deciding whether each figurative statement was sensible as quickly as possible.

Experiment I

Bowdle and Gentner (2005) suggested that grammatical cues used by people in their interpretations of figurative statements can be indicative of whether they processed the statement through comparison or categorization. Specifically, Bowdle and Genter noted that when a given statement is processed through comparison, participants are more likely to use double predication. For instance, for A child is a snowflake, double predication involves the interpretation that both are unique. This is similar to how people interpret literal comparisons (e.g., A tiger is like a lion can be interpreted using both eat meat). However, it is not compatible with how people interpret literal categorizations (e.g., the interpretation of A tiger is a carnivore is not likely to involve both eat meat). Participants may be more likely to use single predication when they interpret a given statement through categorization. For A child is a snowflake, an interpretation with a single predication would only mention the target (e.g., a child is unique). Single predication is more compatible with the interpretation of literal categorizations (e.g., the interpretation of A tiger is a carnivore might involve a tiger eats meat). Bowdle and Gentner (2005) found that people provide more interpretations involving double predication for novel figurative statements and more interpretations involving single predication for conventional figurative statements.

Experiment I collected interpretations and coded double vs. single predications as a means of investigating the experimental conditions where a figurative statement is processed through categorization or comparison. The career of metaphor hypothesis expects that double predications will be more prevalent for novel figurative statements, as these can only be understood through comparison. Single predications, on the other hand, should be more prevalent in

the interpretations of conventional figurative statements, as these allow categorization as well as comparison. Dual reference theory predicts that participants should use more double predications for interpreting similes (whose grammatical form invites comparison) and more single predications for interpreting metaphors (whose grammatical form invites categorization), regardless of conventionality.

Participants

A total of 74 Indiana University students participated in the pretests and the experiment. Subjects received credit for an introductory psychology course in return for participation.

Materials

The stimuli for the experiment were selected from a pool of metaphors gathered from earlier studies of metaphor comprehension. In Pretest 1, participants rated the aptness of statements on a scale ranging from 1 to 9 where 1 indicated "not at all apt" and 9 indicated "very apt." Aptness was defined as how appropriate, informative, and meaningful a given statement is.

Pretest 2 was designed to establish the conventionality of each statement. It was a variation of the conventionality procedure introduced by Gentner and Wollf (1997). Two trained coders established a metaphoric ad hoc category containing both the target and the base of each statement. Participants were presented with only the base terms and the corresponding ad hoc categories and were asked to rate how familiar they were with the ad hoc category as a secondary meaning for the base (e.g., How familiar are you with the use of the word goldmine to refer to anything that is a source of something valuable?). Ratings were collected on a nine-point scale where 1 indicated "not at all familiar" and 9 indicated "very familiar."

All pretests were administered on a computer using E-prime. The experimental statements were presented on a black background in green letters and subjects' responses were collected by keyboard presses.

Based on the ratings from Pretest 2, 11 novel (M=3.655) and 11 conventional (M=5.923) statements were selected. The stimuli in both conditions were selected from those items that had received an aptness rating of 5 or higher (M=6.151) and did not differ significantly in terms of aptness.

For each experimental base term, a comparison statement was created that uses the base in a literal sense (e.g., A silver mine is like a goldmine). This was done to provide a basis of comparison for the metaphoric use of the base tern. As almost all the bases were basic level concepts, an equivalent literal categorization statement was not possible. However, literal categorization statements (e.g., A gorilla is a primate) were included in the materials as fillers so that the participants were exposed to an equal number of figurative and literal statements of either grammatical form.

Each participant saw a given experimental base term in a metaphor (A library is a goldmine), a simile (A library is like a goldmine), or a literal comparison (A silver mine is like a goldmine). The number of metaphors, similes, literal comparisons, and literal categorization fillers observed were controlled across participants.

Like the pretests, the experiment was administered on a computer with E-prime. Participants were instructed to type an interpretation of all the statements they were presented with in a text box.

Results

Repeated measures ANOVAs were conducted on the subject means for double predications and single predications. The experiment had a 2(conventionality: conventional, novel) x 3 (statement type: metaphor, simile, literal comparison) design.

Analyses on the means for double predication revealed a main effect of conventionality ($F(1,39)=17.401$, $p<.05$) and a main effect of statement type ($F(2,37)=12.601$, $p<.05$). Interpretations of novel statements (M=0.259) were more likely to include double predications than interpretations of conventional statements (M=0.159). Interpretations of literal comparisons (M=0.346) included a higher number of double predication than those of metaphors (M=0.119) and similes (M=0.161). The differences between literal comparisons and metaphors ($t(38)=6.108$, $p<.05$) and between literal comparisons and similes ($t(38)=4.099$, $p<.05$) were significant. However, the difference between metaphors and similes was not significant.

Analyses on single predications showed that conventional statements (M=0.725) were more likely to involve single predication than novel statements (M=0.576) ($F(1,38)=19.699$, $p<.05$). There was also a main effect of statement type, such that metaphors (M=0.710) and similes (M=0.720) were more likely than literal comparisons (M=0.514) to involve single predication ($F(2,37)=9.647$, $p<.05$). Post hoc analyses showed that the difference between metaphors and literal comparisons ($t(38)=-3.986$, $p<.05$) and the difference between similes and literal comparisons ($t(38)=-3.858$, $p<.05$) were significant, but the difference between metaphors and similes was not.

These findings support the career of metaphor prediction that conventional figurative statements are more likely to be processed through categorization than novel ones. Interpretations of novel statements involved a greater number of double predications (which are typical of comparison) than conventional ones. Interpretations of conventional statements, on the other hand, involved a greater number of single predications (which are more typical of categorization) than novel ones. Dual reference theory's predictions that similes are more likely to evoke comparison (and thus result in more dual predications) and that metaphors are more likely to evoke categorization (and thus result in more single predications) were not supported.

Experiment II

Experiment II collected reversibility ratings on the experimental stimuli from Experiment I. Literal comparisons (e.g., A tiger is like a lion) are highly reversible, in the sense that they remain meaningful when the two terms of comparison change positions (e.g., A lion is like a tiger). Literal categorizations (e.g., A tiger is a carnivore), on the other hand, tend to be highly irreversible. They lose their meaning once the target and the base switch positions (A carnivore is a tiger). Experiment II presented participants with the two possible orders of the target and the base for each experimental statement and asked them to providing a rating of which order they preferred. According to the career of metaphor hypothesis, because conventional figurative statements can be understood through categorization, conventional base terms should always be preferred in the base position, making conventional figurative statements less reversible than novel ones. Novel statements should continue to be acceptable when the target and the base switch positions, as these statements are only understood through comparison. According to dual reference theory, metaphors should be less reversible than similes as the metaphor form invites categorization and the simile form invites comparison.

Participants

Thirty-four Indiana University students participated in the pretests and the experiment. Subjects received credit for an introductory psychology course in return for their participation.

Materials

The experimental statements were the same ones described in Experiment I. Every participant was presented with each statement on a computer screen with both orders of the target and the base (e.g., Genes are blueprints, and Blueprints are genes) with a scale of 1 to 9 displayed between the two statements. A rating of 1 indicates a preference for the statement to the right of the screen, and a rating of 9 indicates a preference for the statement to the left of the screen. Subjects indicated their preference by pressing the appropriate number key on the keyboard.

Results

The experiment had a 2(conventionality: conventional, novel) x 3 (statement type: metaphor, simile, literal comparison) design. Repeated measures ANOVAs were conducted on the subject means for reversibility ratings. Participants' responses were coded such that 1 always indicates a preference for the form that was rated as the more appropriate order (the forward order) by two judges, and 9 always indicates a preference for the opposite order. Thus, ratings that fall in the center of the scale indicate that the statement is reversible.

Analyses on the subject means also revealed a main effect of conventionality ($F(1, 33)=61.683$, $p<.05$) and a main effect of statement type ($F(2, 32)=12.421$, $p<.05$). Conventional statements ($M=2.670$) received significantly lower ratings than novel statements ($M=4.012$), indicating that the preference for the forward order was stronger for conventional items. Asymmetry ratings of literal comparison statements ($M=4.260$) were higher than both metaphors ($M=2.966$) and similes ($M=2.796$) The differences between literal comparisons and metaphors ($t(33)=4.686$, $p<.05$) and between literal comparisons and similes ($t(33)=4.589$, $p<.05$) were significant. However, the difference between metaphors and similes was not significant.

The findings from Experiment II also support the career of metaphor hypothesis by indicating that, like literal categorization statements, conventional figurative statements appear to become less acceptable when the target and the base switch positions. Novel figurative statements, on the other hand, appear to be less sensitive to the positions of the target and the base, similar to literal comparison statements. The findings of this experiment do not support dual reference theory's assumption that similes should behave similarly to literal comparison statements and that metaphors should behave similarly to literal categorization statements. The grammatical form of a figurative statement did not affect its reversibility ratings.

Experiment III

Experiment III sought to further test the claims of the career of metaphor hypothesis and dual reference theory with a reaction time paradigm used by Gernsbacher, Keysar, Robertson, and Werner (2001). In Experiment III, participants were presented with an experimental statement (e.g., A ballerina is (like) a swan) followed by a property statement that was appropriate either to the literal meaning of the base term (e.g., A swan has feathers) or the metaphoric meaning of the base term (e.g., A swan is graceful). The participants' task was simply to decide whether each statement made sense. Based on earlier studies that employed this method (e.g Glucksberg, Newsome, & Goldvarg, 2001) we hypothesized that if a given figurative statement was processed through comparison, this should activate the literal meaning of the base term, which should facilitate the processing of the literal property statement. On the other hand, if a given figurative statement was processed through categorization, only the metaphoric meaning associated with the base should be activated, and this should inhibit the processing of the literal property statements following this figurative statement. The career of metaphor hypothesis predicts that the processing of literal properties is inhibited after conventional figurative statements but not after novel

figurative statements. Dual reference theory, on the other hand, expects that the processing of literal property statements is inhibited following metaphors but not following similes, as similes activate the literal meaning of the base.

Participants

Fifty-four Indiana University students participated in the pretests and the experiment. Subjects received credit for an introductory psychology course or $5 in return for their participation.

Materials

Materials were the experimental statements from Experiments I and II as well as literal and metaphoric property statements constructed for each experimental statement. As the participants' task was to decide whether each statement made sense, the experiment also included metaphors and similes that didn't make sense (e.g., Cords are (like) leaves) and property statements that didn't make sense (e.g., Leaves are intelligent) as filler items.

The statements were presented on a computer screen by E-prime. The participants' task was to respond "yes" if the statement made sense and "no" if it didn't by pressing a key on the keyboard. Each participant's dominant hand was assigned to the "yes" response. Reaction times and participants' accuracies in rating a statement as sensible or not were recorded.

Results

Analyses on reaction times for the property statements did not produce significant results (see Gokcesu (2007) for a full discussion). However, analyses on the participants' sensibility judgments for the experimental statements did produce significant results that are of theoretical interest.

A 2(conventionality: conventional, novel) x 3(statement type: metaphor, simile, literal comparison) repeated measures ANOVA was conducted on subject means for the sensibility judgments. The results revealed a main effect of form ($F(2,52)=20.376$, $p<.05$). Post hoc analyses showed that subjects' sensibility judgments for metaphors ($M=0.780$) was lower than their sensibility judgments for similes ($M=0.902$) ($t(53)=5.250$, $p<.05$) and comparisons ($M=0.904$) ($t(53)=6.358$, $p<.05$). Similes and comparisons did not differ significantly from each other in terms of sensibility judgments.

More interestingly, there was an interaction between conventionality and form ($F(1,52)=3.638$, $p<.05$). Conventional metaphors ($M=0.863$) were rated as more sensible than novel metaphors ($M=0.697$) ($t(53)=3.077$, $p<.05$), but there were no significant differences between conventional ($M=0.889$) and novel similes ($M=0.914$) or literal comparisons for the conventional ($M=0.914$) and novel ($M=0.894$) base terms. This confirms the career of metaphor hypothesis prediction that conventional figurative statements can be processed through either categorization or comparison. Thus, they are judged as sensible both as metaphors and as similes. Novel figurative statements, on the other hand, can only be processed through comparison. Thus, they are only sensible when presented as similes.

Conclusions

The present experiments tested the claims of the career of metaphor hypothesis (Bowdle & Gentner, 2005; Gentner & Bowdle, 2001) and dual reference theory (Glucksberg and Haught (2006a, 2006b) regarding metaphor comprehension. Overall, the findings supported the career of metaphor hypothesis. The results indicated that novel figurative statements are processed through comparison, whereas conventional figurative statements can be processed through either categorization or comparison, as their bases have dual meanings. Conventional base terms are associated with both literal meanings and stable, domain general categories evoked by repeated use of the base term in figurative contexts, which allow categorization. While dual reference theory's predictions that similes should be processed through comparison and metaphors should be processed through categorization were not confirmed, Experiment III showed that grammatical form might indeed affect processing.

To address Glucksberg and Haught's (2006a) concern that earlier studies supporting the career of metaphor hypothesis employed stimulus sets in which the conventional figurative statements were more apt than the novel ones, the present set of experiments used novel and conventional statements that were comparably apt. The present findings therefore strongly suggest that the effect of conventionality on processing is separate from that of aptness. Similarly, Bowdle (2008) found that while aptness has an effect on the perceived strength of figurative statements, it does not influence the mapping involved in metaphoric statements.

The present findings point to a discrepancy in metaphor processing research regarding the influence of conventionality. While some studies fail to find an effect of conventionality on metaphor comprehension (e.g. Jones and Estes, 2006; Chiappe et al. 2003), others (e.g. Bowdle and Gentner, 2005, Gokcesu, 2007) report that conventionality is indeed a driving factor in this process. Bowdle's (2008) studies provide an explanation for this contradiction. Bowdle went through Jones and Estes's experimental stimuli and selected the items whose base terms were conventional both according to the ratings Jones and Estes collected and the Oxford Dictionary of American English, removing those on which the two sources did not agree. Grammatical form ratings on only these stimuli revealed an effect of conventionality alongside the effect of aptness. This suggests that some of the discrepancy in the literature might arise from the criteria employed for establishing conventionality. Bowdle further showed that including

literal categorization and comparison statements as controls eliminated the effect of aptness, possibly because literal controls that create a strong preference for one grammatical form over the other influence the participants' criteria for grammatical form selection for figurative statements. The fact that none of the experiments that show an effect of aptness included literal controls might also contribute to the discrepancy in the literature regarding the role conventionality on metaphor comprehension.

An interesting aspect of the present study is that the effect of grammatical form only surfaced under a task that required rapid processing. All the figurative statements in these experiments were rated as apt metaphors in Pretest 1. Furthermore, all of them appeared to be interpreted readily in Experiment I, regardless of the grammatical form of the statement. In Experiment II, grammatical form did not interact with conventionality in rendering a given statement more or less reversible. This suggests that when given sufficient time and necessary instructions to evaluate an apt figurative statement, subjects simply go by the semantics of the statement and the meanings of the target and the base that are appropriate to the context. As conventional bases refer to stable metaphoric categories, they are more likely to show signs of processing through categorization. However, under time constraints, when there is no time for full evaluation and the decision regarding whether a given statement makes sense needs to be made based on an immediate understanding of the statements, grammatical form appears to play a more important role that is compatible with the career of metaphor hypothesis. The metaphor form (which shares the grammatical form of categorization statements) posed no problem for conventional figurative statements, and conventional metaphors were judged to be as sensible as conventional similes (which share the grammatical form of comparison statements). This is predicted by the career of metaphor hypothesis, as the conventional bases have secondary metaphoric meanings that allow categorization. For novel figurative statements, on the other hand, metaphor made the statement seem nonsensical at first glance. This is predicted by the career of metaphor hypothesis, which expects that the metaphor form, which suggests categorization, is not appropriate in a statement in which the base term does not refer to a stable figurative category.

In addition to providing support for the career of metaphor hypothesis, the present studies suggest that full comprehension of metaphoric statements might involve a different type of processing than immediate comprehension. Future studies might consider separating these two types of processing in assessments of metaphor comprehension.

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