The Misattribution of Relations in Similarity Judgments of Person Concepts

Zachary Estes (estes@uga.edu)
Department of Psychology, University of Georgia
Athens, GA 30602 USA

Roger Alix-Gaudreau (rodge@uga.edu)
Artificial Intelligence Program, University of Georgia
Athens, GA 30602 USA

Abstract

We demonstrate an effect of the valence of a relation between person concepts on subsequent similarity judgments. In Experiment 1, the assertion of a positive relation between person concepts (e.g., The plumber protected the housewife.) increased their perceived similarity, whereas the assertion of a negative relation (e.g., The plumber alienated the housewife.) decreased their perceived similarity. In Experiment 2, positive relations (e.g., The plumber protected the housewife.) increased the perceived similarity of two unrelated person concepts (e.g., editors and taxi drivers), and negative relations decreased the similarity of unrelated persons. Experiment 3 ruled out a task demand explanation by showing that the effect is specific to similarity judgments. Results suggest that relations between person concepts are misattributed to the similarity of any two subsequently judged persons.

Introduction

Similarity is a central explanatory construct of the cognitive sciences. Many cognitive processes, such as analogy (Gentner, 1983), categorization (Rosch, 1975), conceptual combination (Wisniewski, 1996), induction (Sloman, 1996), memory retrieval (Tulving & Thompson, 1973), etc. are at least partially explained by similarity. Although similarity seems intuitively to result from a comparison process (Gentner & Markman, 1997; Tversky, 1977), recent research indicates that the relations between concepts also influence their perceived similarity (Bassok & Medin, 1997; Estes, in press; Wisniewski & Bassok, 1999). The purpose of the present investigation was to demonstrate that relations affect person perception as well, specifically in terms of the perceived similarity of person concepts.

Models of similarity are based almost exclusively upon research that has focused on object concepts (see e.g., Gentner & Markman, 1997). This research on object concepts has interesting and counterintuitive implications for the similarity of person concepts. We begin by briefly describing current research on similarity and relations before considering the implications of this research for person concepts.

Similarity and Relations

Intuitively, similarity computations seem to entail (1) comparison of concepts, and (2) an evaluation of their degree of commonality relative to their degree of distinctiveness (Tversky, 1977). Much evidence indicates that the comparison process is accomplished via structural alignment (see Gentner & Markman, 1997). That is, the representational structures of the two concepts are aligned, or placed into correspondence, and their commonalities and differences are then determined. For instance, in comparing apples to oranges, the shape of apples is aligned with the shape of oranges, resulting in the detection of a commonality; both concepts have roughly similar shapes. The color of apples is also aligned with the color of oranges, revealing a difference; apples and oranges are different colors. Once the concepts have been compared in this way (i.e., Gentner & Markman, 1997), their commonalities are evaluated relative to their differences (cf. Tversky, 1977), yielding a perception of similarity or dissimilarity.

It has recently been shown, however, that relations between concepts also affect the perceived similarity of those concepts. Wisniewski and Bassok (1999), for example, showed that related concepts (e.g., milk and coffee) tend to be judged more similar than unrelated concepts (milk and lemonade; see description below). Thus, perceptions of similarity appear to result from both a comparison process and an integration process.

Comparison and Integration

Ample evidence indicates that comparison and integration are distinct processes, with independent contributions to similarity. Wisniewski and Bassok (1999) had participants rate the similarity of concepts that were either alignable and related (e.g., milk – coffee), alignable and unrelated (e.g., milk – lemonade), nonalignable and related (e.g., milk – cow), or nonalignable and unrelated (e.g., milk – horse). They found a main effect of alignability, such that alignable concepts were judged more similar than nonalignable concepts. That is, milk was judged more similar to coffee and lemonade than to cow and horse. They also found a main effect of relatedness, with related concepts judged more similar than unrelated concepts. Milk was judged more similar to coffee and cow than to lemonade and horse. Thus, Wisniewski and Bassok demonstrated that comparison (i.e., alignability) and integration (i.e., relatedness) provide independent contributions to perceived similarity (see also Bassok & Medin, 1997).

Perhaps even more convincing of the distinction between comparison and integration is a recent study by Gentner and Gunn (2001). For each of a series of concept pairs, Gentner and Gunn had participants either list a commonality of (i.e.,

comparison) or list a relation between (i.e., integration) the concepts. Then, under time pressure, participants were instructed to list one difference for as many concept pairs as they could. Critically, half of the concept pairs were from the first phase of the experiment (i.e., "old" pairs), and half had not been seen previously (i.e., "new" pairs). Participants in the comparison condition were more likely to list differences for old pairs than for new pairs. But participants in the integration condition exhibited the opposite pattern of results: they were more likely to list differences for new pairs than for old pairs. That is, prior comparison facilitated the detection of differences, whereas prior integration inhibited the detection of differences.

Consistent with Gentner and Gunn's finding, Estes (in press) showed that comparison decreased similarity, whereas integration increased similarity. Participants judged the similarity of concept pairs that could be interpreted either by comparison (e.g., umbrella tree) or by integration (e.g., pancake spatula). An experimental group of participants was instructed to combine the concepts (via comparison or integration) before judging their similarity, while a control group judged the similarity of the concepts without combining them. Relative to control, concepts were judged more similar after integration, and less similar after comparison. That is, interpreting umbrella tree as a compound decreased the perceived similarity of umbrellas and trees, presumably as a result of the comparison process. But interpreting pancake spatula as a compound increased the perceived similarity of those concepts, presumably because of the integration process.

Collectively, these studies demonstrate that comparison and integration exert distinct influences on similarity judgments (Bassok & Medin, 1997; Wisniewski & Bassok, 1999). Specifically, comparison facilitates the detection of differences (Gentner & Gunn, 2001) and therefore decreases perceived similarity (Estes, in press), whereas integration inhibits the detection of differences (Gentner & Gunn, 2001) and hence increases perceived similarity (Estes, in press).

Relational Misattributions to Similarity

Because comparison and integration occur via distinct processes, Gentner and colleagues argue that the term "similarity" should properly be reserved for that which results from comparison. That which results from integration, on the other hand, is "relatedness" or "association" (Gentner & Brem, 1999; Gentner & Gunn, 2001). They argue that relatedness merely intrudes on, or is confused as, true (comparison) similarity. That is, essentially, relations are misattributed as similarity. So it's not that milk is more similar to coffee than to lemonade (Wisniewski & Bassok, 1999). Rather, the relation between milk and coffee (i.e., one pours milk into coffee) is *misattributed* as similarity between those concepts.

This presumed misattribution of relations as similarity has interesting implications for social cognition. Many social judgments, like their cognitive counterparts, are based on similarity. For instance, people are grouped into classes on the basis of their similarity to other group members, and traits are inferred on the basis of the individual's similarity to a given social category (see Wittenbrink, Hilton, & Gist, 1998). If relations between object concepts are misattributed as similarity between those objects, it would seem to follow that relations between person concepts will also be misattributed as similarity between those persons. But consider the implications of this: If a professor smiles at a bus driver, is one warranted to infer that professors and bus drivers are now more similar than they would otherwise be? Moreover, does a florist thanking a bartender cause an inference that teachers and violinists are similar? These questions, which follow directly from the research on object concepts, were investigated below.

Experiment 1

If relations are misattributed as similarity, then relations between person concepts should also affect the perceived similarity of those people (just like with object concepts). In particular, the research on object concepts (i.e., Estes, in press; Wisniewski & Bassok, 1999) indicates that relations should increase perceived similarity. However, the relations in those studies were largely devoid of the positive and negative intentions inherent in the relations of person concepts. Thus, we introduced relation valence (i.e., positive, negative) as an independent variable in the present experiment. Half of the relations were positive (e.g., protected) and half were negative (e.g., alienated). After reading a sentence conveying either a positive or a negative relation between two person concepts, participants judged the similarity of those concepts. The null hypothesis was that positive and negative relations would affect perceived similarity equally. The alternative hypothesis was that positive relations would increase similarity, whereas negative relations should decrease similarity.

Method

Seventy-five University of Georgia undergraduates participated for partial course credit. None participated in more than one experiment reported herein, and all were native English speakers.

Materials consisted of 80 common person concepts, 20 positive relations and 20 negative relations. Concepts were randomly paired, with the constraint that no two extremely similar or dissimilar concepts were paired, so as to minimize ceiling and floor effects. Relations were randomly assigned to concept pairs. Independent evaluation of the materials by the experimenters resulted in greater than 90% agreement that (1) the concept pairs were neither extremely similar nor extremely dissimilar, (2) the relations in the positive condition were in fact positively valenced, and (3) those in the negative condition were in fact negatively valenced. See the Appendix for a complete list of the concept pairs and their positive and negative relations.

Each trial began with a declarative sentence describing either a positive or a negative relation between two common person concepts. For example, one positive stimulus was "The singer thanked the engineer," and the corresponding matched negative stimulus was "The singer yelled at the engineer." Each sentence was presented in 16-point bold type, in order to increase the likelihood that participants would read the sentences carefully. Immediately below each

sentence was a judgment question (i.e. "In general, how similar are singers and engineers?"), presented in 12-point normal type. Below that was a response scale ranging from 1 ("not at all similar") to 7 ("extremely similar").

Participants were instructed to read each stimulus sentence before judging the similarity of its constituent concepts. They were instructed to circle a number on the scale corresponding to their similarity judgment.

The valence of the relation (i.e., positive, negative) was manipulated within-participants; each participant received 20 sentences containing a positive relation and 20 containing a negative relation. Sentences were presented in random, intermixed order. The order of concepts within a sentence, and the valence of the relation between them, were counterbalanced between-participants, resulting in four experimental lists. For example, where one group saw "The singer thanked the engineer," another saw "The engineer thanked the singer," a third saw "The singer yelled at the engineer," and a fourth saw "The engineer yelled at the singer." Participants were randomly assigned to experimental lists, with each list completed by an approximately equal number of participants. Fifty undergraduates participated in the experimental condition.

For purposes of comparison, 25 undergraduates participated in a control condition, in which the 40 similarity judgments occurred *without* their preceding stimulus sentences. Similarity questions were presented in the same order as in the experimental condition, and the order of concepts within each question was again counterbalanced between-participants.

Results and Discussion

Results were analyzed separately with participants (t_p) and items (t_i) as random factors. Common person concepts were judged significantly more similar following positive (M = 2.44, S.E = .11) than negative (M = 2.27, S.E. = .11) relations, t_p (49) = 3.69, $p < .001$ and t_i (39) = 2.89, $p < .01$. This result is shown in Figure 1. Error bars (in all figures) represent one standard error of the mean.

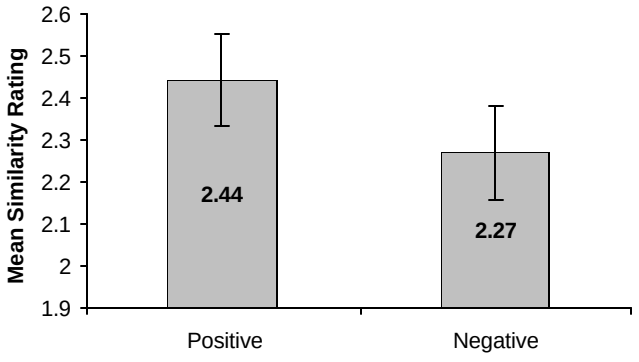

Figure 1: Mean similarity ratings, Experiment 1.

Similarity ratings in the control condition (M = 2.36, S.E. = 0.15) fell between those of the two experimental conditions. However, neither experimental condition differed reliably and consistently from the control condition. The positive condition did not differ from control in either analysis, both $p > .10$. The negative condition differed from control in the item analysis, t_i (39) = 2.54, $p < .02$, but not in the participant analysis ($p > .60$).

These data demonstrate that a positive relation between two person concepts increases participants' judgments of their similarity, while a negative relation decreases that similarity. The size of the effect is small – which may account for the lack of a significant difference between either experimental condition and the control condition – but this is not surprising, given that the concepts being judged were exactly the same in both conditions. We suggest instead that the mere existence of an effect is noteworthy, as it supports the hypothesis that the presence of a relation involving two persons affects their perceived similarity. The results go beyond previous investigations using object concepts, which indicated that relations increase perceived similarity. The present results indicate further that, with person concepts, some relations (i.e., negative ones) *decrease* similarity instead.

Experiment 2

Experiment 1 demonstrated that positive relations increase the similarity of two person concepts, while negative relations decrease the similarity of those person concepts. Apparently, the positive and negative relations are misattributed to the subsequent similarity evaluation. If this effect is in fact due to misattribution (Gentner & Brem, 1999; Gentner & Gunn, 2001), then a relation between two person concepts should also be misattributed to the similarity of other, entirely unrelated person concepts. That is, if participants are unaware that the relations between concepts are influencing their similarity judgments, then this effect should transfer to *any* subsequent similarity judgment. Thus, a positive relation between two person concepts (e.g., The plumber protected the housewife.) should increase the similarity of two unrelated target concepts (e.g., How similar are editors and taxi drivers?). And likewise, a negative relation (e.g., The plumber alienated the housewife.) should decrease the similarity of those unrelated concepts. Experiment 2 tested this hypothesis.

Method

Eighty undergraduates at the University of Georgia participated for partial course credit. Materials from Experiment 1 were modified for the present purposes. Each list of 40 stimuli was split into two lists of 20 stimuli, such that each list contained ten sentences with a positive relation and ten with a negative relation. The judgment questions from the first list were interchanged with those from the second list, so that in every case, the concepts in the stimulus sentence differed from those being judged (e.g. "The singer thanked the engineer. In general, how similar are soldiers and chefs?"). In a given list, no concept that appeared in a stimulus sentence also appeared in a judgment question, or vice versa. Thus, each list consisted of 20 trials, 10 of which contained a positive relation and 10 of which

contained a negative relation. As before, stimulus sentences were presented in 16-point bold type. Participants were told that the sentences had been generated by a previous group of participants, and that they should read these sentences prior to judging the similarity of the subsequent concepts. Participants rated the similarity of the concepts on the same 7-point scale. The order of concepts within a sentence, as well as the valence of the relation between them, was again counterbalanced across participants.

Experiment 1 demonstrated that the mean of the control condition was approximately midway between the means of the positive and negative relation conditions. However, given the small effect size, the number of participants necessary to bear out a significant difference from the control condition was prohibitive. Thus, Experiment 2 did not attempt to replicate the control condition of Experiment 1. Experiment 2 consisted solely of the positive and negative relation conditions.

Results and Discussion

Results were analyzed separately with participants (t_p) and items (t_i) as random factors. Both analyses used paired samples t-tests. As in Experiment 1, similarity ratings following positive relations (M = 2.43, S.E = .09) were significantly higher than those following negative relations (M = 2.30, S.E. = .09), t_p (79) = 2.41, $p < .02$ and t_i (39) = 1.93, $p = .06$. This result is illustrated in Figure 2.

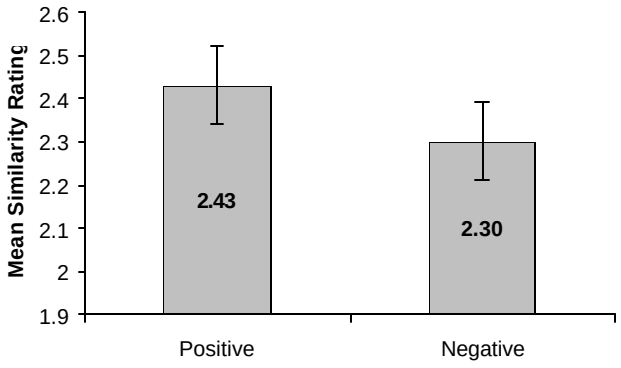

Figure 2: Mean similarity ratings, Experiment 2.

These data show that a positive relation between two person concepts reliably increased participants' judgments of the similarity of two entirely different, unrelated person concepts, while a negative relation reliably decreased that judgment. The consonance of the present results with those of Experiment 1 is striking; the two experiments produced virtually identical results. Whereas positive and negative condition means were 2.44 and 2.27 respectively in Experiment 1, they were 2.43 and 2.30 in Experiment 2. This serves both as corroboration of Experiment 1 and as support for the hypothesis of Experiment 2. It seems that both experiments demonstrate the same phenomenon: the presence of a relation between two person concepts is misattributed as similarity in the subsequent judgment. Moreover, the persons being judged need not be those to whom the relation pertains.

Experiment 3

Results of Experiments 1 and 2 could be attributed to a task demand. Participants may have noticed that some relations were positive and some were negative, and they may have reasoned that the experimenters were anticipating an effect of this manipulation. Hence, they may have complied by intentionally increasing their ratings after positive relations and decreasing their ratings after negative relations.

If this were the case, then the valence (positive or negative) of the relation should predict subsequent ratings, regardless of the judgment elicited. That is, for instance, ratings should increase following positive relations, and should decrease following negative relations, even if we ask the *opposite* question. Thus, to test this hypothesis, Experiment 3 was an exact replication of Experiment 2, except that participants rated the *difference* between two person concepts, rather than their similarity. If, alternatively, the effect observed in Experiments 1 and 2 is specific to similarity judgments, then it should not replicate here in the difference judgments of Experiment 3.

Method

Eighty undergraduates at the University of Georgia participated for partial course credit. Materials were identical to those of Experiment 2, with a single modification: every instance of the words "similar" and "similarity" were replaced with the words "different" and "difference," respectively. Participants were instructed to read the context sentence, which they were told had been generated by previous participants, and then to rate the difference of the two subsequent concepts (e.g. "The singer thanked the engineer. In general, how different are soldiers and chefs?"). The scale ranged from 1 ("not at all different") to 7 ("extremely different"). The experiment was otherwise identical to Experiment 2.

Results and Discussion

Results were again analyzed separately with participants (t_p) and items (t_i) as random factors. Both analyses used paired samples t-tests. Difference ratings following positive relations (M = 5.09, S.E = .08) were nearly identical to those following negative relations (M = 5.12, S.E. = .09). This result, which is shown in Figure 3, did not approach significance, t_p (79) = .40, $p = .69$ and t_i (39) = .02, $p = .98$. Results of Experiment 3, which elicited difference judgments, did not replicate the pattern of results obtained in Experiments 1 and 2, which elicited similarity judgments.

If the results of the previous experiments were simply due to a task demand in which participants deduced that they should increase their rating following a positive relation and decrease it following a negative one, then similar results should have obtained in this third experiment. The lack of such a result suggests that participants were not simply following a rule that produced an artifactual effect in the previous experiments.

The present lack of a reliable difference was not due to insufficient statistical power. First, the relatively large sample size of 80 was exactly the same as that of Experiment 2, which did achieve statistical significance.

And second, variance was approximately equal across experiments, ruling out the possibility that greater variance in Experiment 3 led to a decrease in the ability to detect a difference. There simply was no real difference between the means presented in Figure 3; they differed by a mere three one-hundredths of a point, on a 7-point scale.

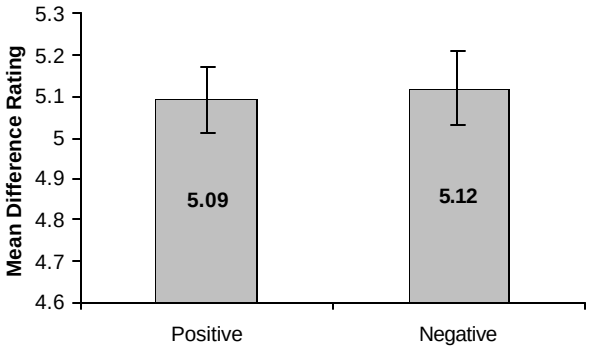

Figure 3: Mean difference ratings, Experiment 3.

Note also that the means of the difference judgments were much higher than the means of the similarity judgments observed in Experiments 1 and 2. This was due to the fact that a rating of "not at all similar" was located on the lower end of the scale in Experiments 1 and 2, whereas the complementary rating of "extremely different" corresponded to the higher end of the scale in Experiment 3.

One might have expected the difference ratings of Experiment 3 to produce a reliable effect opposite to that of Experiments 1 and 2. That is, intuitively, just as positive relations increased similarity ratings, they should have decreased difference ratings. And likewise, just as negative relations decreased similarity ratings, they should have increased difference ratings. However, this intuition assumes that similarity and difference are inverses of one another, an assumption that has been convincingly refuted. It has been shown, for example, that participants tend to judge AA as both more similar to and more different from BB than AC (Medin, Goldstone & Gentner, 1990). This finding that the same alternative is both more similar to *and* more different from the standard necessarily implies that similarity and difference are not inverses. For, if they were inverses, then one alternative stimulus should be chosen as more similar to the standard, and the other alternative stimulus should be chosen as more different from the standard. Hence, the failure of Experiment 3 to reverse the effect of Experiments 1 and 2 may be attributed to the non-complementary nature of similarity and difference judgments.

This explanation is corroborated by the fact that similarity ratings of Experiment 2 and difference ratings of Experiment 3 were not complementary. Calculating the distance of the mean ratings from their respective endpoints of the scale, we see that mean similarity ratings (collapsed across conditions) of Experiment 2 were 1.37 units from the lower endpoint (i.e., 2.37 – 1). If similarity and difference ratings are complementary, then mean difference ratings should be approximately 1.37 units from the higher endpoint of the scale in Experiment 3. But this was not the case: mean difference ratings (collapsed across conditions) were 1.89 units from the higher endpoint (i.e., 7 – 5.11). An independent t-test verified that this difference between 1.37 and 1.89 was highly significant, $t(158) = 4.66$, $p < .001$. Thus, similarity and difference judgments were not complementary in the present experiments (cf. Medin et al., 1990), thereby explaining the lack of a significant result in Experiment 3. Therefore, we conclude that the effect observed in Experiments 1 and 2 is specific to judgments of similarity, and does not extend to judgments of difference.

General Discussion

In Experiment 1, the perceived similarity of common person concepts was increased by the assertion of a positive relation between those concepts. So for instance, plumbers and housewives were judged more similar by participants who were informed that the plumber protected the housewife. And conversely, the perceived similarity of those same person concepts was decreased by the assertion of a negative relation between them. Plumbers and housewives were judged less similar by participants who read that the plumber alienated the housewife. This result demonstrated the influence of relations on similarity judgments of person concepts, and suggested that relations are misattributed as similarity (Gentner & Brem, 1999; Gentner & Gunn, 2001). Experiment 2 further showed that positive and negative relations may even be misattributed to the similarity of another pair of entirely unrelated concepts. In this experiment, for example, a positive relation between a plumber and a housewife increased the similarity of editors and taxi drivers. And a negative relation between the plumber and the housewife conversely decreased the similarity of editors and taxi drivers. Experiment 3 suggested that this effect may be specific to similarity judgments, as the result was not replicated with difference judgments. Thus, the results of Experiments 1 and 2 do not appear to be due to a general strategy of increasing ratings after a positive relation and decreasing ratings after a negative relation.

In the Introduction we stated that the effect of relations on the perception of similarity may be considered a misattribution (Gentner & Brem, 1999; Gentner & Gunn, 2001). That is, the presence of a relation between two concepts is confused as, or intrudes on, perceived similarity. By this account, similarity is the result of a comparison process, whereas relatedness is the result of an integration process. Importantly, similarity is pure comparison; relatedness is a different phenomenon resulting from a distinct process.

Alternatively, Bassok and colleagues (Bassok & Medin, 1997; Wisniewski & Bassok, 1999) reject this "pure" similarity model in favor of a dual process model of similarity. According to the dual process model, comparison and integration are indeed distinct processes, but they both contribute to the perception of similarity. In other words, given the evidence that relations affect similarity, it is apparent that similarity is derived from both comparison and integration. Indeed, Wisniewski and Bassok (1999, Experiment 2) found that the influence of relatedness was

pervasive even in a task that explicitly required comparison instead of integration. Thus, to exclude relatedness from similarity is to render the definition of "similarity" arbitrary.

Distinguishing between the "pure" similarity model (Gentner & Brem, 1999; Gentner & Gunn, 2001) and the dual process model of similarity (Bassok & Medin, 1997; Wisniewski & Bassok, 1999) appears, to a certain extent, to be a matter of theoretical preference. However, our results do appear to lend some, admittedly tentative, support to the pure similarity model. The finding that a relation between person concepts affects the similarity of other, unrelated person concepts is counterintuitive. There seems little reason that participants would consciously and intentionally adjust their similarity ratings of one pair of concepts in accordance with a relation between an unrelated pair of concepts. More plausible is the hypothesis that participants were simply unaware that prior relations were affecting their subsequent similarity judgments. That is, participants were likely misattributing relations as similarity. So to the extent that participants are unaware that relations are affecting their similarity judgments, relations may be considered a misattribution to similarity.

Acknowledgments

We thank Cassie Barnard, Chris Butler, Lisa Hatfield, Cristina Jover, Robby Pelfrey, Jack Tomlinson and Matt Voss for assistance with data collection. This research was funded in part by a Faculty Research Grant to the first author from the University of Georgia Research Foundation.

References

Bassok, M. & Medin, D. L. (1997). Birds of a feather flock together: Similarity judgments with semantically rich stimuli. *Journal of Memory and Language, 36,* 311-336.

Estes, Z. (in press). A tale of two similarities: Comparison and integration in conceptual combination. *Cognitive Science.*

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

Gentner, D. & Brem, S. (1999). Is snow really like a shovel? Distinguishing similarity from thematic relatedness. *Proceedings of the Twenty-First Annual Meeting of the Cognitive Science Society* (pp. 179-184). Mahwah, NJ: Erlbaum.

Gentner, D. & Gunn, V. (2001). Structural alignment facilitates the noticing of differences. *Memory & Cognition, 29,* 565-577.

Gentner, D. & Markman, A. B. (1997). Structure mapping in analogy and similarity. *American Psychologist, 52,* 45-56.

Medin, D. L., Goldstone, R. L. & Gentner, D. (1990). Similarity involving attributes and relations: Judgments of similarity and difference are not inverses. *Psychological Science, 1,* 64-69.

Rosch, E. (1975). Cognitive representations of semantic categories. *Journal of Experimental Psychology: General, 104,* 192-233.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. *Psychological Bulletin, 119,* 3-22.

Tulving, E. & Thompson, D. M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review, 80,* 352-373.

Tversky, A. (1977). Features of similarity. *Psychological Review, 84,* 327-352.

Wisniewski, E. J. (1996). Construal and similarity in conceptual combination. *Journal of Memory and Language, 35,* 434-453.

Wisniewski, E. J. & Bassok, M. (1999). What makes a man similar to a tie? Stimulus compatibility with comparison and integration. *Cognitive Psychology, 39,* 208-238.

Wittenbrink, B., Hilton, J. L. & Gist, P. L. (1998). In search of similarity: Stereotypes as naïve theories in social categorization. *Social Cognition, 16,* 31-55.

Appendix: Concepts and Relations.

Concept Pair	Positive/Negative Relation
actress/construction worker	appreciated/pushed
athlete/gas station attendant	had fun with/bothered
baker/movie producer	danced with/complained about
bus driver/lawyer	cared for/fought with
butcher/maid	visited/accused
carpenter/professor	admired/upset
coroner/economist	respected/ignored
dancer/shopkeeper	welcomed/yelled at
dentist/interpreter	chatted with/rejected
drummer/novelist	entertained/insulted
electrician/sailor	complimented/bothered
farmer/astronomer	trusted/complained about
fisherman/nurse	cared for/tricked
guitarist/bartender	chatted with/stole from
hypnotist/bicycle messenger	entertained/fought with
janitor/architect	helped/tripped
librarian/astronaut	visited/accused
painter/restaurant manager	supported/ignored
pharmacist/tailor	danced with/upset
philosopher/composer	helped/lied to
photographer/programmer	complimented/pushed
pianist/reporter	shook hands with/abused
plumber/housewife	protected/alienated
poet/florist	joked around with/angered
police officer/landscaper	encouraged/angered
politician/waiter	admired/rejected
postal worker/banker	thanked/tripped
priest/stunt man	trusted/hurt
receptionist/barber	joked around with/tricked
sales clerk/factory worker	appreciated/alienated
scientist/prison guard	encouraged/threatened
sculptor/flight attendant	smiled at/insulted
singer/engineer	thanked/yelled at
soldier/chef	supported/opposed
student/airplane pilot	protected/stole from
taxi driver/editor	respected/opposed
teacher/fireman	welcomed/threatened
therapist/rancher	smiled at/abused
violinist/doctor	shook hands with/hurt
welder/travel agent	had fun with/lied to