Making judgments based on similarity and proximity

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Abstract

In this study, we investigate the conceptual structure of the metaphor *"SIMILARITY IS PROXIMITY"*. The results of four experiments suggest a tight mental link between similarity and proximity. Two experiments revealed that people judge entities to be more similar to each other when they are placed closely in space, while two other experiments showed that entities are judged to be closer to each other when they are thought to be more similar. We discuss this bidirectional metaphor transfer effect in light of approaches to metaphor understanding, including the long-standing view that metaphorical mappings are assumed to be asymmetrical. We also consider the implications of this bi-directional mapping for high level cognition.

1. Introduction

Many living beings learn to classify objects in terms of similarity. This includes bees (Giurfa, Zhang, Jenett, Menzel & Srinivasan, 2001), chimpanzees (Thompson, Oden, & Boysen, 1997) and human children (Smith, 1989). This fundamental ability drives the capacity to make sense of the world. Smith and Heise (1992: 252) argue that our environment is structured according to similarity, and that merely "spending time in the world", "looking at it, hearing it, and feeling it" results in mental representations that reflect the regularities that are present in the environment. Perceived similarity then "reflects the co-relations between perceptual properties as they exist in the world" (ibid. 252). Human infants are excellent at detecting statistical regularities in their environments, including regularities of visual input (Kirkham, Slemmer & Johnson, 2002), speech (Saffran, Aslin & Newport, 1996), tones (Saffran, Johnson, Aslin & Newport, 1999) and space (Kirkham, Slemmer, Richardson & Johnson, 2007).

Similarity and proximity are associated in our everyday experience: Similar objects tend to appear in clusters. We see this with flora. Meadows have wildflowers that are similar and co-located, such as patches of poppies and lupine. Forests have trees that are similar and co-located, such as redwoods and black oaks. Animals also cluster because they need to flock or hunt in groups, such as herds of cattle and packs of wolves. And finally, humans exhibit the same pattern. In cities, people of similar socioeconomical statuses or ethnic backgrounds tend to group into neighborhoods and districts.

In brief, throughout the natural and the social world, similarity and proximity are highly correlated. The importance of similarity and proximity for theorizing about the human mind has been known for a long time (e.g., Wertheimer, 1938), and the existence of mental associations between the two domains are well known, for example, spatially clustering stimuli affects perceived similarity (see e.g., Tversky & Gati, 1978 for city names). The metaphor *"SIMILARITY IS PROXIMITY"* is one specific proposal for the mental association between similarity and proximity situated within the larger body of Conceptual Metaphor Theory.

Conceptual Metaphor Theory maintains that people pick up on environmental relationships and internalize them in the form of a cross-domain mappings, where one

conceptual domain (a target domain) is understood in terms of another, typically more basic domain (a source domain). For example, love is something we all know about and experience, but it is difficult to conceptualize or describe in objective terms. Love is often talked about and thought about in terms of movement along a path, and hence, there is a conceptual metaphor, *"LOVE IS A JOURNEY"*, that structures our understanding of love, including our interpretation of metaphorical expressions related to *"LOVE IS A JOURNEY"*, such as *Our relationship is not going anywhere* and *His marriage hit a deadend*. There is a large literature supporting this position, spanning work in linguistics, philosophy, and psychology (see Gibbs, 1994; Johnson, 1987; Lakoff & Johnson, 1980; Lakoff & 1987; Lakoff, 2012).

Within Conceptual Metaphor Theory, a cross-domain mapping such as *"SIMILARITY IS PROXIMITY"* is thought to motivate linguistic expressions such as *The new directors are **close** in their political views* and *Marty and Glen's views on religion could not be **farther apart***. Here, the source domain of physical proximity, a perceptual feature, is mapped onto the target domain of similarity, a relatively more abstract and conceptual feature. For instance, in *The new directors are close in their political views,* the spatial term "close" refers to similarity in political beliefs. This reflects how much of conceptual structure causally arises from everyday perception and the resulting sensorimotor representations (e.g., Smith & Heise, 1992), or, in other words, how metaphor is grounded in embodied experience (Gibbs, Costa Lima, & Francozo, 2004; Gibbs, 2005, 2006).

An extension of Conceptual Metaphor Theory is primary metaphor theory (Grady, 1997, 1999, 2005). Primary metaphors are such metaphors as *"MORE IS UP"* (*This is a **high** number; Inflation is **rising***), *"MORE IS BIGGER"* (*This is a **huge** sum*) and *"TIME IS SPACE"* (*We are **moving toward** the submission deadline*). Primary metaphors are thought to be experientally grounded from very early sensorimotor interactions with and in the world. Non-primary metaphors are thought to import structure from primary metaphors, which can thus be likened to the earliest building blocks of systems of interconnected metaphors. Non-primary metaphors are, for example, such metaphors as *"THEORIES ARE BUILDINGS"* (Grady, 1997; cf. Kövecses, 2002: 108-110) or *"WEB SPACE IS PHYSICAL SPACE"* (Maglio & Matlock, 1999). These metaphors structure

our thinking of objects and phenomena that are more culturally determined, such as academic theories or the internet.

Primary metaphors, on the other hand, are thought to be more pervasive across cultures. In the case of *"SIMILARITY IS PROXIMITY"*, one can immediately see why this might be the case. The processes that lead to the correlation between similarity and proximity are consistent across different cultures. Natural processes include the clustering of fauna and flora due to climate, or the presence of flocking and swarming behaviors in animals. And they include social processes: People tend to move to places where there are others similar to them (for discussion of "segregation effects", see Bishop, 2008), or to adopt behaviors from members in their close social circles (for discussion of "peer effects", see Christakis & Fowler, 2009). Finally, we tend to structure our human-made environment according *"SIMILARITY IS PROXIMITY"*. In markets, grocery stores and libraries, similar objects are positioned close together. We have no reason to expect that these different sources of the correlation between similarity and proximity should vary in any significant way across cultures. Moreover, we furthermore have no reason to expect that the basic learning mechanisms responsible for internalizing these environmental correlations——in this case, presumably Hebbian learning (Hebb 1949)——vary across cultures. So, even though some cultures might not have *linguistic* expressions that stem from *"SIMILARITY IS PROXIMITY"*, every culture is thought to have a *mental* connection in line with this primary metaphor.

To learn about the psychological underpinnings of conceptual metaphors, it is important to conduct experimental studies alongside linguistic analyses (see for instance, Murphy, 1996; Murphy, 1997; Gibbs, 2007a; Gibbs, 2007b). Extensive research on conceptual metaphor and the mechanisms that enable the understanding of metaphorical expressions has been provided by cognitive scientists and linguists over the past 30 years, including *"TIME IS SPACE"* (e.g., Boroditsky & Ramscar, 2002; Gentner, Imai, & Boroditsky, 2002; McGlone & Harding, 1998; Núñez, Motz, & Teuscher, 2006), *"JOY FILLS A CONTAINER"* (Tseng, Hu, Han, & Bergen, 2007), *"ANGER IS HEAT"* (Gibbs, Bogdonovich, Sykes, & Barr, 1997), *"DESIRE IS HUNGER"* (Gibbs et al., 2004), *"RELATIONSHIPS ARE JOURNEYS"* (Gibbs, 2012), and *"SOCIAL DISTANCE IS*

PHYSICAL DISTANCE" (Matthews & Matlock, 2011). Taken together, this work provides evidence that conceptual metaphors play a vital role in everyday thinking.

In recent years, several behavioral studies have investigated *"SIMILARITY IS PROXIMITY"*. In Boot and Pecher (2010), participants sat in front of a computer and made similarity judgments about color. They had to quickly state whether two colored squares presented on a computer screen were similar in hue or not. Participants were faster at providing "similar" responses when the two colored squares were spatially close to each other than when they were spatially far away from each other. Conversely, they were faster at providing "dissimilar" responses when the two boxes were farther apart from each other. So, if the stimulus and response were in line with the metaphor *"SIMILARITY IS PROXIMITY"*, participants' responses were sped up. If the stimulus and response were not in line with the metaphorical mapping, responses were slowed down (for related findings with color stimuli, see Breaux & Feist, 2008). Other experiments have used linguistic stimuli. In Casasanto (2008, Experiment 1), participants were given pairs of words, such as *chaos* and *prestige* and *justice* and *grief*, and asked to make similarity judgments. The word pairs were presented at three different distances on a computer screen: close, mid, far. In general, participants judged words located closer to each other as more semantically similar to each other than words located far apart.

Here we report our own work on *"SIMILARITY IS PROXIMITY"*. Interested in the conceptual structure of this metaphor using a novel approach, we ran four experiments on the connection between physical location and similarity. In our experiments, which were grouped into two sets of two (Experiments 1a and 1b, and Experiments 2a and 2b), we appealed to what Landau, Meier and Keefer (2010) called the *metaphor transfer strategy*. With this strategy, the researcher tests whether an experimental manipulation associated with one metaphorical domain affects subsequent behavior associated with another metaphorical domain. In our case, Experiment 1a and Experiment 2b demonstrate that altering information about distance results in differences in similarity judgments. And Experiment 1b and Experiment 2a demonstrate that altering information about similarity leads to different responses in a spatial task.

Our four experiments were entirely between-participants. In Experiment 1a and Experiment 2b, each participant saw a scenario in which two objects were close to each

other or far from each other in physical space. In Experiment 1b and Experiment 2a, each participant read text that emphasized similarity or dissimilarity. So, in all experiments, each participant participated in only one condition. In this way, our experiments diverge from prior work on *"SIMILARITY IS PROXIMITY",* which used within-participants tasks (e.g., Breaux & Feist, 2008; Boot & Pecher, 2010, Casasanto, 2008). There are benefits to using a between-participants design. It avoids contamination effects, which happens when the results of one experimental trial affects those of a later trial. It also makes it difficult for participants to identify the experimental manipulation, and reduces the likelihood of responses that stem from knowledge of the experiment rather than intuitive reactions to stimuli (see Martin 2008). It can also be informative to use a between-participants approach to replicate results from within-participants studies (for discussion of within-participants and between-participants design in the reasoning literature, see Stanovich & West, 2008).

2. Experiment 1: Judgments about people

2.1. Experiment 1a

Experiment 1a was designed to investigate how manipulations of space would affect judgments of similarity. We tested whether viewing two characters positioned close to each other would lead participants to assume they were similar. And, conversely, we tested whether two characters positioned far away from each other would lead participants to assume they were more dissimilar.

2.1.1. Methodology

A total of 82 native speakers of English residing in the United States participated for a USD 0.15 monetary reimbursement via the online platform Amazon Mechanical Turk (www.mturk.com). This platform is known to be a valid tool for collecting behavioral data (Bohannon, 2011) and performing linguistic experiments (Sprouse, 2011). In this single trial experiment, participants were given the following instructions:

"On the next screen, you are going to see two people in a room for 10 seconds. Look at them and memorize their locations."

The instruction to memorize was intended to encourage participants to pay attention to the spatial layout. After clicking, participants saw the picture displayed in Fig. 1.

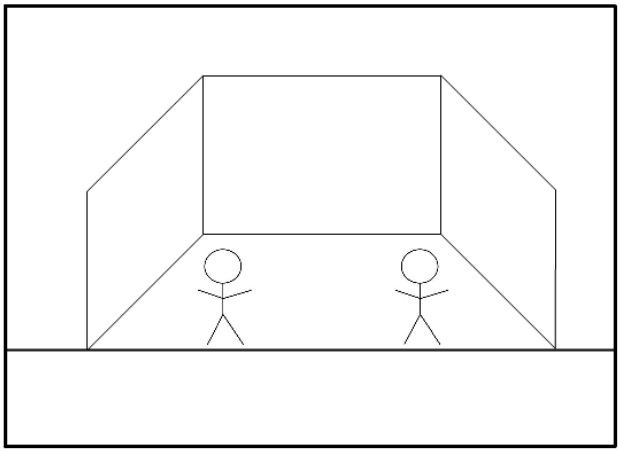

Fig. 1: Experiment 1a stimuli included a depiction of two characters standing in a room, either close from each other or far from each other (shown here).

In the close condition, the stick figures were 60px apart from each other; in the far condition, 170px away from each other. After 10 seconds, the image disappeared, and participants read the following instructions:

"Now, imagine how similar the political ideals of the two people are to each other. Give your rating on a scale from 1 (not at all similar) to 9 (very similar)."

We predicted that participants would make metaphor-consistent similarity judgments, with close characters judged to be more similar to each other than far-away characters. Note that the question that we asked participants explicitly asked for *political* similarity. We did this because previous experimental research suggests that the metaphor *"SIMILARITY IS PROXIMITY"* is effective in more abstract and conceptual reasoning type of situations as opposed to tasks that ask for perceptual judgments (Casasanto, 2008;

Breaux & Feist, 2008). Political similarity is much more abstract than, say, similarity in visual appearance.

2.1.2. Results

We analyzed the data using R (R Core Team, 2012). The overall mean for similarity ratings was 5.95. When the characters in the scene were located near each other, participants judged them to be more similar in political ideals (M=6.38) than when the characters were far from each other (M=5.55). Thus, as predicted, similarity judgments were differentially affected by distance ($t(80)$=2.34, p=0.022, SE=0.35). The results suggest that physical distance alone, in this case, between two characters, can affect subsequent perceptions about political views.

2.2. Experiment 1b

The design of Experiment 1b was the converse of Experiment 1a. Here we investigated whether information about the similarity of characters in a text would influence how close these characters are placed to each other in physical space. Would characters that are described as similar in political views, personality traits and music tastes be placed closer to each other than charaters that are described as different from each other along these domains?

2.2.1. Methodology

A total of 401 English-speaking UC Merced undergraduates volunteered for the study, and received extra credit in a social sciences course. They filled out a survey that occupied one page in a booklet of unrelated materials. At the top of the page, there were instructions that asked each participant to read one of the following passages:

> (1) **Similar condition**
>
> Ann and Jen attend the same class, but they have never talked to each other. Ann likes hip hop, and Jen does, too. They have similar political ideals. Ann is rather conservative, and so is Jen. Also, Ann is outgoing, and Jen is, too.

(2) **Dissimilar condition**

Ann and Jen attend the same class, but they have never talked to each other. Ann likes pop, but Jen loves jazz. They have different political ideals. Ann is rather conservative, but Jen is not. Also, Ann is outgoing but Jen is shy.

Below the passage were the instructions: "See the box below. Imagine that the school is having a party. Draw an "x" for each person to indicate where they are standing." At the bottom of the page, there was a 6" X 6" box in which the X's could be drawn. The statement, "They have never talked to each other," was included to make sure that participants would not simply assume that Ann and Jen are standing close to each other simply because they are friends or socially connected..

2.2.2. Results

There were 201 responses in the similar condition, and 200 in the dissimilar condition. A research assistant measured distance between the two X's in millimeters. Ten percent of all data points were checked for reliability by the first author. The measurements between the two different coders correlated well with each other (r=0.93), and the mean deviation between coders was low (5.7 mm), indicating that the measurements were reliable.

On average, participants drew Ann and Jenn about 74 millimeter away from each other. Participants who read the the similar passage drew Ann and Jenn about 30 mm closer to each other (*M*=58 mm) than did participants who read the dissimilar passage (*M*=89 mm), ($t(334.73)=6.96$, $p<0.0001$, *SE*=4.46).

2.3. Discussion of Experiment 1a and Experiment 1b

We found that participants judged characters positioned close to each other in space to be more similar in political ideals (Experiment 1a). We also found that participants placed two characters closer to each other when they were described as having similar tastes, character traits and political ideals (Experiment 1b). Thus, manipulating information about space affected how participants thought about similarity, and manipulating

information about similarity affected how they thought about physical distance. These results alone run counter to the idea that metaphors are asymmetrical or unidirectional, where the source domain is thought to structure the understanding of the target domain, and not the other way round.

It could be, however, that the results in Experiment 1b were influenced by strategic task demands. Participants were asked to give a spatial response with no explicit spatial cues. If they experienced pronounced uncertainty when providing a response, they may have been inclined to use any information available (Van den Bos, 2003; Van den Bos, Lind, Vermunt, & Wilke, 1997; for discussion related to metaphor, see Boot & Pecher, 2010: 945). It could thus be that participants' reliance on similarity is entirely coincidental and has nothing to do with metaphor per se. To address this possibility, we introduced a new element of similarity in Experiment 2a, phonological similarity. If, as Casasanto (2008) and Breaux and Feist (2008) suggest, the metaphor *"SIMILARITY IS PROXIMITY"* is specifically about more abstract and conceptual rather than perceptual similarity (e.g., in visual appearance), we would expect that similarity along a conceptual dimension such as political views would change spatial responses, but that similarity along a perceptual dimension (e.g., phonological similarity of names) would not. This is what Experiment 2a and Experiment 2b were designed to test. These experiments also serve as conceptual replications of Experiment 1a and Experiment 1b.

3. Experiment 2: Judgments about cities

3.1. Experiment 2a

This experiment uses a different type of stimuli, related to physical proximity of cities rather than characters. It also introduces a different dimension of similarity, namely, similarity in names. This surface similarity between words is more concrete and immediately perceivable than the more abstract similarity in political views or personality traits used in our other experiments.

3.1.1. Methodology

A total of 363 English-speaking undergraduates at the University of California, Merced, participated for extra credit in a social sciences course. The experiment occupied two consecutive pages in a booklet that contained a number of unrelated studies. Participants first read a short, fictional passage about two cities on an island:

(3) The city of Swaneplam has just finished its annual budget, and so has the city of Scaneplave. Swaneplam decided to invest more in education and public healthcare this year. It will also contribute generously to its public transportation system. Similarly, Scaneplave will increase funding for education and healthcare. Also like Swaneplam, Scaneplave will dramatically expand funds for transportation this year.

For the semantically dissimilar version, the last two sentences emphasized *different* political decisions, using the phrases *In contrast* and *Also unlike Swaneplam* to make the dissimilarity particularly salient:

(4) In contrast, Scaneplave will decrease funding for education and healthcare. Also unlike Swaneplam, Scaneplave will dramatically slash funds for transportation this year.

Participants then turned the page and saw a map of the island (see Fig. 2). They were then asked to draw X's on the map to represent each city.

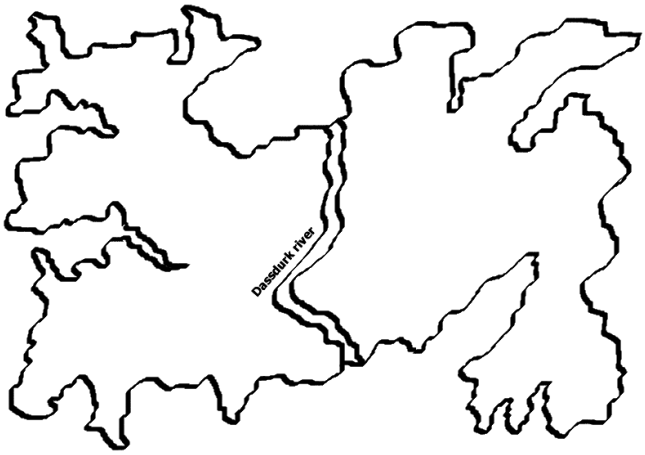

Fig. 2: An island map with "Dassdurk River" in the center was used in Experiment 2a.

To manipulate phonological similarity, we generated both similar-sounding and dissimilar-sounding city names using Wuggy, the pseudoword generator (Keuleers & Brysbaert, 2010). "Swaneplam" and "Scaneplave" were more phonologically similar (Levenshtein distance 3, Borg & Sariyar, 2012) than "Swaneplam" and "Mouchdalt" (Levenshtein distance 9). Conceptual Metaphor Theory does not predict that similarity in names should be associated with spatial proximity, so we expected no changes in spatial responses related to which pairs were used. There were four conditions in total: Phonologically similar+semantically similar, phonologically similar+semantically dissimilar, phonologically dissimilar+semantically similar, phonologically dissimilar+semantically dissimilar. Responses were roughly evenly distributed across the conditions (N=91, 86, 97, 90).

3.1.2. Results

A research assistant measured the distance between the two X's in millimeters. To assure reliability, the first author recoded 10% of the items (37 items). Those measurements correlated well with those of the main coder (r=0.98), and the mean absolute deviation between the coders was low (2.24 mm), suggesting reliable measurements.

Participants drew the two cities 77.6 mm apart on average. In the semantically similar condition, the cities were drawn 72 mm apart; in the semantically dissimilar condition, 83 mm. In the phonologically similar condition, the cities were 80 mm apart; in the phonologically dissimilar condition, 75 mm. Semantic similarity significantly affected distance (F(1,359)=5.97, p=0.015), but phonological similarity did not (F(1,359)=1.92, p=0.17). No interaction between phonological similarity and semantic similarity was observed (F(1,359)=0.3, p=0.58).

A planned post-hoc comparison revealed a significant difference between semantically similar and dissimilar conditions, pooled across phonological similarities, (t(361)=2.44, p=0.015, SE = 4.2). The difference was about 10.23 mm, indicating that conceptually similar cities were about 1 cm closer to each other. The difference between the phonologically similar and dissimilar conditions (5.87 mm) was not reliable (t(361)=1.39, p=0.16, SE = 2.4), suggesting that it is not just *any* dimension of similarity that created differences in spatial judgments. Similarity in names alone did not lead participants to draw cities closer to each other, suggesting that conceptual similarity is, in fact, more relevant to *"SIMILARITY IS PROXIMITY"* than to perceptual similarity alone.

3.2. Experiment 2b

In Experiment 2a, we found an effect of conceptual but not phonological similarity on subsequent city placement. As in Experiment 1a, we wanted to test whether the depicted distance between two cities affected subsequent similarity judgments.

3.2.1. Methods

On Amazon Mechanical Turk, 80 native speakers of English residing in the U.S. were instructed to memorize the locations of two cities on a map, shown in Fig. 2. In line with Experiment 1a, the instruction to memorize was simply a way to encourage participants to pay attention to the spatial layout. In close analogy to Experiment 1a, they saw the map for 10 seconds, with two red X's that were 100 px apart from each other (close condition), or with two red X's that were 320 px apart (far condition). Subsequently, they judged whether the cities were politically similar to each other on a scale from 1 (not at all similar) to 9 (very similar).

3.2.2. Results

The overall mean for judged city similarity was 5.56. Participants who saw cities that were close to each other rated them to be more politically similar (M=6.05) than participants who saw the cities that were far from each other (M=5.14), yielding a reliable difference of 0.91, (t(78)=2.31, p=0.024, SE = 0.4).

6. General discussion

In Experiment 1a and Experiment 2b, we showed that depicting characters or cities closer to each other led participants to assume that they were more similar to each other, which is consistent with Casasanto (2008) and Boot and Pecher (2010), but utilizing a between-participants design. Experiment 1b and 2a, on the other hand, revealed that describing characters or cities as similar to each other made participants assume that they were closer to each other. Together, these studies provide converging evidence for the idea that when people reason about space or similarity, they anchor their understanding in terms of "*SIMILARITY IS PROXIMITY*", both at a somewhat small scale (characters in a room), and a somewhat large scale (cities on an island). That these effects were discovered at two scales suggests that what matters in the spatial dimension (source domain) is the relative difference between two entities within a spatial frame, such as a room or an island.

Note that in the two experiments that used linguistic stimuli (Experiment 1b and Experiment 2b), no explicit metaphorical expressions such as *These colors are close* were included. Lexical items that emphasized literal similarity or dissimilarity (e.g., *and* versus *but*; *similar* versus *different*) alone led to notable changes in spatial responses. In contrast, phonological content that was similar or dissimilar (Experiment 2a) did not. Phonological as opposed to semantic content is a surface characteristic of words, as it only relates to the phonological and orthographic form. The absence of a difference in spatial judgments for a manipulation of surface similarity suggests that *"SIMILARITY IS PROXIMITY"* appears to rely more on abstract or conceptual similarity than on phonological similarity, as has also been argued by Casasanto (2008) and Breaux and Feist (2008).

Our results suggest bidirectional mapping, from source to target domain, as well as from target to the source domain. This may seem controversial in light of the idea that metaphorical mappings are asymmetrical, specifically, that the target domain derives structure from a relatively more basic source domain. Many experimental studies have produced data in support of asymmetry. For example, space affects temporal judgments, but time does not affect spatial judgments (Boroditsky, 2000; Casasanto & Boroditsky,

2008; Casasanto, Fotakopoulou & Boroditsky, 2010; Merritt, Casasanto & Brannon, 2010), suggesting asymmetry with *"TIME IS SPACE"*. Or, the size of dots can affect quantity judgments ("how many dots are there?"), but quantity does not affect size judgments ("how big are the dots?") (Hurewitz, Gelman & Schnitzer, 2006), suggesting asymmetry with *"MORE IS BIGGER"* (see also Dormal & Presenti, 2007). However, many studies are at odds with asymmetry. For example, perceiving numbers (the target domain in metaphors such as *"MORE IS UP"* or *"MORE IS RIGHT"*) changes responses in the spatial source domain (Fischer, Castel, Dodd & Pratt, 2003). And, emotional state (the target domain in metaphors such as *"HAPPY IS UP"* and *"SOCIAL WARMTH IS PHYSICAL WARMTH"*) affects perception of vertical space (Meier & Robinson, 2004) and room temperature (Zhong & Leonardelli, 2008).

It is also worth noting that a metaphor that is related to *"SIMILARITY IS PROXIMITY"* also shows evidence for bidirectional mapping. Experiments on *"SOCIAL DISTANCE IS PHYSICAL DISTANCE"* showed that when people were asked to draw paths on a map, they drew paths closer to characters described as "friends" than to characters described as "strangers" (Matthews & Matlock, 2011; for a reverse, asymmetry-consistent finding see Williams and Bargh, 2008). This finding can be taken as indirect evidence for the bidirectionality of *"SIMILARITY IS PROXIMITY"* as well, because social similarity is consistently related to social distance, and both are associated with physical distance (Bishop, 2008; Christakis & Fowler, 2009). In all these findings, manipulation of the target domain influenced a response in the source domain, not predicted by the view that metaphors are asymmetrical (see also Landau et al., 2010, Footnote 1).

Still, not all metaphor theories strictly adhere to the idea that metaphorical mapping are fully asymmetrical, at least not from start to finish during metaphorical processing. Dedre Gentner and colleagues advocate a two-step structural alignment process. In this approach, features of the source and target domain are linked in early processing (Gentner & Wolff, 1997; Wolff & Gentner, 2000). At this time, the two domains are considered "role neutral", i.e., symmetrical. Next, inferences are made in line with the metaphor, and these inferences are directional . For example, as discussed in Wolff and Gentner (2000: 529), with *My surgeon is a butcher*, elements of a butcher and

a surgeon are first aligned, yielding a shared representation of a person who uses a sharp object to cut flesh. Next, elements from the butcher domain are projected onto the surgeon domain, enabling the metaphorical inference that a surgeon cuts flesh in a crude manner that is not appropriate for medical practice.

Another approach that does not emphasize asymmetry is Conceptual Integration Theory (Fauconnier & Turner, 1998; Turner & Fauconnier, 2002). This approach views metaphorical domains (similarity and proximity, in this case) as two input spaces that combine, with input from a generic space, to give rise to a new, blended space. One problem with attempting to explain our findings for *"SIMILARITY IS PROXIMITY"* in terms of Conceptual Blending Theory is that blending is not capable of accounting for primary metaphors (see Grady, Oakley & Coulson, 1999) because they are deeply entrenched, and their mappings have evolved from repeatedly perceiving environmental correlations in the world. Kövecses (2013) argues that such metaphors are, in fact, better characterized as metonomies. If this is right, it is possible that we are dealing with a metonomy *"PROXIMITY FOR SIMILARITY"*, especially given that close proximity and similarity are highly correlated in nature and in everyday thought. Hence, language that refers to proximity can be seen as a way to metonymically refer to similarity within the same domain. This is not unlike "*ANGER IS HEAT*", which can also be interpreted as the metonomy "*HEAT FOR ANGER*" (see Barcelona, 2000; Radden, 2002), given that anger and heat frequently co-occur in our everyday experience. And, similar arguments can be made for "*HAPPY IS UP*" and "*INTIMACY IS CLOSENESS*", and other metaphors/metonomies (Kövecses, 2013). From this angle, the absence of asymmetry makes good sense: No unidirectional mappings are expected with metonymies.

Right now, there appears to be evidence for asymmetry with pervasive conceptual metaphors, such as *"TIME IS SPACE"*, as well as results to the contrary (for instance, for *"MORE IS RIGHT"*, *"SOCIAL DISTANCE IS PHYSICAL DISTANCE"*, and *"SIMILARITY IS PROXIMITY"*). And, there are multiple theoretical proposals that either assume or do not assume asymmetry for specific metaphors (discussed above). In order to advance theorizing in this domain with experiments, we need to systematically compare primary and non-primary metaphors, and we need to systematically compare both directions of metaphorical mapping. The question thus becomes: Is the current range of

evidence the result of particular metaphors and the particular directional mappings that have been studied? If not, what is it?

A related question is whether symmetrical and asymmetrical effects result from different experimental designs. In our case, it is possible that bidirectionality was in fact an outcome of the task we used. In contrast to Boot and Pecher (2010), Breaux and Feist (2008) and Casasanto (2008), our experiments used richer linguistic stimuli (i.e., full text rather than single words) that were more closely connected to real world situations. In the real world, cities that are near each other seem more similar *and vice versa.* For example, think of "West coast cities" versus "East coast cities". It makes sense that people living close to each other are generally more similar, and conversely, people more similar to each other tend to be located close to each other. So, the basic associations are in fact, bidirectional. Thus, when people are given richer stimuli that more adequately mimic real-world situations, they might tap into this knowledge and thus respond in a more bidirectional fashion.

7. Conclusions

Our results show that when characters or cities are displayed as close to each other, people judge them to be more similar to each other. And, conversely, when two characters or two cities are described as more similar to each other, people judge them to be closer to each other. *"SIMILARITY IS PROXIMITY"* might thus play a vital role in the way we form impressions of such things as cities and people. The fact that we found evidence for similarity and proximity affecting each other in a between-participants design provides converging evidence to show that basic metaphors, such as *"SIMILARITY IS PROXIMITY"*, go far beyond language and in fact figure into our everyday reasoning about the world.

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