Embodied metaphor and abstract problem solving: Testing a metaphoric fit hypothesis in the health domain

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HIGHLIGHTS

- People use metaphor to conceptualize both abstract problems and their solutions.
- We test the interactive effect of metaphoric fit between these understandings.
- Solutions are favored when their metaphoric effects fit a problem's metaphoric framing.
- Solutions with seemingly irrelevant metaphoric effects are seen less favorably.

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ABSTRACT

How do people evaluate candidate solutions to abstract problems that are difficult to grasp? According to conceptual metaphor theory, people can conceptualize abstract ideas in terms of well-known bodily states, even if they are not currently experiencing those bodily states. Extending this perspective, we test a novel *metaphoric fit* hypothesis concerning the (mis)match between embodied-metaphoric framings of an abstract problem (in these studies, depression) and candidate solutions (depression treatments). In Studies 1 and 2, framing depression metaphorically as being physically down or darkened increased the perceived effectiveness of depression medications framed metaphorically as solving those bodily problems ("lifting" and "illuminating," respectively). Consistent with conceptual metaphor theory, this effect was mediated by subjective certainty about depression. Studies 3 and 4 manipulated problem and solution framings to test the interactive effects of metaphoric fit and misfit on solution evaluations. These findings reveal a new route by which embodied knowledge influences problem solving.

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Introduction

People reason about abstract problems using not only knowledge about those problems specifically, but also bodily experiences such as perceptual imagery, "gut-level" affective reactions, and motoric routines. Conceptual metaphor theory (Lakoff & Johnson, 1980) suggests a distinct route by which embodied knowledge influences problem solving. The theory posits that people can understand abstract problems in terms of well-known bodily states, even if they are not currently experiencing those states. Supporting research (discussed shortly) shows that linguistically framing a target abstract problem as a bodily problem leads people to generate solutions that are suited, analogically, to address the bodily problem. The practical implication of these

findings is that metaphor use, although epistemically beneficial, may sometimes produce suboptimal solutions to the abstract problem at hand.

While prior research has focused on solution generation, everyday problem solving often requires evaluating available solutions. For example, consumers confronting health problems must evaluate several candidate treatment options, often without a full medical understanding of the problems' nature or the complex means by which candidate treatments purportedly work. It is not surprising, then, that many health communications employ metaphoric language and imagery to frame abstract health problems and treatments in terms of familiar, perceptually salient bodily states (e.g., "Drug X *tackles* athlete's foot"; Forceville, 1996). This article examines whether such metaphoric framings prompt people to evaluate candidate solutions in ways that are consistent with their knowledge of the relevant bodily states.

Specifically, we extend conceptual metaphor theory to formulate a novel *metaphoric fit* hypothesis: If an embodied-metaphoric framing of an abstract problem prompts people to reason about it using their

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knowledge of a bodily problem, then they should positively evaluate candidate solutions that are themselves framed metaphorically as addressing that bodily problem (Studies 1–3). Additionally, we test whether solution evaluations are negatively affected by metaphors that imply a mismatch between that solution and the problem (Study 4). The current studies test this hypothesis in the context of people's evaluations of depression treatments, but they point to unexamined embodied influences on abstract problem solving across domains.

Embodied metaphor and problem solving

Traditional models propose that people reason about problems by processing information specific to that problem and its candidate solutions (Newell & Simon, 1972). From this perspective, people address health problems, for instance, by acquiring medical information (e.g., from experts) to increase the pool of available solutions and apply rational criteria for settling on an optimal solution (Elstein, Shulman, & Sprafka, 1978).

This traditional view is influential but incomplete. A growing literature on embodied cognition reveals that people also access bodily experiences when reasoning about problems (for a review, see Gibbs, 2005). Studies show, for example, that people are better at learning and solving problems when they concurrently gesture in a manner that matches their verbal description of those problems (e.g., circling with the hand when describing the passage of time; Alibali, Bassok, Solomon, Syc, & Goldin-Meadow, 1999; Cook, Mitchell, & Goldin-Meadow, 2008).

What processes mediate embodied influences on abstract problem solving? Mainstream embodiment theories (Barsalou, 1999, 2008) propose that abstract concepts contain sensorimotor representations of relevant bodily states. To illustrate, people's *influenza* concept may contain, in addition to propositional knowledge of viruses and treatments, sensorimotor representations of bodily symptoms (e.g., fever) that routinely occur during experience with the flu. On this view, people reason about abstract problems in part by monitoring concurrent, problem-relevant bodily states (Kirsh & Maglio, 1994).

Conceptual metaphor is an independent process whereby people systematically map features of an abstract concept onto analogous features of a sensorimotor state or well-scripted interaction with the physical environment. Returning to our example above, people can understand influenza as *navigating difficult terrain* ("I'm not *out of the woods* yet") or as being *physically restrained* ("It's still *got a grip on* me"). In this way, an embodied metaphor allows people to draw on their knowledge of a bodily state as a framework for reasoning about the abstract concept. Importantly, conceptual metaphor theory proposes that this knowledge-mapping provides a subjective sense of certainty about the abstract concept (Keefer, Landau, Rothschild, & Sullivan, 2011), a cognitive mediational process not implied by the embodied cognition perspective. Conceptual metaphor theory further differs from other views on embodied cognition by suggesting that people can use metaphor to reason about an abstract problem by analogy to their knowledge of a bodily state *even if they are not currently experiencing that state*. For instance, they can reason about influenza in terms of navigating difficult terrain without concurrently traversing a path.

Prior research suggests that individuals often use analogies to reason about abstract problems (Gentner & Smith, 2012; Hoffman, Eskridge, & Shelley, 2009; Paletz, Schunn, & Kim, 2013). This research has explored how experts (e.g., scientists, teachers) attempt to reason about or communicate deeply abstract or largely unknown issues. While such research highlights the importance of (often non-embodied) metaphor in problem solving, it does not shed much light on the everyday use of metaphor by non-experts to solve problems. However, prior studies show that messages metaphorically comparing an abstract problem to an embodied problem cause people to generate solutions to the abstract problem that fit their understanding of how to solve the embodied problem. In one compelling demonstration, Thibodeau and Boroditsky (2011) showed that participants who read an article comparing a city's crime problem to an aggressive animal generated more aggressive and punitive crime-reduction strategies, whereas those who read an article framing the same facts in disease-metaphoric terms recommended addressing the root causes of crime, consistent with their knowledge of curing disease.

Importantly, these prior studies do not examine metaphoric influences on evaluations of extant solutions. Instead, research on analogy and problem solving focuses almost exclusively on either the use of metaphors to generate solutions or to communicate a particular, abstract idea (Bearman, Ball, & Ormerod, 2007). In the current research, we shift focus to the important but unexplored domain of people's need to evaluate available solutions. Solution evaluation is common in everyday problem solving: voters decide among proposed policies, consumers choose products to meet their needs, and politicians select among negotiation strategies. Such evaluations can be difficult when not only the problem is abstract, but so too are the means by which candidate solutions purportedly address that problem. Using metaphor to understand both the problem and the effectiveness of candidate solutions may facilitate evaluation in such cases.

The current research: testing a novel metaphoric fit hypothesis

On the basis of the foregoing theorizing, we hypothesized that solution evaluations would be uniquely influenced by an interactive "fit" between accessible metaphoric framings of an abstract problem and candidate solutions. To specify, if a metaphoric framing of an abstract problem leads people to understand that problem in terms of a bodily problem, then they should be more (less) favorable toward solutions that purport to solve (ignore) the metaphorically linked bodily problem.

The current studies test this hypothesis in the context of evaluations of treatments for depression. Like many mental illnesses, depression is abstract in that its defining symptoms are not immediately visible or easily traced to a concrete cause. It is not surprising, then, that people reach for various metaphors to describe depression experience (Mallinson, Kielhofner, & Mattingly, 1996). The most common metaphor (e.g., in depressed clients' reports) compares depression to being spatially *down* or *low* (McMullen & Conway, 2002). Related spatial metaphors compare depression to a physical weight holding one down, and therapy as "easing" or "removing" that burden (Korman & Angus, 1995; Levitt, Korman, & Angus, 2000). Another common metaphor compares depression to a state of *darkness* (McMullen & Conway, 2002), a metaphor famously employed by William Styron to describe his personal experience with depression (Styron, 1990).

Indeed, both *space* and *light* metaphors are conventionally used to talk about moods and other affective experiences in a number of cultures and language families (Kövecses, 2005; Meier & Robinson, 2005). This is likely because they originate in direct experiential correlations in human bodily functioning: both being inactive (i.e., "down") and lower levels of ambient light positively correlate with depression symptoms.[1]

Nevertheless, we expected these metaphors to influence depression treatment evaluations even in the absence of concurrent bodily experiences of being low, stuck, or in the dark. We expected this because we

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[1] The common metaphoric representations of depression in terms of embodied experiences with verticality and illumination are not arbitrary. Positive emotions are normally associated with increased motivation and activity (being *up*) and negative emotions with inactivity or incapacitation (being *down*). Similarly, levels of light directly influence affect, with bright light resulting in more positive affect (Golden et al., 2005) and a lack of light exposure resulting in more negative emotions (e.g., Seasonal Affective Disorder; Lam & Levitan, 2000). These non-metaphoric embodied associations between emotional experience and interactions with the physical world likely form the basis for metaphoric representations of depression. This process enables a person to think and talk about abstract features of depression that *are not physically up/down or dark/light*. It is in this sense that we refer to the associations between depression and *verticality* and *illumination* as metaphoric. For further discussion of how embodied associations form the basis for conceptual metaphors, see Williams, Huang, and Bargh (2009).