Metaphor is grounded in embodied experience

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Abstract

What role do people’s embodied experiences have in their use and understanding of metaphor? Contrary to the traditional belief that metaphor transcends human experience and best reflects metaphysical truths, there is substantial evidence from cognitive science that demonstrates how metaphor is fundamentally grounded in embodiment. We review this empirical evidence and discuss the methodological strategies employed by linguists and psychologists seeking connections between embodiment and metaphor. A case study of how people think and speak of desire in terms of hunger, specifically shows how systematic patterns of bodily experience serve as the source domains for many cross-linguistic metaphorical mappings. These data provide strong evidence in favor of the idea that metaphorical thought and language arises from, and is grounded in, embodiment.

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1. Introduction

Does metaphor allow people to transcend human experience or is it fundamentally rooted in embodied action? Many writers, literary critics, and philosophers claim that the creation and understanding of poetic metaphors transforms the everyday world and our experience in it. As Shelley (1890) noted, the language of poetry “is vitally metaphorical; that is, it marks the before unapprehended relations of things and perpetuates their apprehension.” Shelley suggested that the poet creates previously unrecognized relations and that metaphors create new thoughts which revitalize language. Scholars following this
romantic position tend to downplay the arguments that verbal metaphors do not always create entirely new connections but frequently illustrate pre-existing ones that are primary to our experience. For example, Barfield (1952) remarks that he would change Shelley’s phrase “before unapprehended relations” to “forgotten relations,” because poetry delivers a vitally metaphorical way of thinking, much of which lies below the surface of our everyday consciousness.

Let us consider some examples of poetic metaphor from a poem by Neruda (1969) in order to better understand how metaphors alert readers either to “unapprehended” or to “forgotten” relations.

Love poem 11

I crave your mouth, your voice, your hair. 
Silent and starving, I prowl through the streets. 
Bread does not nourish me, dawn disrupts me, all day.
I hunt for the liquid measure of your steps.

I hunger for your sleek laugh, 
your hands the color of a savage harvest, 
hunger for the pale stones of your fingernails, 
I want to eat your skin like a whole almond.
I want to eat the sunbeam flaring in your lovely body, 
the sovereign nose of your arrogant face, 
I want to eat the fleeting shade of your lashes, 
and I pace around hungry, sniffing the twilight, 
hunting for you, for your hot heart, 
like a puma in the barrens of Quitratue.

Neruda’s poem speaks of how love and desire for another can be understood primarily in terms of our embodied experiences of hunger (e.g., “I crave your mouth . . ., hunger for your sleek laugh, I want to eat the fleeting shade . . ., I pace around hungry”), as he emphasizes how ordinary food, such as bread, does not satisfy his metaphorical hunger. This poem which contains other elaborate metaphorical descriptions of the body-parts that Neruda desires clearly demonstrates how poetry delivers a ‘vitally metaphorical’ way of thinking. Yet in doing so, it refers to and has a meaning that is fundamentally grounded in people’s ordinary body experiences (e.g., of hunger and thirst, of different movements such as when one is prowling, hunting, and pacing around looking for the desired object). Although some metaphysical poetry contains metaphors without embodied grounding, many instances of poetic metaphor and conventional speech express recurring patterns of embodiment.

Our aim in this article is to make the case for the grounding of metaphor in embodied experience. We argue that the poetic value and the communicative expressiveness of metaphoric language partly arises from its roots in people’s ordinary, felt sensations of their bodies in action. We describe some of the empirical evidence from linguistic and psychology on the embodied grounding of metaphor. The research described here
generally adheres to an important methodological commitment to explicitly seek out systematic relations between linguistic structures and conceptual structures (i.e., the ‘cognitive commitment’; see Gibbs, 1994; Lakoff, 1990). We show that this commitment has led linguists and psychologists to discover how pervasive patterns of bodily action give rise to metaphorical thought and language. More specifically, there appears to be a direct link between recurring patterns of embodied experience, primitive and conceptual metaphor, abstract concepts, and conventional and poetic language.

2. Metaphoric thought and language

Perhaps the most significant development in metaphor theory in the past 20 years has been the empirical work from cognitive science showing that metaphor is not merely a linguistic, rhetorical figure, but constitutes a fundamental part of people’s ordinary thought, reason, and imagination (Gibbs, 1994; Lakoff, 1987; Lakoff and Johnson, 1980, 1999; Lakoff and Turner, 1989; Johnson, 1987; Sweetser, 1990; Turner, 1996). It is not always easy to determine whether a particular word, phrase, or expression originates in a ‘dead’ metaphor or reflects the metaphorical concepts that are very much a part of our everyday cognition. Deciding whether a cliché is dead or just unconsciously conventional requires a search for its systematic presence in language and everyday thought.

Consider the following fairly mundane utterances that are often used to talk about love and relationships: Look how far we’ve come. It’s been a long, bumpy road. We’re at a crossroads. We may have to go our separate ways. Our marriage is on the rocks. We’re spinning our wheels. Why are each of these expressions acceptable ways of talking about and understanding, our experiences of love? Scholars often view these expressions as conventional and/or dead metaphors. But there is an important distinction between what is conventional and what is dead (Lakoff and Turner, 1989). Dead metaphors express metaphorical relations that are opaque to contemporary speakers. Thus, speakers may know that kick the bucket means ‘to die,’ but are unaware as to why this phrase has the particular figurative meaning it does. Conventional expressions on the other hand, reflect enduring conceptual mappings. For instance, the above conventional expressions cluster together under one basic metaphorical system of understanding: LOVE IS A JOURNEY (Lakoff and Johnson, 1980). This conceptual metaphor involves understanding one domain of experience (love) in terms of a very different and more concrete domain of experience (journeys). There is a tight mapping according to which entities in the domain of love (e.g., the lovers, their common goals, the love relationship, etc.) correspond systematically to entities in the domain of a journey (e.g., the traveler, the vehicle, destinations, etc.). Although speakers may not be consciously able to identify why the above phrases are metaphorical, the systematicity of these expressions reveal a fixed pattern of ontological correspondences across conceptual domains. These correspondences do not reflect what is identical across the two domains but suggest relational meanings based on the projection of source domain knowledge onto a target domain.

Many linguistic and psychological studies have explored a wide range of representative domains of human experience (e.g., time, causation, spatial orientation, ideas, anger, understanding, etc.) to demonstrate the pervasiveness of various metaphorical systems in
our everyday thought, at least as these ideas are manifested in the language people use (Cameron and Low, 1999; Gibbs, 1994; Gibbs and Steen, 1999; Kövecses, 2000; Lakoff, 1987; Lakoff and Johnson, 1980, 1999; Lakoff and Turner, 1989; Johnson, 1987; Turner, 1996; Sweetser, 1990). These studies have explicitly searched for systematic patterns of metaphorical schemes of thought in conventional expressions (such as the ones shown above), in polysemy, in novel extensions of conventional metaphor in poetry, in historical usage, in nonverbal gestures, and in psycholinguistic experiments. Several studies from cognitive psychology support the idea that metaphorical understanding of concepts motivates the use and understanding of different aspects of language including people’s mental imagery for idiomatic phrases (Gibbs and O’Brien, 1990), their context-sensitive use of idioms (Nayak and Gibbs, 1990), their immediate speeded comprehension of idioms (Gibbs et al., 1997), their on-line processing of metaphors in extended texts (Allbritton et al., 1995), and their interpretation of metaphors in love poetry (Gibbs and Nascimento, 1996). Although there are continued debates on the psychological reality of conceptual metaphors among cognitive psychologists (Gibbs, 1996; Kennedy and Vervaeke, 1993; Murphy, 1996), there is enough empirical evidence from linguistics and psychology to suggest that metaphors are a fundamental part of everyday cognition.

An important observation about conceptual metaphors is that many of their source domains reflect significant patterns of bodily experience. For instance, the way we talk about life or love as a kind of journey refers to the very embodied experience of people moving from some starting point, along a path, to reach, or attempt to reach some destination. Cognitive scientists have explored the implications of this idea about the source domains in conceptual metaphors and explicitly argued that metaphor in both thought and language partly arises from these recurring patterns of embodiment.

3. Image schemas and metaphorical meaning

Studies in cognitive linguistics have shown that much of ordinary human cognition is not represented in terms of propositional and sentential information but is grounded in and structured by various patterns of our perceptual interactions, bodily actions, and manipulations of objects (Johnson, 1987,1993; Lakoff, 1987,1990; Talmy, 1988). These patterns are experiential gestalts, called ‘image schemas’ that emerge during sensorimotor activity as we manipulate objects, seek orientation spatially and temporally, and direct our perceptual focus for various purposes. Image schemas differ from the notion of schemata traditionally used which are abstract conceptual and propositional event structures (see Rumelhart, 1980). By contrast, image schemas are imaginative and nonpropositional in nature and operate as organizing structures of experience at the level of bodily perception and movement. Empirical evidence from cognitive and developmental psychology is consistent with the idea that sensorimotor representations of imagery are essential to many forms of higher-order perception and thought (Intos-Peterson and Roskos-Ewoldsen, 1987; Jeannerod, 1999; Mandler, 1992; Spelke et al., 1992). At the same time, image schemas are more abstract than ordinary visual mental images and consist of dynamic spatial patterns that underlie the spatial relations and movement found in actual concrete images. Mental
images are also temporary representations while image schemas are permanent properties of embodied experience.

A concrete example can be found in the bodily experience of momentum which is pervasive in daily life (see Gibbs and Colston, 1995). We experience visual momentum when we see heavy objects in motion continue to move even when encountering other objects. We experience kinesthetic momentum both when we are the heavy moving thing and when we are the object that some other heavy moving object runs into. We experience auditory momentum both as a correlate of visual and kinesthetic momentum and independently as when thunder builds up to a crescendo. We even experience internal momentum, for instance, when certain bodily functions build up in such a way that they cannot be stopped. We abstract out of all of these recurring embodied experiences (i.e., across different sense modalities and proprioception) those aspects of form which they share, which we refer to through language as ‘momentum’.

Image schemas have internal structure and can serve as the embodied basis for many abstract, metaphorical concepts. Consider the following utterances: I was bowled over by that idea. We have too much momentum to withdraw from the election race. I got carried away by what I was doing. We better quit arguing before it picks up too much momentum and we can’t stop. Once he gets rolling, you’ll never be able to stop him talking.

These utterances reflect how the image schema for MOMENTUM allows discussion of very abstract domains of cognition such as political support, control, arguments, and talking in terms of physical objects moving with momentum. We can predict important aspects of the inferences people draw when understanding these sentences given what is known about ‘representational momentum’ (RM) from cognitive psychological research (Gibbs and Colston, 1995). The term ‘representational momentum’ was coined by Freyd and Finke (1984) to refer to an internalized representation of physical momentum. A variety of experiments have studied different aspects of RM. The typical paradigm used to investigate RM consists of the presentation of a sequence of three static images or the inducing stimuli of an object (usually a simple geographic shape or a dot) which appears to be moving linearly or rotating in one direction. A final target position of the image is then presented and participants are asked to determine if the image’s position is the same as the third static image of the object. Participation in a RM task involving some ability to follow in imagination the path of a moving object and then focus on the point where it will come to rest.

The classic finding from RM studies is that participants’ memory for the final position of an object undergoing implied motion is shifted toward the direction of the motion. This effect was first discovered for rotating objects (Freyd and Finke, 1984) and was later extended to linearly moving objects (Finke and Freyd, 1985; Hubbard and Bharucha, 1988). For example, if participants watch an image of a rotating object and then have to remember the final position of the object, they will typically report that it was further along in the rotation than it actually was. The same sort of effect holds for linearly moving objects. If participants watch an image of an object which appears to be moving along a linear path and then have to remember its final position, they will report that the final position was further along the path than it actually was.

These empirical results correspond to some of the inferences people presumably draw when understanding different sentences that metaphorically refer to momentum. Although
there is no experimental work on people’s understanding of momentum sentences, it is worthwhile to consider several linguistic examples. One finding from RM research is that people behave as if an apparently moving object continues to move even after encountering an obstacle. Essentially, the moving object appears to carry the obstacle along with it rather than deflecting off it, or stopping. Understanding the sentence *I was bowled over by that idea* requires people to accept that the idea was important and that the speaker was convinced of the idea. This follows from one of the characteristics of moving objects: the bigger the objects are, the more momentum they have when moving. Accordingly, when a big object encounters an obstacle, the object should carry it along as it continues to travel. When the conceptual metaphor *IDEAS ARE OBJECTS* is used, one should infer on reading or hearing *I was bowled over by that idea* that the person encountering an important (big) idea would be convinced (carried along) by that idea.

Another result from RM research is that objects moving with momentum are perceived as being unable to stop immediately. Even if a force is applied, the object will continue along for some distance before coming to a rest. One might infer from this situation that if reaching a particular destination is desired, then the more momentum an object has the better are the chances for the object to reach the destination. We can apply this knowledge, along with the conceptual metaphor *ACCOMPLISHMENTS ARE MOVEMENTS*, to the sentence *We have too much momentum to withdraw from the election race* to infer that the candidate in the election race has a good chance (much momentum) to win the election, and therefore, shouldn’t attempt to withdraw (stop).

A related finding from RM studies is that an object with unchecked momentum will move a long distance, perhaps even overshooting some desired destination. This situation informs the inferences drawn on the sentence *I got carried away by what I was doing*. Specifically, a person doing something without monitoring the time involved or the resources devoted to doing it (an object moving with unchecked momentum) ends up devoting too much time or resources to the task (overshoots the desired destination).

Finally, a different aspect of RM research concerns the apparent speed and acceleration of the moving object. This factor affects the perceived amount of momentum that an object will have. Applying this finding to the sentence *Once he gets rolling, you’ll never get him to stop talking* leads to the inference that interrupting (stopping) the person early in the conversation (when speed is low) will be easier than interrupting him later (when speed is high). This inference also emerges when reading the sentence *You had better stop the argument now before it picks up too much momentum and we can’t stop it*. The inference here might be that arguments start off fairly innocuously (with low speed) but as they progress, things may be said that are not retractable (high speed). For both sentences, we understand that the talking or argument should be stopped as early as possible.

This brief, admittedly speculative, analysis of the image schemas and metaphors that might be involved in the empirical studies on RM is meant to illustrate something about the importance of bodily experience in human perception and cognition. We emphasize that the bodily experience can be derived from both sense modalities such as sight and sound, as well as full-bodied kinesthetic action. The research from various mental imagery tasks not only shows that imagery is not strictly pictorial, and is highly kinesthetic, but also suggests different possibilities on how embodied image schemas are related to people’s use and understanding of metaphorical linguistic expressions.
Psycholinguistic research has explicitly examined different image schemas and shown that they can be used to predict people’s intuitions about the related meanings of polysemous words including those meanings that are highly abstract and metaphorical. For instance, one set of studies demonstrated that people make sense of different uses of *stand* because of their tacit understanding of several image schemas that arise partly from the ordinary bodily experience of standing (Gibbs et al., 1994). These image schemas, the most important of which are BALANCE, VERTICALITY, CENTER-PERIPHERY, RESISTANCE, and LINKAGE not only produce the grounding for many physical senses of *stand* (e.g., *he stands six-foot nine, stand in the way, and stand at attention*) but also underlie people’s understanding of complex, metaphorical uses (e.g., *the part stands for the whole, as the matter now stands, and the engine can’t stand the constant wear*). Different senses of *stand* including metaphorical ones are perceived as similar in meaning partly on the basis of the underlying image schema profile for each use of the word in context.

Different psycholinguistic studies have explicitly aimed at finding the embodied character of metaphoric language use in regard to how people understand conventional and idiomatic expressions. They rely first on cognitive linguistic analyses to discover possible patterns of embodied metaphors. Then, they carry out independent investigations on people’s understanding of the source domains for these embodied metaphors, especially in terms of their embodied understandings of these domains apart from their use in linguistic expressions. Finally, they use the data from these independent analyses to make predictions about what gets mapped onto different target domains in conceptual metaphors. Psychologists prefer this type of strategy because it allows them to examine embodied experiences independent of one’s understanding of language, and then, use this assessment to make experimental predictions about people’s intuitions about linguistic meaning, including metaphor. To illustrate this research strategy in more detail, consider one set of psycholinguistic studies that examined people’s intuitions of different bodily experiences. These studies specifically focused on the image schemes that serve as the source domains for several important conceptual metaphors underlying speakers’ use and understanding of idioms such as *blow your stack, flip your lid, and hit the ceiling*, each of which roughly mean ‘to get very angry’ (Gibbs, 1992). Scholars sometimes claim that knowledge about ‘heated fluid in containers’ comes solely from observing water in pots. We agree that this is one source of information about the source domain of the metaphor ANGER IS HEATED FLUID IN A CONTAINER. But the primary way that people acquire this source domain knowledge is through their own experiences of their bodies as containers filled with, among other things, various fluids (e.g., sweat, blood, urine) that can be heated up (e.g., as when under pressure, or during exercise, or when feeling emotional in different ways). Once more, the recurring aspects of these sensory and full-bodied kinesthetic experiences give rise to image-schematic source domains that get projected to form conceptual metaphors.

A first study of the role of image schemas in metaphor understanding showed that participants were remarkably consistent in their responses to the various questions about their embodied experiences in regard to different source domains in various conceptual metaphors. For instance, for the conceptual metaphor ANGER IS HEATED FLUID IN A CONTAINER, the participants responded that the explosion of the fluid inside is caused by the increase in the heat of the fluid. They also reported that this explosion is unintentional...
because containers and fluid have no intentional agency, and that the explosion occurs in a violent manner. These brief responses provide a rough, nonlinguistic profile of the participants’ understanding of a particular source domain concept (i.e., heated fluid in the bodily container). These profiles are rough approximations of image-schematic structures of the source domains (Gibbs and Colston, 1995; Lakoff, 1990; Turner, 1991, 1996).

These different image-schematic profiles about certain abstract concepts allowed Gibbs (1992) to predict how idioms are understood. According to him, intuitions about various source domains map onto their conceptualizations of different target domains in very predictable ways. For instance, the understanding of anger should partly be structured by one’s folk concept for heated fluid in the bodily container as described above. Several studies in Gibbs (1992) showed this to be true. Not surprisingly, when people understand anger idioms such as blow your stack, flip your lid, or hit the ceiling, they infer that the cause of anger is internal pressure, the expression of anger is unintentional, and is done in an abrupt, violent manner. These same inferences are not drawn about causation, intentionality, and manner when comprehending literal paraphrases of idioms such as get very angry. Furthermore, it was easy to process the idiomatic phrase blow your stack when this was read in a context that accurately described the cause of the person’s anger as being due to internal pressure, where the expression of anger was unintentional and violent. Thus, when the entailments are consistent with the entailments of the source-to-target domain mappings of heated fluid in a container onto anger, people find idioms easy to process. But readers took significantly longer to read blow your stack when any of these entailments were contradicted in the preceding story context. In general, these studies illustrate how an independent analysis of image schemas can lead to empirical predictions about people’s intuitions about metaphorical meaning.

The Gibbs (1992) experiments provide empirical evidence that (a) conceptual metaphors motivate many kinds of systematic expressions ranging from idioms to poetic metaphors, and (b) the source domains in many conceptual metaphors are inherently structured as image schemas which arise from recurring bodily experiences. In this way, part of how people make sense of and understand different linguistic expressions is grounded in embodiment.

4. Primary metaphors

Despite the contribution that conceptual metaphor theory has made to understand the embodied grounding of metaphor in thought and language through image schemas, the theory has one major problem. Conceptual metaphors appear to differ in the way they are experientially grounded (Grady, 1997, 1999). For instance, consider the well-known conceptual metaphor MORE IS UP (e.g., Inflation is up this year). It is easy to correlate having more of some objects or substance (i.e., quantity) with seeing the level of those objects or substance rise (i.e., verticality). But many conceptual metaphors do not suggest such straightforward experiential correlations. For instance, the well-known conceptual metaphors THEORIES ARE BUILDINGS and LOVE IS A JOURNEY do not seem to have the same kind of correlation in experience as seen in MORE IS UP. Thus, actual travel
has little to do with the progress of relationships, and theories are not closely tied to the buildings in which people generate, discuss, and dismantle these ideas.

A related problem with conceptual metaphor theory is that it does not explain why certain source-to-target domain mappings are not likely to occur (Grady, 1997, 1999). For instance, the conceptual metaphor THEORIES ARE BUILDINGS motivates many meaningful linguistic expressions such as The theory needs to be buttressed or The foundation for your theory is shaky. But some aspects of buildings are clearly not mapped onto the domain of theories which is one reason why it sounds odd to say The theory has no windows.

An interesting solution to these problems suggests that conceptual metaphors are not the most basic level at which metaphorical mappings exist in human thought and experience. Grady (1997) argued that the strong correlation in everyday embodied experience leads to the creation of ‘primitive’ or ‘primary’ metaphors. According to Lakoff and Johnson (1999), some of the most prominent primary metaphors are:

- INTIMACY IS CLOSENESS (e.g., We have a close relationship)
- DIFFICULTIES ARE BURDENS (e.g., She’s weighed down by responsibilities)
- AFFECTION IS WARMTH (e.g., They greeted me warmly)
- IMPORTANT IS BIG (e.g., Tomorrow is a big day)
- MORE IS UP (e.g., Prices are high)
- SIMILARITY IS CLOSENESS (e.g., Those colors aren’t the same, but they’re close)
- ORGANIZATION IS PHYSICAL STRUCTURE (e.g., How do pieces of the theory fit together)
- HELP IS SUPPORT (e.g., Support your local charities)
- TIME IS MOTION (e.g., Time flies)
- STATES ARE LOCATIONS (e.g., I’m close to being in a depression)
- CHANGE IS MOTION (e.g., My car has gone from bad to worse)
- PURPOSES ARE DESTINATIONS (e.g., He’ll be successful, but isn’t there yet)
- CAUSES ARE PHYSICAL FORCES (e.g., They push the bill through Congress)
- KNOWING IS SEEING (e.g., I see what you mean)
- UNDERSTANDING IS GRASPING (e.g., I’ve never been able to grasp transfinite numbers)

These metaphorical correlations arise out of our embodied functioning in the world. In each case, the source domain of the metaphor comes from the body’s sensorimotor system. A primitive is a metaphorical mapping for which there is an independent and direct experiential basis and independent linguistic evidence. A ‘compound’ or ‘complex’ metaphor, on the other hand, is a self-consistent metaphorical complex composed of more than one primitive. Complex metaphors are created by blending primary metaphors and thereby fitting together small metaphorical pieces into larger metaphorical wholes.

For instance, consider the following three primitive metaphors: PERSISTING IS REMAINING ERECT, STRUCTURE IS PHYSICAL STRUCTURE, and INTERRELATED IS INTERWOVEN. These three primitives can be combined in different ways to give rise to compound metaphors that have traditionally been seen as conceptual
metaphors. But the combination of these primitives allows for metaphorical concepts without gaps. Thus, combining PERSISTING IS REMAINING ERECT with STRUCTURE IS PHYSICAL STRUCTURE provides for a compound THEORIES ARE BUILDINGS that nicely motivates the metaphorical inferences that theories need support and can collapse, etc., without any mappings such as ‘that theories need windows’. In a similar way, the combination of STRUCTURE IS PHYSICAL STRUCTURE and INTERRELATED IS INTERWOVEN gives rise to a different metaphorical compound for theories, namely, THEORIES ARE FABRICS. This compound metaphor gives rise to the reasonable inferences that theories can unravel or may be woven together without generating less likely entailments such as ‘that theories are colorful’ in the way that some fabrics have colors.

This view of the embodied basis for metaphorical thought and language solves the ‘poverty of mapping’ problem often noted for conceptual metaphor theory and other theories of metaphor (Grady, 1997). Thus, if there is a conceptual metaphor THEORIES ARE BUILDINGS, why can speakers not typically say That theory has no windows? Most metaphor theories are focused on specifying what aspects of the source domain get mapped onto a target domain to block inappropriate mappings. But the theory of primary metaphors provides a natural solution to the problem without positing specific mechanisms that override parts of source-to-target domain mappings. Moreover, the correlation between source and target domains may possibly be instantiated in the body via neural connections (Lakoff and Johnson, 1999). Under this view, neural connections in the brain may reflect how inferences from the sensorimotor source domain (i.e., verticality) are projected into the subjective target (i.e., quantity).

5. DESIRE IS HUNGER: A case study

Primitive metaphors provide empirical evidence for the way metaphors are understood via embodied experiences. This section describes the early findings of a project showing that people’s understandings of metaphorical expressions about human desires (e.g., I am starved for his affection, I am hungry for power and fame) are motivated by people’s embodied experiences related to feeling hunger (Lima et al., in preparation). This is true for native speakers of both American English and Brazilian Portuguese. In particular, people’s embodied understanding of hunger gets mapped onto their understanding of the abstract domain of human desires.

Section 1 of the present paper presents examples of Pablo Neruda’s poetic descriptions of his feelings of love/lust and desire in terms of his bodily hunger. One reason that readers may respond affectively to Neruda’s work is because of their own embodied experiences of hunger and its strong correlation to feelings of desire.

Consider how two American college students refer to their desires as hunger in these short excerpts that were written as part of a class assignment at the University of California, Santa Cruz. Nathan, age 21, wrote:

All I used to do since about the time I was 11 or 12 was play with computers. Computers, especially playing computer games, was all I could ever think about. Any
time I heard that some new game had come out, I would get this craving in the pit of my stomach where I just had to have the game and learn all I could about it and become a master at it. It was like I could never get enough of these games—they sort of were my main source of mental fuel for many years. I was like this throughout high school, but I am now pretty much burned out on them (but I still play occasionally). I’ve had my fill so to speak.

Margo, age 20, wrote of a different desire experience that is frequently described in terms of hunger:

Back in high school, I had this HUGE crush on this guy, James, who was a total hunk. He would flirt with me when we’d talk, but I didn’t get a chance to know him very well, nevermind ever be alone with him. I was dying to get closer to him, and felt starved for his attention. I walked around for over five months feeling silly and empty because I wanted him so bad. I wanted to eat him alive! He was yummy!

Nathan and Margo certainly are not revitalizing language through the creation of ‘unapprehended relations’ nor are they especially noting relations that have been ‘forgotten’. But they fluently refer to what likely is a highly correlated experience for people of all cultures, namely, the correlation between hunger and desire. Asserting this metaphorical relationship is not just a conventional or arbitrary way of speaking about desire because there appear to be rich, systematic correspondences between feeling hunger and feeling different aspects of desire. Although there is a positive correlation in our hunger and desire experiences, the concept of desire is fundamentally more abstract because literally satiating hunger does not fulfill many abstract desires. Thus, hunger for fame is different from that for food in that eating solves the hunger problem but not the desire for fame. Nonetheless, people still see hunger as proper metaphor for desire in the sense that both hunger and desire relate to various kinds of longing. It is precisely this rich set of metaphorical correspondences between hunger and varied desire experiences that enables both great poets, like Neruda, and ordinary people to express their thoughts about desire in intuitively plausible ways.

What is the relationship between people’s embodied experiences of hunger and their concept of desire? The first step in our research strategy was to discover systematic language patterns in talk of desire in both American English and Brazilian Portuguese. Our analysis of both American English and Brazilian Portuguese reveals that both hunger and thirst are frequently used to describe different desire experiences. Thus, American English speakers often talk of desire in the following ways:

He hungers for recognition—He thirsts for recognition
He hungers for adventure—He thirsts for adventure
He had a hunger for power—He was thirsty for power
He hungers for revenge—He thirsts for revenge

Brazilian Portuguese speakers also talk of their desires in terms of hunger and thirst as seen in the following examples:
Tenho fome de riqueza—Tenho sede de riquezas
(‘I hunger for wealth’—‘I thirst for wealth’)

Tenho fome de saber—Tenho sede de saber
(‘I hunger for knowledge’—‘I thirst for knowledge’)

Tenho fome de amor—Tenho sede de amor
(‘I hunger for love’—‘I thirst for love’)

Tenho fome de vingança—Tenho sede de vingança
(‘I hunger for revenge’—‘I thirst for revenge’)

Beyond these general similarities between American English and Brazilian Portuguese, both languages systematically refer to the objects of desire in concrete and abstract ways. Thus, concrete ‘things’ can be referred to in expressions such as Rachel’s house makes my mouth water or A casa da Raquel me deixa com agua na boca. Abstract entities, referring to less concrete things, events, and actions include expressions such Our team is hungry for a victory, I thirst for a vacation, and in Portuguese, Estou sedento por umas ferias, and Estou sedento para começar um novo emprego. Finally, objects of desire that are emotional feelings which include talk of desires for another person and sexual desires are referred to in expressions in both languages such as John is drooling over Mary or Joao esta se babando por Maria.

This brief linguistic examination of the ways American English and Brazilian Portuguese speakers talk of their different desires clearly shows that experiences of hunger appear to structure significant aspects of their understandings of desire. The studies we now report examined the specific hypothesis that if there is a strong positive correlation between desire and hunger in people’s ordinary experience, there should be convincing evidence of people thinking about, and talking about, many aspects of desire directly in terms of hunger. Earlier linguistic research on Chagga, a language from Tanzania, showed that feeling hungry and eating are used to express sexual desire, sexual satisfaction, or to evaluate the potential of a sexual partner (Emanatian, 1995). The next step of our research strategy was to examine participants’ embodied experiences of hunger apart from their understanding of hunger in talk of desire. We expected that some bodily experiences of hunger would be far more prominent than others across both American English and Brazilian Portuguese speakers. If hunger and desire are highly correlated, and if people metaphorically make sense of their desires partly in terms of hunger, then these more prominent parts of their hunger experiences should be invariantly mapped onto their different concepts for desire. Thus, participants should subsequently consider certain ways of talking about desires in terms of specific hunger experiences more acceptable than less prominent aspects of feeling hunger.

The empirical findings presented here are preliminary, and for purposes of this paper are described somewhat informally (see Lima et al., in preparation, for a fuller write-up of these and additional data). In the first study, 43 participants in the United States (20 students at the University of California, Santa Cruz) and Brazil (23 students at the University of Campinas) were presented with a list of three types of symptoms that may possibly result
from a person being hungry. ‘Local symptoms’ referred to specific parts of the body, ‘general symptoms’ referred to whole body experiences, and ‘behavioral symptoms’ referred to various behaviors that may result as a consequence of a person being hungry. Each of these three symptoms were subdivided into items closely related to the experience of being hungry, items possibly related, and items not at all related. Examples of these stimuli are presented below:

1. Local symptoms
   a. Closely related:
      - one has a stomach ache
      - one has a headache
      - the stomach grumbles
      - the thought of food makes one’s mouth water
      - the whole body aches
      - the mouth becomes dry
   b. Possibly related:
      - one becomes temporarily blind
      - one is covered by cold sweat
   c. Not related:
      - the hands itch
      - the nails become breakable
      - the fingers snap
      - the feet hurt
      - the knees swell
      - the eyes become red
      - the heart aches

2. General symptoms
   a. Closely related:
      - become thirsty
      - become dizzy
      - become weak
      - feel discomfort
      - have an appetite
      - become sleepy
   b. Possibly related:
      - become crazy about food
      - become sick
      - get a fever
      - can die if one doesn’t eat
      - do not think clearly
c. Not related:
   want to run
   get annoyed
   become talkative
   do not want to see anybody

3. Behavioral symptoms
   a. Closely related:
      the person becomes depressed
      the person becomes very anxious
      the person becomes emotionally fragile
   b. Possibly related:
      the person behaves madly and would do anything for food
      the smell of food drives a person out of his/her mind
      the person is out of balance
      the person behaves like an animal chasing its prey
   c. Not related:
      the person behaves normally
      the person keeps his/her feet on the ground
      the person can work well
      the person can maintain a high-level intellectual discussion
      the person drowns in sorrow
      the person puts down others

Each set of items above was randomly determined in that we simply generated embodied experiences and body-parts for the questionnaire without thinking of the DESIRE IS HUNGER metaphor.

Participants received a booklet containing a long random list of symptoms and had to rate each item on a 7-point scale as to whether they had experienced the effect mentioned when feeling hungry (with 1 meaning ‘never’ and 7 meaning ‘quite frequently’). An analysis of these ratings showed that both English and Portuguese speakers gave similar ratings to the different items. For example, the two groups of participants agreed that the following items were highly related to their hunger experiences (the average rating for each group for all the items in the study is also presented):

   Strong effects of hunger on the human body

1. Local symptoms
   the stomach grumbles
   thought of food makes one’s mouth water
   one has a stomachache
   one has a headache

   English: 5.39
   Portuguese: 5.78
2. General symptoms
   feel discomfort
   becomes weak
   become dizzy
   gets annoyed
   have an appetite

   English: 6.03
   Portuguese: 6.12

3. Behavior symptoms
   person feels out of balance
   person becomes emotionally fragile
   person becomes very anxious

   English: 4.74
   Portuguese: 5.09

The two groups of participants also agreed on those items that were not related to their hunger experiences. Examples of these items and the mean ratings (for all the items used in the study) are presented below:

Weak effects of hunger on the human body

Local symptoms
   the knees swell
   the feet hurt
   the hands itch
   the fingers snap

   English: 2.02
   Portuguese: 1.88

General symptoms
   wants to run
   doesn’t wish to see anyone
   becomes talkative
   gets a fever

   English: 3.27
   Portuguese: 2.84

Behavior symptoms
   the person behaves normally
   the person can work well

   English: 2.63
   Portuguese: 2.26
Overall, these findings indicate significant regularities in people’s embodied experiences of hunger, at least as suggested by speakers from two different cultures. The data presented here reflect only those items for which strong agreement was given, i.e., those viewed either as highly or weakly relevant to hunger. Of course, there were many items that participants in both cultures viewed as being moderately related to hunger. For our purposes, however, we were interested only in those items rated as highly or weakly relevant to hunger.

There were a few notable differences in the ratings for the American English and Brazilian Portuguese participants. Several items were rated as closely related to hunger experiences for Portuguese speakers but were rated as not very relevant to hunger for English speakers. These items include:

- the mouth becomes dry (local)
- one becomes crazy about food (general)
- one behaves madly and would do anything for food (behavior)

Moreover, the following items were rated as much more related to hunger for English speakers than for Portuguese ones:

- the whole body aches (local)
- one gets annoyed (general)
- one becomes depressed (behavior)

These variations in English and Portuguese speakers’ intuitions reflect something of how cultural experiences shape some of our embodied understandings of hunger. Brazilians, for example, live in a culture where poverty and hunger is more salient than is seen in most parts of California, and it is not surprising to see that the Brazilian participants viewed the embodied consequences of hunger in more severe terms. (We should note that our comparison of American English and Brazilian Portuguese speakers does not imply that each group represents a homogeneous selection of native speakers. Both the United States of America and Brazil have many intersecting cultures, and it would not be surprising to find differences among, say, Brazilian speakers depending on what part of the country the participants came from and different socio-economic factors.)

The results of this first study provided a rough characterization of folk understandings of embodied experiences for hunger. Our next study examined whether people’s folk knowledge about hunger is correlated with their understandings of different experiences of desire. We asked English and Portuguese speakers from the same populations sampled in the first study (but with different participants) to give their intuitions about two types of questions. The first set of questions focused on how participants felt when experiencing three types of desire: love, lust, and the desire for things, such as fame, adventure, money, etc. (the ‘other’ category). Participants were asked to read each question and then rate the relevance of various bodily experiences, again on a 7-point scale. An example of one body question for love is presented below:
Body Questions

How do you imagine that somebody who is deeply in love feels?

- the person becomes dizzy
- the person becomes weak
- the person gets annoyed
- the person becomes talkative

Similar questions were presented for lust and desire for the ‘other’ category. Half of the items were constructed by using body experiences that were previously rated as being highly relevant to people’s experiences of hunger (e.g. feeling dizzy), while the other half were constructed using body experiences that were rated as having little to do with hunger (e.g. becoming talkative).

The second set of questions focused on participants’ intuitions about the acceptability of different ways of linguistically expressing desire. Similarly to the body questions, half of the items were constructed from strongly (or highly) rated bodily experiences for hunger as shown in the first study, with the other half coming from weakly (or lowly) rated hunger items in Experiment 1. These linguistic questions were posed for three types of desire (i.e. love, lust, and other) as was the case for the body questions. The participants’ task was simply to read each statement and rate on a 7-point scale whether it was an acceptable way of talking in their respective language (with 1 meaning ‘not acceptable’ and 7 meaning ‘very acceptable’). Below are examples of the items from the love/lust and other questionnaires. These were first created in English and then translated into Brazilian Portuguese.

Linguistic Questions

(Love/Lust items)

- I have a strong headache for you.
- My stomach was aching for you.
- I’m completely dizzy for my wife.
- You really make my mouth water.
- I have a great appetite for my boss.
- I’m becoming weak for you.
- My whole body aches for you.
- I realized that my feet hurt for you.
- You’re the one who makes my fingers snap.
- My hands were itching for you.

(Other items)

- I am very anxious for revenge.
- I have a strong headache for knowledge.
- My stomach aches for the next part of the story.
- I’m completely dizzy for a new car.
- I’m emotionally fragile for the truth.
My fingers snap for the opportunity to go to the moon.
My knees swell for more information about my ancestry.

Fifty students (25 from each culture) participated in this study, with each person providing ratings for both the body and linguistic questions. An analysis of the mean ratings across participants within each language showed that items previously rated as highly relevant to hunger were now seen as most acceptable for both body and linguistic questions. Table 1 presents the ratings for the two types of questions (for three types of desire, given items that were previously rated as strongly and weakly related to hunger). For now, we have collapsed across the variable of body symptom (e.g. local, general, behavior).

The findings for both the Body and Linguistic questions are generally consistent across English and Portuguese for the three types of symptoms for the three types of desire (love, lust, other). Each difference between the strong and weak items for each type of desire was statistically significant, with the exception of love and other desire for English speakers which were only marginally different. Overall, though, the data demonstrate how knowing something about people’s embodied experiences of hunger allows us to predict which aspects of desire will, and will not, be thought of and talked about in terms of our complex embodied understandings of hunger.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>Ratings for the acceptability of body and linguistic questions</th>
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<tbody>
<tr>
<td></td>
<td>Russian</td>
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<tr>
<td>Results—Acceptability of Body Questions</td>
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<tr>
<td>Strong</td>
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<tr>
<td>Love</td>
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<tr>
<td>Weak</td>
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<td>Strong</td>
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<td>Lust</td>
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<td>Weak</td>
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<tr>
<td>Strong</td>
<td>3.83</td>
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<tr>
<td>Other</td>
<td></td>
</tr>
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<td>Weak</td>
<td>3.53</td>
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<tr>
<td>Results—Acceptability of Linguistic Questions</td>
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<tr>
<td>Strong</td>
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<td>Other</td>
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<td>Weak</td>
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</table>
Although the results are similar for the three types of desire, there is variation in how English and Portuguese participants map different hunger symptoms onto desire. We are still analyzing the influence of different body symptoms on these ratings and will present these findings on another occasion. But for now, English and Portuguese speakers differ for the local symptoms for both the body and linguistic items. For instance, the linguistic items She drooled anytime she saw Bob and My stomach aches in anticipation of having sex with Mary were rated as much more acceptable in English than in Portuguese. These differences indicate that the salience of particular, localized bodily experiences of desire as hunger may differ across the two languages.

We emphasize that our findings on DESIRE IS HUNGER do not imply a complete equivalence between desire and hunger, but only a strong correlations between them. Desire, especially for abstract entities and concrete objects that cannot be eaten, is more abstract than is hunger, which is precisely why people project their embodied understandings about hunger onto the more abstract domain of desire.

6. Conclusion

Does metaphor reflect transcendent metaphysical concerns or is it grounded in embodied experience? Our main argument is that philosophical speculation is not enough to answer this question. Empirical research is needed to establish connections between embodiment and metaphor in thought and language. Only by explicitly attempting to find how patterns of embodied experience relate to metaphoric thought and language, and doing this in a way that a hypothesis can, in principle, be falsified, can a strong case be made for, or against, embodied metaphor. We do not deny that some verbal metaphors, including some poetic expressions, reflect mappings that have little to do with the body (see Bernsten, 1999 for a discussion of the embodied basis for modernist poetry). Yet there is a large amount of empirical evidence from linguistics and psychology that demonstrates how metaphor gains much of its conceptual and expressive power from the systematic mappings of embodied source domains onto more abstract target domains of experience.

Empirical evidence from cognitive psychology shows that significant aspects of non-linguistic experience directly tie into people’s understanding of metaphorical language (e.g. expressions about different aspects of momentum). Moreover, a growing body of experimental work has adopted the specific methodological strategy to discover the possible connections between embodiment and metaphorical language use. We have applied this strategy in several lines of work (Gibbs, 1992; Gibbs et al., 1994), most notably in studies on how people metaphorically conceptualize desire in terms of hunger (Lima et al., in preparation). Thus, in our studies on desire, we have (1) examined linguistic expressions in two languages for evidence of the abstract idea of desire being talked about in terms of hunger, (2) investigated people’s embodied experiences of the source domain of hunger apart from their role in linguistic expressions, and (3) used this information to investigate native speakers’ intuitions (in two languages) of various aspects of desire (both as questions about the body and in terms of their understanding of different linguistic expressions). The results show that we can closely predict which aspects of desire, and
what kinds of linguistic utterances, in both American English and Brazilian Portuguese, will be seen as most meaningful from our independent analysis of people’s embodied experiences for hunger. Furthermore, these data are consistent with the idea that primitive metaphors serve as the most fundamental grounding for metaphorical thought and language.

None of these conclusions is intended to suggest that embodiment is the sole basis for all metaphor in language and thought. Many scholars work on aspects of metaphorical language, such as traditional ‘A is B’ or resemblance metaphors, that may be explained apart from embodiment per se (cf. Glucksberg, 2001). Part of the oddness in debates over metaphor is that people rarely acknowledge how theoretical disagreement rests simply on the type of metaphorical language considered. Our only strong claim is that a significant aspect of metaphoric language is motivated by embodied experience.

One implication of our findings is that the ability to translate various linguistic metaphors from one language to another rests on the degree to which these verbal expressions instantiate primary metaphors. Linguistic statements that reflect complex (i.e. compound) metaphors, or linguistic metaphors not closely related to abstract metaphorical concepts grounded in embodied experience, should be more difficult to accurately translate.

Most generally, the work described in this article suggests the prominence of correlated embodied experience in how we ordinarily think and talk in metaphor. Our advocacy of embodied metaphor may appear to embrace a rather reductionist view of metaphor (a complaint that is commonly made against the work of Lakoff and Johnson, among others). Although we clearly aim as part of our adherence to the cognitive commitment to explore links between language, mind, and body, the claim that metaphor is grounded in embodied experience actually enables us to see what is most powerful about metaphor when used to express highly poetic meanings. Rather than just reducing metaphor to the body, our work shows how the body gives rise to metaphor that both appears to ‘revitalize language’, as Shelley would put it, and express relations that seem ‘forgotten’, as suggested by Barfield.

References


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