

The Role of Nature and Nurture in Conceptual Metaphors

The Case of Gustatory Priming

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Abstract. It is unclear whether embodied-cognition effects are caused by the activation of cultural-linguistic metaphors, or whether these metaphors stem from preverbal mechanisms that directly affect both language and behavior. Therefore, we conducted a study wherein 62 Israeli participants ate sweet or spicy snacks and performed a social judgment task. Preverbal mechanisms assign positive hedonic value to sweetness and negative value to spiciness. However, in Israeli culture, “sweetness” is used as a metaphor for inauthenticity, whereas “spiciness” stands for intellectual competence. In accordance with the predictions of a culturally-mediated variant of conceptual-metaphor theory, the results showed that priming participants with spicy (vs. sweet) tastes increased judgments of intellectual competence, decreased judgments of inauthenticity, and increased overall evaluation of a social target.

Keywords: embodiment, conceptual metaphor, open data, open materials, social judgment, taste

Highlights

- Eating a sweet (vs. spicy) snack resulted in less favorable social judgments
- This effect was predicted based on Israeli cultural-linguistic metaphors
- The results suggest that cultural-linguistic practices can overshadow preverbal mechanisms
- We discuss implications for the reliability and replicability of embodiment effects

Introduction

People often describe each other by reference to such concrete qualities as “sweetness,” and “warmth.” Conceptual-metaphor theory (Lakoff & Johnson, 2008) argues that linguistic analogy to concrete experience is not merely a communicative instrument, but rather part of the fundamental processes that enables abstract conceptualization. Supporting this notion, much research in the “embodied cognition” literature demonstrated how concrete sensorimotor experiences affect abstract thought (for a review see, Niedenthal, Barsalou, Winkielman, Krauth-Gruber, & Ric, 2005).

For example, as predicted on the basis of the metaphorical uses of the property of warmth, past research has shown that the physical experience of holding a warm cup yields

more favorable judgments of others, (Williams & Bargh, 2008); likewise, as predicted on the basis of the metaphorical uses of the property of purity, research has shown that cleaning one’s hands yields more favorable judgments of people who engaged in morally objectionable behavior (Schnall, Benton, & Harvey, 2008).

According to the “scaffolding view,” such embodied metaphors arise because “concepts are mapped onto existing and well-understood concepts, such that the structure of the developmentally earlier, primary concept is retained in the newly constructed concept” (Williams, Huang, & Bargh, 2009, p. 1257). Thus, for example, our innate schema associating bodily warmth and caregiver-proximity (Harlow & Zimmermann, 1959) may result in conceiving affection in terms of temperature (Williams & Bargh, 2008).

Whereas the scaffolding view describes the ontogeny of embodied metaphors, it does not provide us with an account of the mechanism which underlies embodiment effects. Specifically, it is unclear whether linguistic metaphors are causal to embodiment effects, or whether these metaphors are the result of preverbal mechanisms that shape both our language and thought.

Consider the example of the warmth-trust experiment by Williams and Bargh (2008). It is possible that warmth and trust were linked together in the mind of an infant, such that the preverbal mechanisms that subserve the perception of warmth activate the preverbal mechanisms that promote an attachment to a caregiver. Thus, according to

this *preverbal* account, warmth-trust effect should be observed also in infants and even nonhuman animals; the subsequent emergence of conceptual metaphors should be seen as the down-stream effect of these preverbal mechanisms, rather than a critical element in the mechanism subserving embodiment phenomena.

As an alternative to this Preverbal account of embodiment phenomena, it is possible that that embodied metaphor effects are directly caused by conceptual metaphors that exist in people's culture. According to such an account, while it may be true that preverbal experiences can serve as important scaffolds in the development of concepts and customs, human beings are unique in that they can discard the sensorimotor scaffolds on which they relied; once these scaffolds are discarded, human being cognition is primarily governed by *Linguistic-Cultural Practices (LCP)*. Namely, governed by the shared set of ideas, associations, and behaviors that develop in human being culture and language. If, for whatever reason, a culture developed the notion that "a warm person is distant and unaffectionate," then individuals from this culture should form more negative evaluations of social targets when holding a warm cup – despite the innate association between warmth and affection.

The distinction between LCP and preverbal mechanisms is not always clear-cut. For example, it is possible that LCP fine-tune the implementation of innate principles that exist in preverbal infants or even animals. In a study by Lee and Schwarz (2012), people were shown to grow suspicious specifically when encountering the smell of fish, but not when exposed to other unpleasant scents, supposedly due to the cultural metaphor "*something smells fishy*." In the discussion of these findings, the authors suggest that conceptualizations of interpersonal suspicion may stem from a preverbal mechanism for olfaction-based discerning of "suspicious" foods; the specific association to fish smell, however, is the result of LCP in a North-American culture (Lee & Schwarz, 2012; see related discussion in Leung, Qiu, Ong, & Tam, 2011).

Lee and Schwarz's (2012) findings suggest that LCP have an important role in honing the specific metaphors that affect social judgment. But can the metaphors that exist in a person's culture "gain a life of their own," and overshadow innate, "hard-wired" associations between physical experience and behavior? Evidence of such effects would provide strong support to the LCP view of embodiment phenomena. In order to directly contrast the LCP and preverbal accounts of embodiment phenomena, we turned to examine the effects of gustatory priming on social judgment.

Preverbal Responses to Sweet and Spicy Gustatory Stimuli

The taste of sweet foods is the most prominent example of positive hedonic experience, due to the potent appetitive effects it has on organisms. Both newborn infants and nonhuman animals respond to the taste of sucrose by showing a distinct pattern of facial responses (lip smacking, tongue protrusions, muscle relaxation, and smiling) that were

found to be reliable interspecies indicators of positive affective experience (Berridge, 2000; Steiner, 1979; Steiner, Glaser, Hawilo, & Berridge, 2001). Human infants (see Liem & Mennella, 2002 for a review) as well as nonhuman animals (see Steiner et al., 2001) display a universal preference to sweet over non-sweet food, and will exert much greater effort in attempts to consume sweetened versus non-sweetened foods (e.g., Sheffield & Roby, 1950). Furthermore, sweet-tasting foods inhibit crying behavior in newborn human infants, regardless of their caloric and nutritional value (Barr et al., 1999).

It is believed that these behaviors were honed by evolution to prompt approach toward sweet foods and their consumption. The motivation to approach sweetness is adaptive because foods that have a sweet taste are typically high in caloric value, and thus provide a valuable resource in promoting an organism's survival (e.g., Ulijaszek, 2002). In light of this, sweet foods activate neural circuitry involved in reward and approach motivation (e.g., O'Doherty, Deichmann, Critchley, & Dolan, 2002) and can be used in experimental settings in order to activate behavioral approach tendencies (e.g., Förster & Stepper, 2000).

In addition to prompting approach responses, sweet tastes have the capacity to inhibit avoidance responses. Much research on human beings (e.g., Miller, Barr, & Young, 1994) and nonhuman animals (e.g., Blass, Fitzgerald, & Kehoe, 1987; Holder, 1988) shows that consumption of sweet foods inhibits nociceptive responses to painful stimuli by producing an analgesic effect. Furthermore, evidence shows that merely smelling sweet fragrances increases tolerance for pain in a cold-pressor test (Prescott & Wilkie, 2007).

Whereas sweet nutrients are generated by plants in order to attract animals that later disperse their seeds, a number of plants, such as the chilly-pepper, have adopted an evolutionary strategy aimed at selectively deterring teeth-bearing mammals from consuming them (Tewksbury & Nabhan, 2001). Such plants manage to produce chemicals that target mammals' pain-receptors, and produce the sensation we refer to as spiciness or pungency (Caterina et al., 1997).

In light of the fact that the sensation of spiciness is caused by receptors that detect tissue damage, it is unsurprising that spicy foods were shown to increase pain-sensitivity and avoidance responses (e.g., Gilchrist, Allard, & Simone, 1996; Klein et al., 2013) and that animals display an innate preference for non-spicy over spicy foods (Carstens et al., 2002; Rozin, Gruss, & Berk, 1979), that can be overcome only with gradual exposure and social learning (e.g., Rozin & Kennel, 1983). And while exposure to human being LCP gives rise to enjoyment of spicy foods, it is argued that this enjoyment is a form "benign masochism," similar to the enjoyment from a scary movie, or a sad song (Rozin, Guillot, Fincher, Rozin, & Tsukayama, 2013).

Linguistic-Cultural Practices Associated With Spiciness and Sweetness

Given the innately positive valence associated with sweet foods, and innately negative valence associated with

spiciness, it is unsurprising that LCP associated with sweetness and spiciness often go hand in hand with their preverbal hedonic characterization.

Words associated with sweetness are used in many languages to denote affection and love; for example, the Merriam Webster dictionary defines the adjective “sweet” as describing the quality of being “very gentle, kind, or friendly” or “very pretty or cute.” Research conducted in the United States suggests that tasting sweet foods leads people to behave more positively toward others, and judge themselves as having a more agreeable personality (Meier, Moeller, Riemer-Peltz, & Robinson, 2012) and that being the target of a benevolent act causes people judge candy as being sweeter (Gray, 2012). Similarly, research conducted in Singapore shows that inducing feelings of love leads people to rate foods as being sweeter (e.g., Chan, Tong, Tan, & Koh, 2013).

When it comes to spicy tastes, the pain and arousal that it brings about give rise to it being used in conceptualizations of aggression and high-arousal. For example, in China, saying that a person is “spicy,” means that he is quick to anger (Ji, Ding, Deng, Jing, & Jiang, 2013). Similarly, according to the Merriam Webster English dictionary, being “peppery” means having a “lively, aggressive, or somewhat shocking quality.”

The association between aggression and spiciness can also be found in ancient Jewish Talmudic writings that date back two millennia. In the Talmud, the word *Pilpul* (adding pepper), is used to denote a “heated argument,” and specifically refers to the ancient Jewish practice of fierce scholarly debate. Related to this LCP, the adjective *Harif* (spicy) has been used in Hebrew culture ever since the Talmudic period in order to describe a person who has the intellectual capacity for intelligent theological argumentation. Due to the importance of *Pilpul* in Jewish cultural practices, the trait of *Harifoot* (spiciness) has long been considered one of the most highly desirable traits in the Hebrew culture (Lauterbach, 1905). For example, the influential scholar Rava (270–352 CE) argued that the capacity for logical debate is of the outmost importance, by saying that (loosely translated): “one spicy pepper outweighs an abundance of pumpkins” (Yona, 2006).

Because of this deeply-ingrained LCP, current day Israeli culture still makes prevalent use of the term “spiciness” as a metaphor for intellectual competence (namely, “she is Harifa” – “she is a smart person”). Thus, at least in Israeli culture (but possibly in other cultures as well) LCP, have reversed the initial hedonic association associated with spiciness, namely, attributing the character of spiciness to a person means viewing him in a highly positive light.

Furthermore, in Israeli LCP, as part of its “Dugri culture” (Katriel, 1986), which assigns high value on directness and authenticity in communication, sweetness is not always associated with positive traits. One of the words used to describe “sweetness” (in Hebrew – “she is *mataktaka*”) is used as a metaphor that describes a negative trait, namely, inauthenticity (i.e., “she is a phony person”). Such LCP-mediated hedonic reversals may be present in

English-speaking countries as well, although probably to a lesser extent. For example, according to Merriam Webster dictionary, the word “saccharine” (which is a form of artificial sweetener) is used to mean “sweet or sentimental in a way that does not seem sincere of genuine.”

The Current Research

Based on the evidence reviewed herein, spiciness and sweetness seem to provide an example of a case wherein preverbal and linguistic-cultural valence diverge. As such, examining the effects of sweetness and spiciness on Israeli participants can allow us to contrast predictions derived from the LCP and preverbal account of embodiment phenomena.

In light of this, we conducted a study in which Israeli participants ate spicy or sweet foods while reading a story that depicted an intellectually competent, yet overly “saccharine” protagonist. Participants then judged the authenticity, intellectual competence, and overall favorability of the protagonist. According to the LCP account of embodiment effects, priming participants with a sweet (vs. spicy) taste should lead them to judge a person as less authentic, less intellectually-competent, and hence less favorable in general. In contrast, the *preverbal* account predicts that the innate association between sweetness (spiciness) and positive (negative) valence should result in the reverse pattern of results.

Method

Participants

Sixty-two (31 males) secular Jewish-Israeli participants (ages 21–30, $M = 24.72$) from the greater Tel-Aviv area took part in the study. The number of participants and exclusion criteria were determined a-priori to allow 30 participants per condition. Additional six participants were excluded because they failed a post-study memory test meant to determine engagement with the task; two were unresponsive to our manipulation (they did not report the spicy and sweet foods as such); two expressed distress when eating the spicy snack.

Procedure

Participants were randomly assigned to the *sweet* ($n = 32$) or *spicy* ($n = 30$) groups. The task and instructions were presented on a computer screen in order to avoid experimenter effects. Next to the screen we placed a plate which contained 25 g of a popular snack. An even number of participants in each group was served with one of two types of a spicy (“Spicy Doritos,” or “Spicy Bisli”) or sweet (“Click Chocolate”; “Gummy Bears”) snacks.

The spicy snacks were selected based on a pretest which included 15 participants who were similar in the

characteristics to the experimental group. Participants were asked to rate the spiciness of five different spicy snacks. The two snacks that were selected for use were the two spiciest snacks, which were given ratings of 5.89 and 5.04 on a scale of 1 (= *not spicy at all*) to 7 (= *very spicy*). Participants were told that the study investigates the effect of eating on memory, so they were asked to eat the snacks served on the plate while reading a short story, and that afterwards their comprehension will be tested.

The story described an interaction between a business woman named Rachel and her husband. We made sure to interleave within the story many elements that permitted to see Rachel as being “saccharine” (e.g., Rachel says – “wait my dearest... I have to take this call”) as well as being intellectually competent (e.g., she is said to have single-handedly built a successful investment-portfolio management business). A pretest conducted on 17 participants who rated Rachel on a scale of 1 (= *very negative*) to 7 (= *very positive*) indicated that she was viewed relatively neutrally ($M = 3.7$, $SD = 0.91$). The complete story in the original Hebrew, and translated into English, is available online at the open science framework website (<https://osf.io/xzgbm>).

After reading the story, participants rated Rachel along five spiciness-related (quick-witted, sharp, witty, lively, intelligent), five saccharinity-related (vulgar, inauthentic, insincere, kitschy, sycophant), and three neutral traits (introvert, sporty, innocent). None of the traits directly referred to the gustatory metaphors. Participants subsequently answered three general evaluation questions (e.g., “how much do you like of Rachel?”; “how much do you respect Rachel?”) followed by a memory test (e.g., “what was the name of Rachel’s husband?”). They then rated the spiciness and sweetness of the snack, and the degree to which they

enjoyed it. All ratings were reported using a 1 (“not at all”) to 7 (“very much”) scale. Finally, participants were questioned to make sure that none suspected the purpose of the experiment.

Results

The complete raw data is available online at the open science framework website (<https://osf.io/qd7vu>). The results of the manipulation check showed that participants who ate the spicy snacks rated it to be more spicy ($M = 5.77$, $SD = 0.13$) than sweet ($M = 1.23$, $SD = 0.57$), $t(29) = 26.50$, $p < .001$. Similarly, participants who ate the sweet snack rated it to be more sweet ($M = 6.31$, $SD = 0.70$) than spicy ($M = 1.00$, $SD = 0.00$), $t(31) = 43.38$, $p < .001$. Cronbach’s alpha for the saccharinity/inauthenticity traits was .74, for spiciness/intelligence was .74, and for the general evaluation was .90. We calculated each participant’s average rating on “saccharinity,” “spiciness,” and “general evaluation” questions (see Figure 1 for specific traits).

Participants enjoyed the sweet snacks ($M = 5.25$, $SD = 1.48$) more than the spicy snacks ($M = 4.36$, $SD = 1.42$), $F(1, 60) = 5.70$, $p = .020$. In light of this, we entered snack enjoyment as a covariate in the statistical model and conducted an ANCOVA on each of these measures with Taste (spicy/sweet) as the independent variable, controlling for participants’ enjoyment of the snack. Gender, Age, or Type of Snack did not have any main or interactive effects on the ratings. As predicted, participants gave higher ratings of intelligence in the spicy ($M = 5.79$, $SD = 0.62$) versus sweet ($M = 5.27$, $SD = 0.82$) condition, $F(1, 59) = 8.39$, $p = .002$, $d = 0.715$; higher ratings of

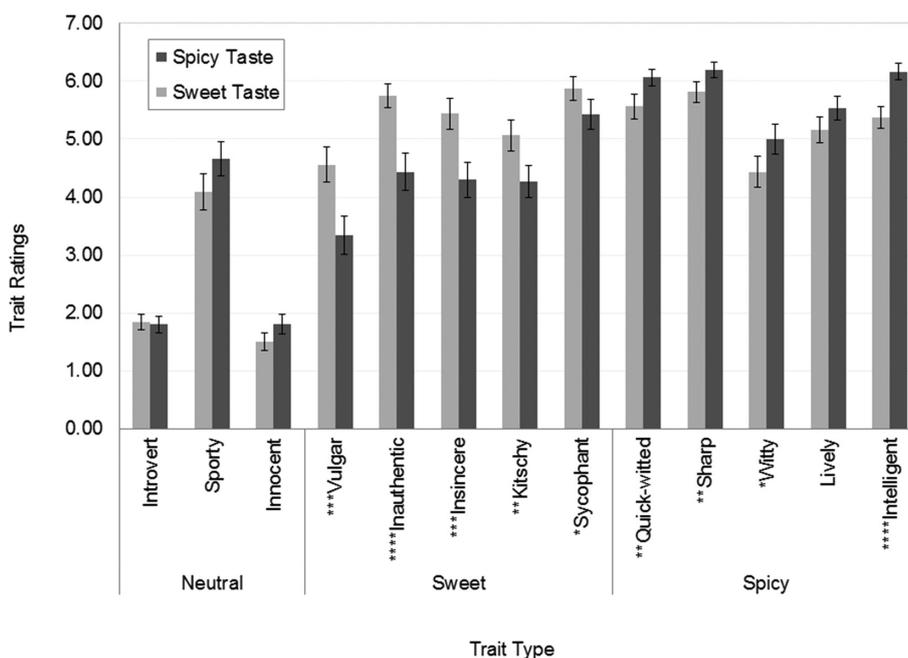


Figure 1. Average rating by trait and taste condition. Error bars represent standard errors of the mean. * $p < .10$; ** $p < .05$; *** $p < .01$; **** $p < .001$.

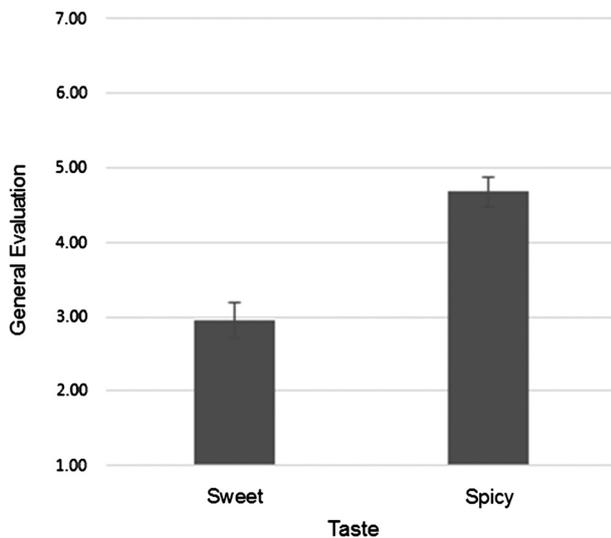


Figure 2. Average general evaluation by taste condition. Error bars represent standard errors of the mean.

inauthenticity in the sweet ($M = 5.34$, $SD = 1.09$) versus spicy ($M = 4.35$, $SD = 0.96$) condition, $F(1, 59) = 10.80$, $p < .001$, $d = 0.963$; and more favorable general evaluations in the spicy ($M = 4.89$, $SD = 1.09$) versus the sweet ($M = 2.96$, $SD = 1.37$) condition, $F(1, 59) = 25.70$, $p < .001$, $d = 1.55$ (Figure 2). There were no significant differences in the ratings of the three neutral traits (all $p > .60$). The results did not differ when omitting enjoyment ratings from the model, and conducting a one-way ANOVA. Intelligence: $F(1, 60) = 7.53$, $p = .007$; inauthenticity: $F(1, 60) = 14.146$, $p < .001$; general evaluation: $F(1, 60) = 29.48$, $p < .001$; neutral traits: $F(1, 60) < 1$.

Discussion

Our results showed that priming participants with spicy (vs. sweet) tastes increased judgments of intellectual competence, decreased judgments of inauthenticity, and increased overall evaluation of a social target. These effects were predicted on the basis of prevalent metaphors in Israeli culture, according to which sweetness is associated with saccharinity/inauthenticity, and spiciness is associated with intellectual competence.

As noted in the Introduction, past research demonstrated that LCP can fine-tune the implementation of preverbal principles (Lee & Schwarz, 2012). In similar vein, a recent study by Slepian and Ambady (2014) demonstrated the importance of LCP in embodiment phenomena by showing that an arbitrary metaphor transferred via linguistic communication (reading a paragraph that describes the past as being “heavy”) affected participants’ preverbal experience (i.e., judgments of old books as heavier). The current

research goes one step further in demonstrating that LCP can overshadow and reverse the innate hedonic value of preverbal experiences. As such, the current results provide a strong demonstration of the involvement of linguistic-cultural practices in embodiment phenomena.

The current results also provide a conceptual replication of previous findings (e.g., Lee & Schwarz, 2012; Meier et al., 2012; Schnall et al., 2008; Williams & Bargh, 2008, to give just a few of examples) that were provided support to conceptual-metaphor theory (Lakoff & Johnson, 2008). An important aspect of the current conceptual replication is its statistical robustness – the observed differences between the sweet and spicy conditions were very large (i.e., Cohen’s d ranging from 0.71 to 1.55, Hedges’ g ranging from 0.70 to 1.53). Many recent studies within the framework of embodied cognition research have demonstrated the ubiquity of effects of conceptual metaphors on behavior. However, the recent failures to replicate some of the widely publicized priming and embodiment phenomena gave rise – in the words of prominent psychologist Daniel Kahneman – to “a storm of doubt” concerning the reliability of results. At the current period of increasing skepticism of social-psychological findings, we believe that robust conceptual replications of embodiment phenomena, as the one provided herein, are of special importance.

The reports of failed replication attempts of behavioral priming and embodiment phenomena were taken by some (e.g., Dijksterhuis, 2014) as warranting investigation into novel theoretical variables that may moderate the observed effects (or lack thereof). The current finding, according to which cultural-linguistic metaphors overshadowed the innate hedonic values associated with sweetness and spiciness, seems to suggest that conceptual-metaphor researchers must conduct their research with extreme concern to LCP and examine whether a specific metaphor (e.g., purity-cleanliness; warmth-trust) is prevalent in a specific culture and sample. Furthermore, acknowledging the importance of LCP in abstract reasoning may entail a greater caution in claims concerning the generalizability of psychological phenomena such as those reported in the embodiment literature. However, it is important to note that the current study did not include an intercultural comparison of the effects of the gustatory metaphors; in light of this, the possibility that LCP may serve a moderator of embodiment remains to be tested in future studies.

A limitation of the current report is the relatively small sample size (62 participants); in light of this, conceptual as well as direct replications of the effects reported herein are warranted. Future work should also continue to examine whether the innate hedonic value associated with other experiences such as warmth and nutrition can sometimes be trumped by LCP (e.g., “cool guy,” “hungry for success”). Such further evidence would support the view that despite the involvement of culturally-independent preverbal mechanisms in abstract thought, the critical role of linguistic-cultural practices should not be underestimated.

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