

Journal of Personality and Social Psychology

Sweet Taste Preferences and Experiences Predict Prosocial Inferences, Personalities, and Behaviors

Brian P. Meier, Sara K. Moeller, Miles Riemer-Peltz, and Michael D. Robinson

Online First Publication, August 29, 2011. doi: 10.1037/a0025253

CITATION

Meier, B. P., Moeller, S. K., Riemer-Peltz, M., & Robinson, M. D. (2011, August 29). Sweet Taste Preferences and Experiences Predict Prosocial Inferences, Personalities, and Behaviors. *Journal of Personality and Social Psychology*. Advance online publication. doi: 10.1037/a0025253

Sweet Taste Preferences and Experiences Predict Prosocial Inferences, Personalities, and Behaviors

Brian P. Meier
Gettysburg College

Sara K. Moeller
Saint Xavier University

Miles Riemer-Peltz
Gettysburg College

Michael D. Robinson
North Dakota State University

It is striking that prosocial people are considered “sweet” (e.g., “she’s a sweetie”) because they are unlikely to differentially taste this way. These metaphors aid communication, but theories of conceptual metaphor and embodiment led us to hypothesize that they can be used to derive novel insights about personality processes. Five studies converged on this idea. Study 1 revealed that people believed strangers who liked sweet foods (e.g., candy) were also higher in agreeableness. Studies 2 and 3 showed that individual differences in the preference for sweet foods predicted prosocial personalities, prosocial intentions, and prosocial behaviors. Studies 4 and 5 used experimental designs and showed that momentarily savoring a sweet food (vs. a nonsweet food or no food) increased participants’ self-reports of agreeableness and helping behavior. The results reveal that an embodied metaphor approach provides a complementary but unique perspective to traditional trait views of personality.

Keywords: personality, prosocial, taste, embodiment, sweet

The field of personality psychology has been critiqued several times, and these critiques have resulted in an invigorated science (Funder, 2009; Kenrick & Funder, 1988). Personality traits (i.e., individual difference tendencies toward particular cognitions, experiences, and behaviors) emerged as the basic unit of personality (McCrae & Costa, 1999). Convergence on a set of “basic” traits (i.e., the five-factor or Big 5 model) has been established in many psychometric studies (for a review, see John & Srivastava, 1999). In turn, recent meta-analytic reviews have shown that personality traits are consequential in predicting many outcomes, whether related to interpersonal issues, the workplace, or pathological symptoms and diagnoses (Ozer & Benet-Martinez, 2006; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007; Widiger, Verheul, & van den Brink, 1999). Thus, great progress has been made in isolating key traits and outcome measures associated with traits.

Nonetheless, the trait approach to personality assessment continues to garner criticism. Pervin (1994) suggested that self-reported traits may fail to capture dynamic motivational processes, which are nonetheless consequential and important (also see McClelland, Koestner, & Weinberger, 1989). Cervone (1999, 2005) suggested that making outcome predictions on the basis of self-reported traits may often constitute a tautology. For example, if the

trait of neuroticism is defined in terms of the frequent experience of negative emotions, it should not be surprising that it predicts the more frequent experience of negative emotions. Self-reported traits are also not very informative from a process-related standpoint. Indeed, they often do not predict the processing tendencies (e.g., related to accessibility or priming) that they should reasonably predict from an explanatory perspective (Robinson, 2004; Robinson & Neighbors, 2006). It can be difficult, therefore, to understand why traits predict the outcomes that they do (Pervin, 1994).

Broad-minded personality psychologists have long called for more implicit assessments of personality (Cattell, 1957; Eysenck, 1947; McClelland, 1951). Such assessments would not directly ask individuals about their personality traits but would rather make inferences about the individual on the basis of questions or tasks that do not obviously pertain to the self-concept. Such measures have several potential advantages. Self-reports of personality traits closely track the social desirability of the traits reported on (Edwards, 1957), but implicit approaches to personality assessment are likely to mitigate such self-report biases to a great extent (Robinson & Gordon, 2011). Implicit assessments are also useful in bypassing Cervone’s (1999) tautology critique of trait–outcome relationships mentioned above. Finally, to the extent that an implicit personality measure predicts an outcome, the results would seem important from a process-related standpoint. Indeed, personality processes (but not personality traits) can be manipulated, in turn providing crucial causal evidence for the mechanism of interest (e.g., Meier, Wilkowski, & Robinson, 2008). The present studies systematically pursue the idea that recent theories of conceptual metaphor and embodiment possess untapped potential for understanding personality processes.

Brian P. Meier and Miles Riemer-Peltz, Department of Psychology, Gettysburg College; Sara K. Moeller, Department of Psychology, Saint Xavier University; Michael D. Robinson, Department of Psychology, North Dakota State University.

Correspondence concerning this article should be addressed to Brian P. Meier, Department of Psychology, Gettysburg College, Gettysburg, PA 17325. E-mail: bmeier@gettysburg.edu

An Embodied Metaphor Approach to Personality Processes

In characterizing the attributes of the self and others, people frequently use metaphors in their everyday discourse (Gibbs, 1994, 2006). They presumably do so because it is difficult to conceptualize dispositional tendencies in the abstract without recruiting metaphors of a more concrete, physical type (Lakoff & Johnson, 1999). Such mappings likely begin in childhood through scaffolding mechanisms in which early perceptual experiences are used to ground latter conceptual achievements (Barsalou, 2008; Crawford, 2009; Spellman & Schnall, 2009; Williams, Huang, & Bargh, 2009). The importance of such mechanisms is that they allow developing individuals to represent abstract concepts, which are less familiar and difficult to grasp, in terms that are much more concrete and familiar (e.g., the physical closeness of a caregiver is later used as a way to understand emotional closeness as well). The repetition of such embodiment processes has been hypothesized to rewire the neural circuitry involved, a process termed *neural binding* (Lakoff, 2008; Schnitzer & Pedreira, 2005).

Until recently, such ideas were largely based on linguistic analyses (Lakoff & Johnson, 1999). However, a contemporary body of social cognition work has shown that manipulations consistent with robust linguistic metaphors alter behaviors and thoughts in a metaphor-consistent direction. For example, Meier and Robinson (2004) found that positive words were evaluated faster when presented high on a computer screen, whereas negative words were evaluated faster when presented low on a computer screen, consistent with prominent metaphors linking positive states to high vertical positions (e.g., “I’m feeling up”). Wilkowski, Meier, Robinson, Carter, and Feltman (2009) found that ambiguous faces were thought to be angrier when superimposed on a background suggestive of heat versus nonheat, consistent with anger–heat experiences and metaphors (Anderson & DeLisi, in press). There are now a number of important studies of this type (e.g., Lee & Schwarz, 2010; Schubert, 2005; Williams & Bargh, 2008, for a review, see Landau, Meier, & Keefer, 2010), all of which creatively establish metaphor-related influences on social cognition and judgments. Such studies represent important advances to the social psychology literature.

Such developments, though, have yet to truly inform the personality literature to any significant extent. On the other hand, there are at least conceptual reasons for thinking that a metaphor-enriched understanding of personality processes may be fruitful. Metaphors are frequently used in characterizing the personality tendencies of self and others (e.g., Gibbs & Beitel, 1995; Haas, 2002). Such metaphors might be considered folk theories of personality, but such folk theories presumably possess some wisdom (Goffman, 1959). Indeed, consider that *friendless* (Hostility) is characterized in terms of “warmth” (“coldness”) in a major conceptual and measurement model in the personality literature (Wiggins, 1979; Wiggins & Broughton, 1991). Further, Fleeson and Nofle (2009) made a case for the idea that similar processes may be involved in understanding state- and trait-related influences on social functioning. On the basis of such considerations, we hypothesized that a metaphoric perspective on personality processes might yield insights into the nature of individual differences. We pursued such ideas in the context of a novel empirical focus, one linking prosocial functioning to the gustatory taste of sweetness.

Sweet Tastes as a Source Domain for Prosocial Functioning

Prosocial functioning is defined in terms of intentions and behaviors that favor the welfare of others (Dovidio, Piliavin, Schroeder, & Penner, 2006). A number of situational (Batson, 2010; Greitemeyer, 2009) and individual difference (Norenzayan & Shariff, 2008; Organ & Ryan, 1995) predictors of prosocial functioning have been identified. Such work is important in developing an understanding of prosociality. Yet, integrative frameworks in this domain seem to be lacking (e.g., Mikulincer & Shaver, 2010). In the present studies, we systematically examined one potential integrative framework, one in which prosocial functioning is metaphorically understood in terms of sweet taste preferences and experiences.

There is good reason to expect taste metaphors to be consequential. From birth, individuals need to ingest food multiple times per day to survive and thrive. Given the commonness of feeding, its biological relevance, and its presence from birth, the taste-related realm is one that is especially likely to be used in scaffolding later interpersonal processes of a more conceptual type (Williams et al., 2009). It may be pointed out that taste seems to have practically zero attributes in common with interpersonal processes in a direct sense. Taste is about food, but people are not food; taste is about chemical properties and their influence on taste receptors, but people are not characterized in chemical terms. Yet, metaphors operate in terms of such cross-domain mappings (Lakoff & Johnson, 1999; Landau et al., 2010). Indeed, taste-related terms—particularly bitter, spicy, sour, and sweet—are used to characterize behavior and the manner in which people differ from each other. Such metaphors seem especially common when considering sweet tastes. It is notable that people invoke sweetness metaphors in the interpersonal realm. They typically do so in three contexts. Many of the most common nicknames for romantic partners are of a sweetness-related type, such as “honey,” “sugar,” “sweetie,” and “sweetheart.” Further, outside of a romantic context, the word *sweet* is often invoked to characterize a kind action, such as a compliment or the granting of a favor. Finally, the word is often used to describe a nice, friendly, and caring person and in fact is a synonym for such interpersonal characteristics. Thus, “sweet” metaphors allow people to communicate about others in a parsimonious manner within the domain of prosociality.

Such metaphoric language is likely common because sweet tastes are especially palatable and pleasant, indeed innately so (Berridge, 2003; Fox & Davidson, 1986; Keskitalo et al., 2007). Of course, pleasure can be obtained from a number of interpersonal and noninterpersonal activities, and there is thus the question of why sweetness metaphors tend to emphasize prosocial behaviors and qualities. This issue will be revisited in the General Discussion. For now, it is enough to note that linguistic metaphors and the folk theories of personality that they capture do emphasize this particular link. Therefore, and following Lakoff and Johnson’s (1999) contention that metaphors guide judgment and behavior even in noncommunication contexts, the processes involved in sweetness-related metaphors may constrain and explain prosocial functioning in ways currently unappreciated.

Studies and Hypotheses

Is there untapped wisdom in understanding prosocial functioning in terms of sweetness metaphors? We conducted a series of studies to examine this possibility. Study 1 was a person perception study in which depicted strangers professed liking a certain food primarily characterized by one taste: bitter, salty, sour, spicy, or sweet. The hypothesis was that perceivers would ascribe a higher level of agreeableness to targets expressing liking for a sweet food. Study 2 then examined whether agreeable individuals actually do like sweet foods to a greater extent than do those low in agreeableness. Findings of this type would be entirely novel to the personality trait literature and would suggest that there is a degree of truth to the dispositional link between prosocial functioning and liking for sweet foods.

Studies 3–5 were even more ambitious. In Study 3, we treated liking for sweet foods as a personality variable and hypothesized that greater preferences of this type would predict prosocial intentions and behaviors in a laboratory context. Study 4 was a manipulation study in which it was hypothesized that the momentary savoring of a sweet-tasting food would lead individuals to infer that they were more agreeable people. Study 5 was a manipulation study in which it was hypothesized that a sweet taste experience would result in greater intentions to volunteer one's time to help another person in need. In total, the studies used both correlational and experimental designs and encompassed personality inferences, dispositions, intentions, and behaviors in examining a link between sweet tastes and/or preferences on the one hand and prosocial functioning on the other hand.

Study 1

Sweetness metaphors may guide personality inferences of agreeableness, the empirical focus of Study 1. For purposes of experimental control, we used a zero-acquaintance procedure (Ambady & Rosenthal, 1992; Meier, Robinson, Carter, & Hinsz, 2010) in which pictures of strangers were paired with statements indicating liking for food items whose dominant taste was bitter, salty, sour, spicy, or sweet. Such statements were randomly assigned to pictures, a procedure ensuring that inferences of the hypothesized type could not be due to nonverbal indicators (e.g., appearance, hairstyle, target sex). For purposes of discriminant validity, we also asked perceivers to judge levels of extraversion and neuroticism. We hypothesized a unique relationship between expressed liking for sweet foods and inferences of agreeableness.

Method

Participants. Participants were 90 North Dakota State University (NDSU) undergraduates (33 male) with an average age of 19.22 ($SD = 2.69$) years. Seventy-eight participants were Caucasian, seven were Asian, one was Black, and one was Hispanic. Three participants reported “other” as their race.

Procedures. Participants were told that we were interested in their ability to make snap judgments concerning the personality of others. Pictured targets consisted of 100 pictures from the Yale Face Database (Georghiades, Belhumeur, & Kriegman, 2001), balanced by target sex. Such individuals were Caucasian in race and of conventional appearance. In addition, they displayed neutral

facial expressions, were photographed from the neck up, and were presented in black and white.

Each picture was paired with a statement indicating liking for a particular food item (“I like X”). There were 45 items that spanned all five commonly understood taste types, with nine items each: sweet (e.g., honey), bitter (e.g., grapefruit), sour (e.g., lemons), spicy (e.g., peppers), and salty (e.g., pretzels). However, we did not mention that the taste items were of a certain taste type, and therefore personality inferences cannot be understood in terms of such labels. Each food item was randomly paired with one male face and one female face.¹

Each trial proceeded as follows. A face was randomly selected and randomly paired with one of the taste items. Such information was presented for 1.50 s to ensure sufficient encoding time. Subsequently, the target-specific information was removed and participants judged the extent to which the specific target was likely “agreeable,” “extraverted,” and “neurotic,” all in relation to the same 6-point rating scale (1 = *not very*; 6 = *very*). The order of such personality ratings was randomized at the trial level to preclude systematic order effects. Each food item was paired with one male face and one female face, for a total of 90 trials and 270 personality judgments. Participants were debriefed after completing the task.

Results and Discussion

Ratings were averaged for each taste type (bitter, salty, sour, spicy, and sweet) for each personality judgment (agreeable, extraverted, and neurotic). All such taste by personality inference ratings were reliable ($\alpha s = .74-.85$).

These personality inferences were examined as a function of the 3 (personality factor) \times 5 (taste type) design in a repeated-measures analysis of variance. Main effects for personality factor, $F(2, 178) = 28.37, p < .001$, partial $\eta^2 = .24$, and taste type, $F(4, 356) = 7.68, p < .001$, partial $\eta^2 = .08$, were both significant. The Personality Factor \times Taste Type interaction was significant, $F(8, 712) = 11.07, p < .001$, partial $\eta^2 = .11$. This interaction reveals that different personality inferences were made on the basis of different target-reported taste preferences. The means for the main effects and interaction are shown in Table 1.

It was predicted that sweet taste preferences would lead person perceivers to infer higher levels of agreeableness. This hypothesis was tested in two ways. First, considering only trials in which individuals stated a preference for sweet items, agreeable ratings were higher than both extraverted ratings, $t(89) = 5.10, p < .001, d = 0.54$, and neurotic ratings, $t(89) = 7.38, p < .001, d = 0.78$. Second, considering agreeable ratings alone, targets expressing a liking for sweet foods were rated as more agreeable than targets

¹ Depicted individuals in Study 1 reported liking foods of one of five taste types. Sweet items consisted of candy, caramel, chocolate cake, honey, ice cream, maple syrup, pears, strawberries, and sugar. Sour items consisted of cranberries, Granny Smith apples, lemons, lemon drops, limes, plain yogurt, sauerkraut, sour cream, and vinegar. Bitter items consisted of bitter melon, cabbage, coffee, cottage cheese, grapefruit, radishes, rye bread, tea, and tonic water. Salty items consisted of bacon, beef jerky, dill pickles, green olives, pretzels, salt, saltine crackers, salty peanuts, and soy sauce. Spicy items consisted of Cajun foods, cayenne pepper, chilies, curry, hot salsa, jalapeno peppers, peppers, spicy sausage, and Tabasco sauce.

Table 1
Descriptive Statistics for the Interactive Findings of Study 1

Taste type	Personality inferences			Main effect
	Extraverted	Neurotic	Agreeable	
Bitter	3.23 (0.62)	3.03 (0.70)	3.46 (0.66)	3.24 (0.48)
Salty	3.31 (0.65)	2.95 (0.69)	3.64 (0.66)	3.30 (0.47)
Sour	3.21 (0.64)	3.00 (0.76)	3.48 (0.69)	3.23 (0.52)
Spicy	3.56 (0.75)	3.07 (0.75)	3.51 (0.69)	3.38 (0.55)
Sweet	3.37 (0.76)	2.99 (0.80)	3.81 (0.80)	3.39 (0.58)
Main effect	3.34 (0.59)	3.01 (0.68)	3.58 (0.62)	

Note. Standard deviations are reported in parentheses. The main effect row collapses across taste types, and the main effect column collapses across the three personality judgments.

expressing a liking for the following kinds of foods: bitter, $t(89) = 5.41, p < .001, d = 0.57$; salty, $t(89) = 2.93, p < .005, d = 0.31$; sour, $t(89) = 5.20, p < .001, d = 0.56$; spicy, $t(89) = 4.47, p < .001, d = 0.47$. The interactive predictions were supported in two ways, then.

The results of Study 1 are robust in suggesting that people infer that others are agreeable to the extent that they report liking sweet foods. We emphasize that this was so although targets were held constant across taste conditions by random assignment and no references to sweetness were made. In the latter connection, perceivers first had to categorize foods as sweet before inferring high levels of the prosocial trait of agreeableness, and the procedures were subtle in this respect. Nonetheless, sweetness preferences emerged as an important predictor of agreeable inferences. The nature of the findings suggests that personality inferences may often be made in an embodied metaphoric manner, encouraging further studies on the scope of such metaphor-related processes.

Study 2

Study 1 found that targets expressing a liking of sweet-tasting foods were rated as higher in agreeableness, but is there a kernel of truth to such inferences (i.e., do prosocial individuals actually like sweet foods to a greater extent)? We sought to answer this question in Study 2. We focused on the Big 5 trait of agreeableness, as this trait in particular can be viewed in terms of variations in prosocial functioning. People high in agreeableness can be characterized as friendly, cooperative, and compassionate, whereas people low in agreeableness are more competitive, self-centered, and aggressive (Graziano & Eisenberg, 1997; Graziano, Jensen-Campbell, & Hair, 1996; Graziano & Tobin, 2009). Further, agreeableness negatively predicts hostile and aggressive behaviors (Martin, Watson, & Wan, 2000) and positively predicts prosocial behaviors (Carlo, Okun, Knight, & de Guzman, 2005). We hypothesized that more agreeable individuals would in fact exhibit greater preferences for sweet tastes (but not necessarily other tastes), thereby extending the findings of Study 1 to the personality trait literature.

Method

Participants. Participants were 55 NDSU undergraduates (27 male) with an average age of 19.85 ($SD = 2.69$) years. Fifty participants were Caucasian, four were Asian, and one was Black.

Procedures. We asked participants to rate their liking for foods from the five taste types used in Study 1. In order to ensure that the results were generalizable, we used some different foods in Study 2 and added one food per taste type (such that there were 10 total foods for each taste type). Participants rated their liking for each food according to a 6-point scale (1 = *dislike strongly*; 6 = *like strongly*). We computed an average score for each taste type (bitter $\alpha = .44, M = 3.46, SD = 0.68$; salty $\alpha = .58, M = 3.76, SD = 0.69$; sour $\alpha = .68, M = 3.44, SD = 0.74$; spicy $\alpha = .88, M = 3.26, SD = 1.14$; sweet $\alpha = .78, M = 4.65, SD = 0.76$).²

Subsequently, participants completed an agreeableness scale. Individual differences in agreeableness were assessed in terms of Goldberg's (1999) 10-item agreeableness scale. Goldberg is a leading advocate of the five-factor model of personality (e.g., Goldberg, 1990, 1999) and has freely distributed his personality scales. His short-form scales have demonstrated reliability and validity and correlate with other scales measuring traits in the five-factor tradition (Goldberg, 1999; John & Srivastava, 1999; McCrae & John, 1992). We have used this scale in many previous examinations of agreeableness (e.g., Meier & Robinson, 2004; Meier et al., 2008; Robinson & Wilkowski, 2006; Wilkowski, Robinson, & Meier, 2006).

Participants were asked to indicate the extent (1 = *very inaccurate*; 5 = *very accurate*) to which they behave in ways reflective of high (e.g., "have a soft heart") versus low (e.g., "insult people") levels of agreeableness. After the four negatively keyed statements were reverse scored, an average agreeableness score was computed ($\alpha = .79, M = 4.27, SD = 0.47$). Participants were subsequently debriefed.

² Participants in Study 2 reported their liking for food of the five dominant taste types. Sweet items consisted of candy, caramel, chocolate cake, honey, ice cream, maple syrup, pears, raisins, strawberries, and sugar. Sour items consisted of cranberries, Granny Smith apples, lemons, lemon drops, limes, lime sherbet, plain yogurt, sauerkraut, sour cream, and vinegar. Bitter items consisted of beer, celery, coffee, cottage cheese, ginger ale, grapefruit, radishes, rye bread, tea, and tonic water. Salty items consisted of bacon, beef jerky, caviar, dill pickles, green olives, pretzels, salt, saltine crackers, salty peanuts, and soy sauce. Spicy items consisted of Cajun foods, cayenne pepper, chilies, curry, horseradish, hot salsa, jalapeno peppers, spicy sausage, peppers, and Tabasco sauce.

Results and Discussion

It was hypothesized that a liking for sweet foods would positively predict trait levels of agreeableness. This proved to be the case, $r(53) = .36$, $p = .007$, and this relationship held when controlling for liking of the other four taste types (i.e., bitter, salty, sour, and spicy), $r(49) = .29$, $p = .038$. We also examined the bivariate correlations with agreeableness and each individual taste type as well as the partial correlations with agreeableness and each of the other taste types individually while controlling for the remaining taste types. None of these relationships were significant ($ps > .115$).

Study 1 found that targets expressing a liking of sweet-tasting foods were viewed as higher in agreeableness. Study 2 revealed that there is a kernel of truth to such taste-related inferences in that agreeable individuals do, in fact, like sweet-tasting foods to a greater extent than do their disagreeable counterparts. The results of Study 2 thus provide a unique perspective on individual differences in prosocial functioning, one that focuses on intrapsychic and folk predictors of personality processes. Further, we emphasize the importance of the Study 2 findings in another way. The fact is that no prior studies of personality have sought to link personality traits to taste preferences, yet our results suggest that such a metaphor-based analysis appears fruitful. The question remains, however, as to whether sweet taste preferences themselves might predict prosocial functioning quite aside from the fact that they systematically covaried with the personality trait of agreeableness.

Study 3

Personality traits may be useful predictors of prosocial functioning (Graziano & Eisenberg, 1997). Yet, prosocial functioning typically operates in a manner that is much more situational in nature. That is, individuals encounter situations in which others likely need help, and the question is the extent to which they intend to (or actually do) extend their time, effort, and resources under such circumstances. There is often a disconnect between what people say they will do and what they actually do in such situations (Nisbett & Wilson, 1977; Sherman, 1980). Thus, in Study 3, we focused on dependent measures of a proximal situational type. We hypothesized that sweet taste preferences would positively predict both prosocial intentions and prosocial behaviors in terms of such spontaneous dependent measures.

Method

Participants. Participants were 108 NDSU undergraduates (52 male) with an average age of 19.94 ($SD = 3.23$) years. Ninety-seven participants were Caucasian, seven were Asian, two were Hispanic, one was Native American, and one was Black.

Procedures. In Studies 1 and 2, a liking for sweet foods was the best predictor of agreeableness. Thus, in Study 3, given the other goals of the study, we assessed only liking for sweet foods, using the items and rating scale of Study 2 ($\alpha = .77$, $M = 4.87$, $SD = 0.62$). A prominent volunteer need in the NDSU community was used to assess prosocial intentions. The Red River flows directly through the Fargo–Moorhead area. Weeks prior to data collection, Red River levels swelled to disaster levels (approxi-

mately 40 feet, with many dikes sufficient for only 32 feet). A massive mobilization effort was required in which an estimated 6 million sandbags were placed along dikes (Kolpack, 2009). Classes were canceled at NDSU to support this flood-mitigation effort, and student sandbaggers were a major source of volunteers. When the flood levels subsided, NDSU classes resumed and the study was conducted at this time. It was necessary to remove the 6 million sandbags that had been placed. To assess prosocial intentions, we informed the participants of the need for this second volunteer effort and asked them whether they would be willing to help, a dichotomous outcome (0 = no, 1 = yes). Participants who agreed to help were given an information sheet with actual volunteer information.

At the end of the session, participants were told that the study was over and that full participation credit would be awarded, thereby relieving them of any further obligations. Subsequently, however, it was mentioned that a colleague in the English department was collecting data on media preferences and was looking for volunteers. A brief voluntary survey was handed to participants as they left the lab. The questions pertained to the number of books read per year and liking for different types of movies. Responses to such questions were not of interest; rather, we coded whether each individual completed the survey and trudged up four floors within the building to deposit it in a marked box placed in front of the English department (0 = no, 1 = yes). Names were not attached to the surveys (code numbers were used), and thus depositing them could be defined as a prosocial behavior. We debriefed participants by e-mail hours after their involvement.

Results and Discussion

Individuals expressing greater liking for sweet foods were expected to exhibit more prosocial intentions and behaviors. With regard to the first prediction, 90 of 108 participants reported that they would help the flood-cleanup efforts. We used logistic regression procedures, as the dependent measure was dichotomous and the predictor was continuous. As hypothesized, greater liking of sweet foods predicted greater intentions to volunteer one's time to flood-cleanup efforts ($\beta = 1.00$, $SE = 0.42$, $p = .017$).

The second prediction pertained to actual prosocial behaviors. Forty-four of the 108 participants completed the "English survey" and deposited it in a fourth-floor response box. A logistic regression analysis examined whether greater liking for sweet foods predicted this dependent measure. A significant relationship was found ($\beta = 0.68$, $SE = 0.34$, $p = .049$). As hypothesized, the direction of the relationship was positive, such that individuals who liked sweet foods to a greater extent were more likely to complete this voluntary survey.

A greater number of individuals intended to help flood-cleanup efforts than to sacrifice their time for the sake of an ostensible English department colleague. The differential rates could reflect the more serious nature of the flood-cleanup efforts to the community at large or, more likely, reflect the greater willingness of individuals to report prosocial intentions than to engage in actual prosocial actions (Sherman, 1980). Regardless, sweet taste preferences predicted both dependent measures. We emphasize that sweet taste preferences possess no obvious relation to personality traits, and yet individual differences in such preferences were consequential in predicting prosocial functioning.

Study 4

Self-reported personality traits are remarkably stable over time (McCrae & Costa, 1994). Such findings are viewed as important evidence for a temperamental perspective of personality, once thought to largely preclude the influence of situational factors (McCrae & Costa, 1999). When individuals self-report on their personality, though, they presumably access self-knowledge that should be susceptible to priming effects to some extent (Robinson & Clore, 2002). Schwarz (1999; also see Council, 1993) reviewed multiple sources of evidence for the idea that self-reports of personality are indeed malleable and influenced by situational factors.

Of particular relevance to Study 4, though, is the idea that personality tendencies include state as well as trait variation. Although the notion of a personality state may seem puzzling, the personality literature has increasingly embraced it. For example, even introverts act extraverted, from time to time, in their daily lives (Fleeson, 2001; McNiel & Fleeson, 2006). Agreeableness may possess similar state-like properties, and we sought to support this point in causal terms. Accordingly, in Study 4, we manipulated sweet taste experiences and hypothesized that individuals assigned to a sweet taste condition, relative to a control condition, would subsequently report higher levels of agreeableness.

Method

Participants. Participants were 58 Gettysburg College undergraduates (26 male) with an average age of 19.26 ($SD = 1.42$) years. Fifty-five participants were Caucasian, two were Asian, and one was Black.

Procedures. Participants were informed that the study generally concerned the influence of tastes on cognitive performance and tasks were administered to support this cover story. In actuality, though, our interest was in subsequent self-reports of agreeableness. In order to manipulate taste experiences related to sweetness, we randomly assigned participants to taste a sweet candy (Hershey's Kisses; $n = 28$) or a nonsweet candy (Altoids Tangerine Sours; $n = 30$). Participants tasted two pieces of the candy, one each before they began two different tasks unrelated to the hypotheses. These tasks lasted approximately ten minutes in total. Individuals assigned to the sweet condition sampled two successive Hershey's Kisses, each containing 2.55 g of sugar (as noted on the package label). The control candy, Altoids, was chosen as it was also bite-size and generally appealing but less sweet. Sugar content for this control condition candy was 0.80 g per piece (as noted on the package label). A manipulation check was included at the end of the study that asked participants to rate the extent to which the candy tasted sweet (1 = *not at all*; 7 = *extremely*).

Subsequently, all participants were asked to rate their levels of agreeableness according to Goldberg et al.'s (2006) reliable and valid 10-item agreeableness scale used in Study 2 ($\alpha = .75$, $M = 4.23$, $SD = 0.44$). Items on this scale can be attitudinal in nature (e.g., "am interested in people") and accordingly are likely to be malleable in specific contexts. Accordingly, self-reported levels of agreeableness were hypothesized to be higher subsequent to consuming sweet than nonsweet candies.

To rule out effects of the manipulation on mood states, we then asked participants to report on their current experiences of positive

and negative affect according to the well-validated Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988). The PANAS includes 10 markers of positive affective states (e.g., excited) and 10 markers of negative affective states (e.g., upset), all rated on a 5-point scale (1 = *very slightly or not at all*; 5 = *extremely*). We computed averages for positive affect ($\alpha = .76$, $M = 3.04$, $SD = 0.56$) and negative affect ($\alpha = .80$, $M = 1.46$, $SD = 0.50$). Participants were debriefed after completing these questionnaires.

Results and Discussion

The manipulation check revealed that participants found the Hershey Kisses sweeter ($M = 5.71$, $SD = 0.91$) than the candies tasted in the control condition ($M = 4.47$, $SD = 1.50$), $t(56) = 3.72$, $p < .001$, $d = 0.98$. Thus, sweet taste experiences were effectively manipulated. To examine the effects of this manipulation on self-reports of agreeableness, an analysis of covariance was performed. Taste type (sweet vs. less sweet) was the independent variable, self-reports of agreeableness were the dependent variable, and positive and negative affective states were entered as covariates. Participants randomly assigned to the sweet taste condition reported higher subsequent levels of agreeableness ($M = 4.37$, $SD = 0.38$) than did those assigned to the control taste condition ($M = 4.11$, $SD = 0.47$), $F(1, 54) = 5.10$, $p = .028$, partial $\eta^2 = .09$. Neither covariate was significant ($F_s < 1$).

The manipulation of sweet taste experiences resulted in higher self-reports of agreeableness, independent of mood states. The ingestion of sugar may facilitate self-control (Gailliot & Baumeister, 2007), but the findings from Study 4 should not be viewed in such terms. Resources were not depleted and the dependent measure did not involve self-regulatory efforts. In combination with the correlation results from Studies 2 and 3, the data establish a systematic relationship between sweet food preferences and experiences and prosocial functioning. We regard such results as particularly important from a personality processing perspective as they suggest that embodied metaphors may capture something real and important in characterizing differences between individuals. The other benefit of a personality processing perspective, though, is that the relevant mechanisms can be manipulated, in effect changing the person, at least temporarily.

We suggest that the manipulation in Study 4 temporarily affected participants' levels of agreeableness, but a couple of issues may weaken this conclusion. First, participants in the sweet condition ate Hershey's Kisses. Although no mention was made of the name of this candy, the shape of this candy is well recognized and trademarked. It is also true that "kisses" generally connote favorable and intimate relations with others. It is possible that this candy may have primed associations that were more semantic than desired. Second, because the dependent variable focused on self-reports of agreeableness, one could argue that the significant effect was due to a judgment bias rather than a temporary change in disposition that has implications for behavior. We conducted Study 5 to address both concerns. In Study 5, the dependent variable involved proximal prosocial intentions and behavior. Furthermore, we used a sweet candy that did not have such a recognizable shape or set of semantic associations. In addition, two control conditions were used in Study 5, one of which was a true control condition in which no food products were consumed.

Study 5

In Study 5, we modified the sweet taste manipulation used in Study 4. Furthermore, we used a dependent variable that assessed helping intentions and behavior in proximal terms. Subsequent to the taste experience manipulation (see below), individuals were told that another professor in the psychology department needed volunteers for a study but could not compensate them. Requests of this type are classic in understanding prosocial functioning (Dovidio et al., 2006; Twenge, Baumeister, DeWall, Ciarocco, & Bartels, 2007). In specific terms, we quantified the number of minutes that participants would devote and hypothesized that sweet taste experiences would result in greater helping.

Method

Participants. Participants were 55 Gettysburg College undergraduates (25 male) with an average age of 20.12 ($SD = 1.28$) years. They were paid \$8 for their participation. Thirty-eight participants were Caucasian, six were Black, four were Hispanic, two were Asian, and one was Native American. One reported “other” as her race, and three did not answer the race question.

Procedures. Participants were told that the study was concerned with personality and cognition. Participants were randomly assigned to one of three conditions: a no-taste condition ($n = 17$), a sweet taste condition ($n = 19$), or a nonsweet taste condition ($n = 19$). In the two food conditions (sweet vs. not sweet), verbal instructions indicated researchers’ interest in taste perceptions. Participants in the taste condition were told that “we are conducting some research on taste. We would like you to eat a food and then later comment on that food.” We made it clear that the food was not a gift that needed to be reciprocated but simply part of the study. In these two conditions, also, participants were asked to savor rather than devour their foods, so that more accurate taste perceptions could be made. No such instructions were administered in the nonfood control condition (see below). All phases of the study were completed in a private room.

Participants assigned to the sweet taste condition sampled one piece of Dove Silky Smooth Milk Chocolate, which is a piece of chocolate with 4.40 g of sugar (as noted on the package). Participants assigned to the nonsweet taste condition sampled one Carr’s Table Water Cracker, which is a round wafer with 0 g of sugar (as noted on the package). In both of these taste conditions, a 30-s food tasting period then ensued. Participants assigned to the no-taste condition were not given food to consume, and there was thus no 30-s tasting period. All participants subsequently completed an unrelated questionnaire that lasted approximately one minute.

Upon completion of the unrelated questionnaire and before the sugar could be metabolized (Gailliot et al., 2007), an experimenter informed each participant that another professor in the psychology department had just stopped by and said that volunteers for another, unrelated study were needed but could not be monetarily compensated. The statement was plausible because undergraduates at Gettysburg College are routinely asked to volunteer their time for such noncompensated research efforts. It was emphasized that such efforts would be entirely voluntary and would not in any way affect their compensation for the current study.

Each participant was then asked how many minutes, up to 30, he or she would be willing to help in this unrelated study. Overall,

participants were generous in offering their help ($M = 18.27$ min, $SD = 11.31$ min). This is particularly impressive because it was understood that such helping would occur immediately following completion of the study proper. Hence, this dependent measure should be viewed in terms of prosocial intentions and of prosocial behaviors, given the immediacy of the commitment.

Subsequently, participants in the taste conditions rated the sweetness of the foods consumed (1 = *not at all*; 7 = *extremely*), as a manipulation check. Then, all participants reported on their current mood states in relation to the positive ($\alpha = .86$, $M = 2.88$, $SD = 0.72$) and negative ($\alpha = .66$, $M = 1.46$, $SD = 0.40$) affect scales of the PANAS (Watson et al., 1988). Participants were then debriefed.

Results and Discussion

The manipulation check revealed that the sweet food was perceived as sweeter ($M = 5.95$, $SD = 0.71$) than the nonsweet food ($M = 2.05$, $SD = 1.35$), $t(36) = 11.13$, $p < .001$, $d = 3.62$. To examine the effect of condition on helping behavior, we performed an analysis of covariance. Taste type was the independent variable, helping behavior in minutes was the dependent variable, and both positive affect and negative affect scores were entered as covariates. The main effect of condition was significant, $F(2, 50) = 3.82$, $p = .029$, partial $\eta^2 = .13$. Neither covariate was significant ($F_s < 1$). Means by condition are displayed in Figure 1. Subsequent pairwise comparisons using least significant difference procedures revealed that those assigned to the sweet taste condition volunteered more minutes to help another professor in the department than did those randomly assigned to the other two conditions ($ps < .05$). Further, the latter nonsweet conditions did not differ from each other ($p = .575$).

The momentary manipulation of a sweet food taste, relative to two control conditions, made individuals more agreeable in terms of spontaneous helping intentions and behavior. We found these effects even though the taste manipulation of Study 5 did not involve a candy with a recognizable shape and set of semantic associations related to agreeableness (e.g., Hershey’s Kisses). Furthermore, the manipulation was briefer in nature than that used in Study 4 and included two control conditions, neither of which manipulated a sweet taste and one of which involved no taste experience at all. Also, the dependent measure involved helping intentions and behavior rather than self-reported judgments of one’s behavior. The findings of Study 5 extend those of Studies

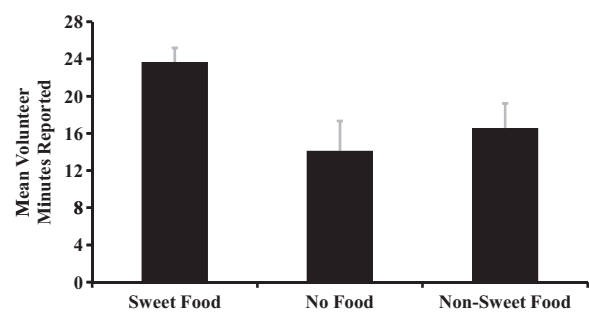


Figure 1. Means for the effect of taste type on volunteer minutes in Study 5. Error bars represent the standard error of the mean.

1–4 in highlighting a novel, yet metaphor-consistent, influence of sweet taste preferences and experiences on prosocial functioning.

General Discussion

The digital computer revolution led to the belief that human cognition is computerlike, meaning that information can be modeled in terms of arbitrary symbols (0s and 1s) and transformations of such input. Barsalou (1999) challenged this view and suggested that individuals recruit perceptual simulations for conceptual purposes, such as in determining whether leaves rustle or mirrors shine (i.e., embodiment). Niedenthal, Barsalou, Winkielman, Krauth-Gruber, and Ric (2005) suggested that social cognition is sometimes embodied as well. For example, facial feedback has been shown to influence emotional experience in a direct manner (Strack, Martin, & Stepper, 1988). Much of this work, though, has examined relatively straightforward, though still very interesting, predictions that focus on the activation of thoughts or perceptions that are directly related to a particular concept (e.g., thinking about the elderly makes one walk slower, like elderly people; Bargh, Chen, & Burrows, 1996).

Conceptual metaphor theory makes more radical claims (Landau et al., 2010; Meier & Robinson, 2005). Metaphors involve linguistic expressions in which somewhat abstract experiences (e.g., anger) seem to be conceptualized in terms of quite different events and experiences of a much more perceptual type (e.g., rising temperatures in the body or explosions). Lakoff and Johnson (1980, 1999) proposed that such metaphors, previously viewed as instances of language use, actually influence our thoughts, feelings, and behaviors in subtle and yet potentially profound manners. This view of metaphor has generated controversy among linguists and others (Gibbs, 1994), but social psychology studies have provided some empirical support for a metaphor-enriched view of social cognition (Landau et al., 2010).

Our contributions to this burgeoning literature are multiple. We are unaware of any studies showing that taste metaphors are consequential in predicting social functioning, and thus the findings are unique. Furthermore, the studies are the first we know of to reveal that individual differences in preferences for particular perceptual experiences (e.g., sweet tastes) predict metaphor-consistent cognitions and behaviors. Also, our studies were comprehensive in nature in that they confirmed predictions made with respect to personality inferences, individual difference tendencies, and the experiments. Finally, we suggest that the findings are consequential in understanding personality processes. Below, we revisit the basis for our predictions, make a case for the utility of a metaphor-enriched view of personality processes, and present future research directions.

Why Is Prosocial Functioning Conceptualized in Terms of Sweet Tastes?

Our daily lives are filled with social interactions, most often with people with whom we have some prior interaction history (e.g., family, friends, coworkers, familiar others). Hogan (1996) contended that the very concept of personality emerged from our need to anticipate and predict regularities in such interaction patterns. Of paramount importance is whether such others are hostile or friendly, as we should be wary of hostile others and

instead seek to affiliate with friendly others (Kiesler, 1983). It is not enough to characterize the particular actions of others, which might reflect transitory situational factors. Rather, the goal is to understand something more fundamental, yet difficult to conceptualize: namely, the likelihood that the person, in the future and over time, will treat us well or poorly. It is precisely under such circumstances—namely, recurrent concerns combined with difficulty in conception—that metaphors are most likely to be recruited and used (Lakoff & Johnson, 1999).

Metaphors are used to understand the abstract, inexpressible experiences that we have in terms of more concrete perceptual experiences. Taste experiences are ubiquitous, as we have to eat once if not multiple times per day, and such experiences can be palatable versus less palatable. Therefore, it is not surprising that the taste domain is recruited in interpersonal contexts. Of the five most consensual taste qualities—bitterness, saltiness, sourness, spiciness, and sweetness—sweetness is unique in that it is universally palatable. Rats will work hard for sweet tastes, even in the context of artificial sweeteners (Berridge, 2007). Sweet tastes activate the neural circuitry of approach motivation and reward (O’Doherty, Deichmann, Critchley, & Dolan, 2002; Rolls, 1999) even among preverbal human infants (Fox & Davidson, 1986). Human adults can learn to appreciate and receive pleasure from other tastes, particularly spiciness, but doing so violates innate preferences for sweetness (Rozin, 2007).

Sweetness, then, is an important perceptual quality. Nevertheless, it is difficult to determine exactly why a particular source domain (sweetness) grounds a particular abstract target domain (prosociality). For example, why do we think about and characterize relationships in terms of warmth rather than body odors, as people perceive both during close personal contact? Kövecses (2002) contended that a cognitive linguistic view of metaphor may provide some answers. In his language, they are “motivated” by correlations in experience and/or some underlying similarity, even if diffuse. With reference to the first principle, anger feels “hot,” and it is therefore not surprising that heat is used to conceptualize anger in more general terms (e.g., “he’s hot under the collar”). With reference to the second principle, both roses and cheeks can be red, and this common color leads to metaphoric associations (e.g., “rosy cheeks”).

It would be difficult if not impossible to determine the precise nature of a particular set of metaphors. Our studies cannot precisely pinpoint why sweetness is a pronounced metaphor for prosocial functioning, but Kövecses’ (2002) motivating factors might be relevant. First, human breast milk is decidedly sweet in taste and chemical composition (Brown, 2005; Upadhyay et al., 2004), and feeding episodes are marked by a close bond of the mother and child (Else-Quest, Hyde, & Clark, 2003; Rossoni et al., 2008). Thus, one of the earliest bases for later emotional attachments (Bowlby, 1980) is also marked by a sweet-tasting ingested food. Second, it can also be pointed out that sweet foods are rewarding and comforting (Rolls, 1999). It is therefore not surprising that sweet taste metaphors emphasize comforting interactions with others rather than more vigorous and uncertain forms of interpersonal pleasure. Finally, consider that meals are typically shared with close others, whether family members or friends. The particular pleasures of eating sweet foods (Rozin, 2007), then, are likely to be associated with close relationships through such co-variations in experience. Thus, it could be that sweetness is a

source domain for prosociality because of correlations in experience and preexisting similarities.

Toward a Metaphor-Enriched Conception of Personality

The trait approach to personality focuses on its descriptive features. For example, an agreeable person is one who exhibits agreeable behaviors. Critics have suggested that such a purely descriptive approach to personality may not be particularly explanatory (Pervin, 1994). At the very least, we should seriously consider alternative ways of conceptualizing individual differences, ways that may help us understand and explain why people act and feel as they do (McClelland, 1987). Metaphors constitute a rich, largely untapped source of potential insights and folk predictions concerning person perception, individual differences, and associative processes that may underlie them (Gibbs & Beitel, 1995). Conceptual metaphor has proven a source of significant new insights into social cognition (Landau et al., 2010). Such studies, among other research strategies, manipulate perceptual experiences (warmth, cleanliness, or physical closeness) and demonstrate that such perceptual experiences influence interpersonal affect and social judgments. Studies 4 and 5 of the present investigation used a similar experimental strategy, although in novel terms with respect to both the manipulation and outcomes.

Personality, though, is typically understood in terms of stable differences between individuals rather than the impact of situational factors (Kenrick & Funder, 1988). Thus, a metaphor-enriched perspective of individual differences must use correlational designs, at least to some extent, to contact the personality literature. Yet, most metaphors for personality are not likely to be directly associated with physical or perceptual manifestations. For example, in most cultures, people do not eat other people. Even if they did, agreeable versus disagreeable individuals are unlikely to taste particularly sweet. Such considerations necessitated the use of a creative research strategy, one in which personality metaphors should constrain preferences for metaphor-consistent experiences or perceptions. Indeed, this was shown in the present paper: People high in agreeableness liked sweet foods to a greater extent than did people low in agreeableness (Study 2) and, perhaps of more importance, such preferences for sweet food tastes predicted laboratory measures of prosocial functioning (Study 3). Perceptual preferences, then, may serve as a general model for linking person perception and individual differences to their metaphor-consistent manifestations.

Additional Questions and Future Research Directions

A characteristic feature of agreeable individuals is that they are less angry and aggressive (Wilkowski & Robinson, 2008). Given that agreeable individuals liked sweet foods to a greater extent (Study 2) and that liking for sweet food predicted prosocial functioning (Study 3), it would be informative in future research to examine whether sweet-toothed individuals are less angry and aggressive. Further, we suggest that preferences for sweet foods may predict less reactivity to traditional provocations of aggression (e.g., pain, Anderson & Bushman, 2002; social rejection, Twenge, 2005). In short, we advocate a wider scope of research on individual differences in sweet food preferences and prosocial

functioning. For example, those liking sweet foods to a greater extent may be less reactive to pain-inducing situations or interpersonal transgressions. Indeed, sweet taste experiences have been shown to mitigate the negative reaction to physical pain experiences (e.g., Skogsdal, Erricson, & Schollin, 1997). Sweet taste experiences could thus heighten the self-regulation of aggression.

Taste-related metaphors seem most pronounced in suggesting a relation between prosocial functioning and sweetness, the focus of the present studies. Yet, bitter is a synonym for hostility, and it might be that bitter taste preferences and experiences predict interpersonal hostility. Although low agreeable individuals in Study 2 did not significantly report a greater liking for bitter foods, it is possible that preferences for bitter tastes might predict other outcomes of a more antagonistic interpersonal type. Spicy is a term sometimes used to describe particularly vivacious and lively individuals. Indeed, Table 1 reveals that person perceivers seemed to ascribe higher levels of extraversion to target expressing a liking for spicy foods. Sour is sometimes used to describe particularly joyless individuals (e.g., “a sourpuss”), and metaphors of this type might be informative in future studies of a personality processing type. We are unsure whether salty preference would be informative in future studies. Nonetheless, the general point is that taste-related metaphors may be useful in understanding other personality processes than those examined.

Finally, one may wonder if the present results would be replicated in non-English-speaking cultures. Some and perhaps the vast majority of conceptual metaphors seem to be culturally universal (Kövecses, 2000, 2006). On the other hand, metaphors linking sweet taste experiences to prosocial functioning may exhibit cultural variation. Depierre (2009) contended that taste experiences are conceptualized differently among English and French speakers. Thus, it could be that some taste metaphors have different consequences for interpersonal functioning in other cultures. Accordingly, although we do suggest that our results are likely to be found in other cultures, there may be some cultures in which similar findings might not be observed. Cross-cultural research of the present type would be quite interesting and informative.

References

- Ambady, N., & Rosenthal, R. (1992). Thin slices of expressive behaviors of interpersonal consequences: A meta-analysis. *Psychological Bulletin, 111*, 256–274. doi:10.1037/0033-2909.111.2.256
- Anderson, C. A., & Bushman, B. J. (2002). Human aggression. *Annual Review of Psychology, 53*, 27–51. doi:10.1146/annurev.psych.53.100901.135231
- Anderson, C. A., & DeLisi, M. (in press). Implications of global climate change for violence in developed and developing countries. In J. Forgas, A. Kruglanski, & K. Williams (Eds.), *Social conflict and aggression*. New York, NY: Psychology Press.
- Bargh, J. A., Chen, M., & Burrows, L. (1996). Automaticity of social behavior: Direct effects of trait construct and stereotype priming on action. *Journal of Personality and Social Psychology, 71*, 230–244. doi:10.1037/0022-3514.71.2.230
- Barsalou, L. W. (1999). Perceptual symbol systems. *Behavioral and Brain Sciences, 22*, 577–660.
- Barsalou, L. W. (2008). Grounded cognition. *Annual Review of Psychology, 59*, 617–645. doi:10.1146/annurev.psych.59.103006.093639
- Batson, C. D. (2010). Empathy-induced altruistic motivation. In M. Mikulincer & P. R. Shaver (Eds.), *Prosocial motives, emotions, and be-*

- havior: The better angels of our nature* (pp. 15–34). Washington, DC: American Psychological Association.
- Berridge, K. C. (2003). Pleasures of the brain. *Brain and Cognition*, *52*, 106–128. doi:10.1016/S0278-2626(03)00014-9
- Berridge, K. C. (2007). The debate over dopamine's role in reward: The case for incentive salience. *Psychopharmacology*, *191*, 391–431. doi:10.1007/s00213-006-0578-x
- Bowlby, J. (1980). *Attachment and loss*. New York, NY: Basic Books.
- Brown, J. E. (2005). *Nutrition through the life cycle* (4th ed.). Belmont, CA: Thomson.
- Carlo, G., Okun, M. A., Knight, G. P., & de Guzman, M. R. T. (2005). The interplay of traits and motives on volunteering: Agreeableness, extraversion and prosocial value motivation. *Personality and Individual Differences*, *38*, 1293–1305. doi:10.1016/j.paid.2004.08.012
- Cattell, R. B. (1957). *Personality and motivation structure and measurement*. Oxford, England: World Book.
- Cervone, D. (1999). Bottom-up explanation in personality psychology: The case of cross-situational coherence. In D. Cervone & Y. Shoda (Eds.), *The coherence of personality: Social-cognitive bases of consistency, variability, and organization* (pp. 303–341). New York, NY: Guilford Press.
- Cervone, D. (2005). Personality architecture: Within-person structure and processes. *Annual Review of Psychology*, *56*, 423–452. doi:10.1146/annurev.psych.56.091103.070133
- Council, J. R. (1993). Context effects in personality research. *Current Directions in Psychological Science*, *2*, 31–34. doi:10.1111/1467-8721.ep10770636
- Crawford, L. E. (2009). Conceptual metaphors of affect. *Emotion Review*, *1*, 129–139. doi:10.1177/1754073908100438
- Depierre, A. (2009). English and French taste words used metaphorically. *Chemosensory Perception*, *2*, 40–52. doi:10.1007/s12078-009-9037-5
- Dovidio, J. F., Piliavin, J. A., Schroeder, D. A., & Penner, L. A. (2006). *The social psychology of prosocial behavior*. Mahwah, NJ: Erlbaum.
- Edwards, A. L. (1957). *The social desirability variable in personality assessment and research*. Fort Worth, TX: Dryden Press.
- Else-Quest, N. M., Hyde, J. S., & Clark, R. (2003). Breastfeeding, bonding, and the mother–infant relationship. *Merrill-Palmer Quarterly*, *49*, 495–517. doi:10.1353/mpq.2003.0020
- Eysenck, H. J. (1947). *Dimensions of personality*. Oxford, England: Kegan Paul.
- Fleeson, W. (2001). Toward a structure- and process-integrated view of personality: Traits as density distributions of states. *Journal of Personality and Social Psychology*, *80*, 1011–1027. doi:10.1037/0022-3514.80.6.1011
- Fleeson, W., & Nofle, E. E. (2009). In favor of the synthetic resolution to the person–situation debate. *Journal of Research in Personality*, *43*, 150–154. doi:10.1016/j.jrp.2009.02.008
- Fox, N. A., & Davidson, R. J. (1986). Taste-elicited changes in facial signs of emotion and the asymmetry of brain electrical activity in human newborns. *Neuropsychologia*, *24*, 417–422. doi:10.1016/0028-3932(86)90028-X
- Funder, D. C. (2009). Persons, behaviors and situations: An agenda for personality psychology in the postwar era. *Journal of Research in Personality*, *43*, 120–126. doi:10.1016/j.jrp.2008.12.041
- Gailliot, M. T., & Baumeister, R. F. (2007). The physiology of willpower: Linking blood glucose to self-control. *Personality and Social Psychology Review*, *11*, 303–327. doi:10.1177/1088868307303030
- Gailliot, M. T., Baumeister, R. F., DeWall, C. N., Maner, J. K., Plant, E. A., Tice, D. M., & Brewer, L. E. (2007). Self-control relies on glucose as a limited energy source: Willpower is more than a metaphor. *Journal of Personality and Social Psychology*, *92*, 325–336. doi:10.1037/0022-3514.92.2.325
- Georghiades, A. S., Belhumeur, P. N., & Kriegman, D. J. (2001). From few to many: Illumination cone models for face recognition under variable lighting and pose. *IEEE Transactions on Pattern Analysis and Machine Intelligence*, *23*, 643–660. doi:10.1109/34.927464
- Gibbs, R. W. (1994). *The poetics of mind: Figurative thought, language, and understanding*. Cambridge, England: Cambridge University Press.
- Gibbs, R. W. (2006). *The Cambridge handbook of metaphor and thought*. New York, NY: Cambridge University Press.
- Gibbs, R. W., & Beitel, D. (1995). What proverb understanding reveals about how people think. *Psychological Bulletin*, *118*, 133–154. doi:10.1037/0033-2909.118.1.133
- Goffman, E. (1959). *The presentation of self in everyday life*. Garden City, NY: Doubleday.
- Goldberg, L. R. (1990). An alternative “description of personality”: The Big Five factor structure. *Journal of Personality and Social Psychology*, *59*, 1216–1229. doi:10.1037/0022-3514.59.6.1216
- Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. C. (2006). The International Personality Item Pool and the future of public-domain personality measures. *Journal of Research in Personality*, *40*, 84–96.
- Graziano, W. G., & Eisenberg, N. (1997). Agreeableness: A dimension of personality. In R. Hogan, J. A. Johnson, & S. R. Briggs (Eds.), *Handbook of personality psychology* (pp. 795–824). San Diego, CA: Academic Press.
- Graziano, W. G., Jensen-Campbell, L. A., & Hair, E. C. (1996). Perceiving interpersonal conflict and reacting to it: The case for agreeableness. *Journal of Personality and Social Psychology*, *70*, 820–835. doi:10.1037/0022-3514.70.4.820
- Graziano, W. G., & Tobin, R. M. (2009). Agreeableness. In M. R. Leary & R. H. Hoyle (Eds.), *Handbook of individual differences in social behavior* (pp. 46–61). New York, NY: Guilford Press.
- Greitemeyer, T. (2009). Effects of songs with prosocial lyrics on prosocial thoughts, affect, and behavior. *Journal of Experimental Social Psychology*, *45*, 186–190. doi:10.1016/j.jesp.2008.08.003
- Haas, H. A. (2002). Extending the search for folk personality constructs: The dimensionality of the personality-relevant proverb domain. *Journal of Personality and Social Psychology*, *82*, 594–609. doi:10.1037/0022-3514.82.4.594
- Hogan, R. (1996). A socioanalytic perspective on the five-factor model. In J. S. Wiggins (Ed.), *The five-factor model of personality: Theoretical perspectives* (pp. 163–179). New York, NY: Guilford Press.
- John, O. P., & Srivastava, S. (1999). The Big Five trait taxonomy: History, measurement, and theoretical perspectives. In L. Pervin, A. Lawrence, & J. P. Oliver (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 102–138). New York, NY: Guilford Press.
- Kenrick, D. T., & Funder, D. C. (1988). Profiting from controversy: Lessons from the person–situation debate. *American Psychologist*, *43*, 23–34. doi:10.1037/0003-066X.43.1.23
- Keskitalo, K., Knaapila, A., Kallela, M., Palotie, A., Wessman, M., Sammalisto, S., . . . Perola, M. (2007). Sweet taste preferences are partly genetically determined: Identification of a trait locus on chromosome. *American Journal of Clinical Nutrition*, *86*, 55–63.
- Kiesler, D. J. (1983). The 1982 interpersonal circle: A taxonomy for complementarity in human transactions. *Psychological Review*, *90*, 185–214. doi:10.1037/0033-295X.90.3.185
- Kolpack, D. (2009, May 10). After Fargo's flood, 6 million sandbags remain. *USA Today*. Retrieved from http://www.usatoday.com/weather/news/2009-05-10-fargo-sandbags-flood_N.htm
- Kövecses, Z. (2000). The concept of anger: Universal or culture specific? *Psychopathology*, *33*, 159–170. doi:10.1159/000029139
- Kövecses, Z. (2002). *Metaphor: A practical introduction*. New York, NY: Oxford University Press.
- Kövecses, Z. (2006). *Metaphor in culture: Universality and variation*. Cambridge, England: Cambridge University Press.
- Lakoff, G. (2008). The neural theory of metaphor. In R. W. Gibbs Jr. (Ed.),

- The Cambridge handbook of metaphor and thought* (pp. 17–38). New York, NY: Cambridge University Press.
- Lakoff, G., & Johnson, M. (1980). *Metaphors we live by*. Chicago, IL: University of Chicago Press.
- Lakoff, G., & Johnson, M. (1999). *Philosophy in the flesh: The embodied mind and its challenges to Western thought*. New York, NY: Basic Books.
- Landau, M. J., Meier, B. P., & Keefer, L. A. (2010). A metaphor-enriched social cognition. *Psychological Bulletin*, *136*, 1045–1067. doi:10.1037/a0020970
- Lee, S. W. S., & Schwarz, N. (2010). Of dirty hands and dirty mouths: Embodiment of the moral purity metaphor is specific to the motor modality involved in moral transgression. *Psychological Science*, *21*, 1423–1425. doi:10.1177/0956797610382788
- Martin, R., Watson, D., & Wan, C. K. (2000). A three-factor model of trait anger: Dimensions of affect, behavior, and cognition. *Journal of Personality*, *68*, 869–897. doi:10.1111/1467-6494.00119
- McClelland, D. C. (1951). *Personality*. New York, NY: Sloane.
- McClelland, D. C. (1987). *Human motivation*. New York, NY: Cambridge University Press.
- McClelland, D. C., Koestner, R., & Weinberger, J. (1989). How do self-attributed and implicit motives differ? *Psychological Review*, *96*, 690–702. doi:10.1037/0033-295X.96.4.690
- McCrae, R. R., & Costa, P. T., Jr. (1994). The stability of personality: Observation and evaluations. *Current Directions in Psychological Science*, *3*, 173–175. doi:10.1111/1467-8721.ep10770693
- McCrae, R. R., & Costa, P. T., Jr. (1999). A five-factor theory of personality. In L. A. Pervin, O. P. John, L. A. Pervin, & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 139–153). New York, NY: Guilford Press.
- McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality*, *60*, 175–215. doi:10.1111/j.1467-6494.1992.tb00970.x
- McNiel, J. M., & Fleeson, W. (2006). The causal effects of extraversion on positive affect and neuroticism on negative affect: Manipulating state extraversion and state neuroticism in an experimental approach. *Journal of Research in Personality*, *40*, 529–550. doi:10.1016/j.jrp.2005.05.003
- Meier, B. P., & Robinson, M. D. (2004). Does quick to blame mean quick to anger? The role of agreeableness in dissociating blame and anger. *Personality and Social Psychology Bulletin*, *30*, 856–867. doi:10.1177/0146167204264764
- Meier, B. P., & Robinson, M. D. (2005). The metaphorical representation of affect. *Metaphor and Symbol*, *20*, 239–257. doi:10.1207/s15327868ms2004_1
- Meier, B. P., Robinson, M. D., Carter, M. S., & Hinsz, V. B. (2010). Are sociable people more beautiful? A zero-acquaintance analysis of agreeableness, extraversion, and attractiveness. *Journal of Research in Personality*, *44*, 293–296. doi:10.1016/j.jrp.2010.02.002
- Meier, B. P., Wilkowski, B. M., & Robinson, M. D. (2008). Bringing out the agreeableness in everyone: Using a cognitive self-regulation model to reduce aggression. *Journal of Experimental Social Psychology*, *44*, 1383–1387. doi:10.1016/j.jesp.2008.05.005
- Mikulincer, M., & Shaver, P. R. (Eds.). (2010). *Prosocial motives, emotions, and behavior: The better angels of our nature*. Washington, DC: American Psychological Association.
- Niedenthal, P. M., Barsalou, L. W., Winkielman, P., Krauth-Gruber, S., & Ric, F. (2005). Embodiment in attitudes, social perception, and emotion. *Personality and Social Psychology Review*, *9*, 184–211. doi:10.1207/s15327957pspr0903_1
- Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review*, *84*, 231–259. doi:10.1037/0033-295X.84.3.231
- Norenzayan, A., & Shariff, A. F. (2008, October 3). The origin and evolution of religious prosociality. *Science*, *322*, 58–62. doi:10.1126/science.1158757
- O'Doherty, J. P., Deichmann, R., Critchley, H. D., & Dolan, R. J. (2002). Neural response during anticipation of a primary taste reward. *Neuron*, *33*, 815–826. doi:10.1016/S0896-6273(02)00603-7
- Organ, D. W., & Ryan, K. (1995). A meta-analytical review of attitudinal and dispositional predictors of organizational citizenship behavior. *Personnel Psychology*, *48*, 775–802. doi:10.1111/j.1744-6570.1995.tb01781.x
- Ozer, D. J., & Benet-Martinez, V. (2006). Personality and the prediction of consequential outcomes. *Annual Review of Psychology*, *57*, 401–421. doi:10.1146/annurev.psych.57.102904.190127
- Pervin, L. A. (1994). A critical analysis of current trait theory. *Psychological Inquiry*, *5*, 103–113. doi:10.1207/s15327965pli0502_1
- Roberts, B. W., Kuncel, N. R., Shiner, R., Caspi, A., & Goldberg, L. R. (2007). The power of personality: The comparative validity of personality traits, socioeconomic status, and cognitive ability for predicting important life outcomes. *Perspectives on Psychological Science*, *2*, 313–345. doi:10.1111/j.1745-6916.2007.00047.x
- Robinson, M. D. (2004). Personality as performance: Categorization tendencies and their correlates. *Current Directions in Psychological Science*, *13*, 127–129. doi:10.1111/j.0963-7214.2004.00290.x
- Robinson, M. D., & Clore, G. L. (2002). Episodic and semantic knowledge in emotional self-report: Evidence for two judgment processes. *Journal of Personality and Social Psychology*, *83*, 198–215. doi:10.1037/0022-3514.83.1.198
- Robinson, M. D., & Gordon, K. H. (2011). Personality dynamics: Insights from the personality social cognitive literature. *Journal of Personality Assessment*, *93*, 161–176. doi:10.1080/00223891.2010.542534
- Robinson, M. D., & Neighbors, C. (2006). Catching the mind in action: Implicit methods in personality research and assessment. In M. Eid & E. Diener (Eds.), *Handbook of multimethod measurement in psychology* (pp. 115–125). Washington, DC: American Psychological Association.
- Robinson, M. D., & Wilkowski, B. M. (2006). Loving, hating, vacillating: Agreeableness, implicit-self esteem, and neurotic conflict. *Journal of Personality*, *74*, 935–978. doi:10.1111/j.1467-6494.2006.00399.x
- Rolls, E. T. (1999). The functions of the orbitofrontal cortex. *Neurocase*, *5*, 301–312. doi:10.1080/13554799908411984
- Rossoni, E., Feng, J., Tirozzi, B., Brown, D., Leng, G., & Moos, F. (2008). Emergent synchronous bursting of oxytocin neuronal network. *PLoS Computational Biology*, *4*, e1000123. doi:10.1371/journal.pcbi.1000123
- Rozin, P. (2007). Food and eating. In S. Kitayama & D. Cohen (Eds.), *Handbook of cultural psychology* (pp. 391–416). New York, NY: Guilford Press.
- Schnitzer, M. L., & Pedreira, M. A. (2005). A neuropsychological theory of metaphor. *Language Sciences*, *27*, 31–49. doi:10.1016/j.langsci.2004.10.001
- Schubert, T. W. (2005). Your highness: Vertical positions as perceptual symbols of power. *Journal of Personality and Social Psychology*, *89*, 1–21. doi:10.1037/0022-3514.89.1.1
- Schwarz, N. (1999). Self-report: How the questions shape the answers. *American Psychologist*, *54*, 93–105. doi:10.1037/0003-066X.54.2.93
- Sherman, S. J. (1980). On the self-erasing nature of errors of prediction. *Journal of Personality and Social Psychology*, *39*, 211–221. doi:10.1037/0022-3514.39.2.211
- Skogsdal, Y., Ericsson, M., & Schollin, J. (1997). Analgesia in newborns given oral glucose. *Acta Paediatrica*, *86*, 217–220. doi:10.1111/j.1651-2227.1997.tb08872.x
- Spellman, B. A., & Schnall, S. (2009). Embodied rationality. *Queen's Law Review*, *35*, 117–164.
- Strack, F., Martin, L. L., & Stepper, S. (1988). Inhibiting and facilitating conditions of the human smile: A nonobtrusive test of the facial feedback hypothesis. *Journal of Personality and Social Psychology*, *54*, 768–777. doi:10.1037/0022-3514.54.5.768

- Twenge, J. M. (2005). When does social rejection lead to aggression? The influences of situations, narcissism, emotion, and replenishing connections. In K. D. Williams, J. P. Forgas, W. von Hippel, K. D. Williams, J. P. Forgas, & W. von Hippel (Eds.), *The social outcast: Ostracism, social exclusion, rejection, and bullying* (pp. 201–212). New York, NY: Psychology Press.
- Twenge, J. M., Baumeister, R. F., DeWall, C. N., Ciarocco, N. J., & Bartels, J. M. (2007). Social exclusion decreases prosocial behavior. *Journal of Personality and Social Psychology, 92*, 56–66. doi:10.1037/0022-3514.92.1.56
- Upadhyay, A., Aggarwal, R., Narayan, S., Joshi, M., Paul, V. K., & Deorari, A. K. (2004). Analgesic effect of expressed breast milk in procedural pain in term neonates: A randomized, placebo-controlled, double-blind trial. *Acta Paediatrica, 93*, 518–522. doi:10.1080/08035250410022792
- Watson, D., Clark, L. A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. *Journal of Personality and Social Psychology, 54*, 1063–1070. doi:10.1037/0022-3514.54.6.1063
- Widiger, T. A., Verheul, R., & van den Brink, W. (1999). Personality and psychopathology. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (2nd ed., pp. 347–366). New York, NY: Guilford Press.
- Wiggins, J. S. (1979). A psychological taxonomy of trait-descriptive terms: The interpersonal domain. *Journal of Personality and Social Psychology, 37*, 395–412. doi:10.1037/0022-3514.37.3.395
- Wiggins, J. S., & Broughton, R. (1991). A geometric taxonomy of personality scales. *European Journal of Personality, 5*, 343–365. doi:10.1002/per.2410050503
- Wilkowski, B. M., Meier, B. P., Robinson, M. D., Carter, M. S., & Feltman, R. (2009). “Hotheaded” is more than an expression: The embodied representation of anger in terms of heat. *Emotion, 9*, 464–477. doi:10.1037/a0015764
- Wilkowski, B. M., & Robinson, M. D. (2008). The cognitive basis of trait anger and reactive aggression: An integrative analysis. *Personality and Social Psychology Review, 12*, 3–21. doi:10.1177/1088868307309874
- Wilkowski, B. M., Robinson, M. D., & Meier, B. P. (2006). Agreeableness and the prolonged spatial processing of antisocial and prosocial information. *Journal of Research in Personality, 40*, 1152–1168. doi:10.1016/j.jrp.2005.12.004
- Williams, L. E., & Bargh, J. A. (2008). Keeping one’s distance: The influence of spatial distance cues on affect and evaluation. *Psychological Science, 19*, 302–308. doi:10.1111/j.1467-9280.2008.02084.x
- Williams, L. E., Huang, J. Y., & Bargh, J. A. (2009). The scaffolded mind: Higher mental processes are grounded in early experiences of the physical world. *European Journal of Social Psychology, 39*, 1257–1267. doi:10.1002/ejsp.665

Received September 20, 2010

Revision received June 24, 2011

Accepted July 24, 2011 ■