Dispositional Properties of Metaphor:

The Predictive Power of the Sweet Taste Metaphor for Trait and Daily Prosociality

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Abstract

Metaphors often characterize prosocial actions and people as sweet. Three studies sought to explore whether conceptual metaphors of this type can provide insights into the prosocial trait of agreeableness and to daily life prosociality. Study 1 (n = 698) examined relationships between agreeableness and food taste preferences. Studies 2 (n = 66) and 3 (n = 132) utilized daily diary protocols. In Study 1, more agreeable people liked sweet foods to a greater extent. In Study 2, greater sweet food preferences predicted a stronger positive relationship between daily prosocial behaviors and positive affect, a pattern consistent with prosocial motivation. Finally, Study 3 found that daily prosocial feelings and behaviors varied positively with sweet food consumption in a manner that could not be ascribed to positive affect or self-control. Altogether, the findings encourage further efforts to extend conceptual metaphor theory to the domain of personality processes, in part by building on balance-related ideas.

Keywords: Agreeableness, Metaphor, Sweet, Prosocial, Daily

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Sweet taste metaphors are prevalent when thinking about prosocial (genuinely caring and helpful) people and their actions (Schlosser, 2015). A caring gesture is a "sweet" gesture. Love, which motivates prosocial feelings and actions, has a metaphorically sweet taste to it (Chan, Tong, Tan, & Koh, 2013). Terms of endearment (e.g., "honey", "sugar", "cupcake") often follow suit (Kövecses, 1988). Outside of love relationships, "sweet" is a prominent term used to describe people who are particularly agreeable (Asch, 1958). Indeed, the word sweet is a synonym for people who are gentle, kind, and friendly (Gilead, Gal, Polak, & Cholow, 2015), which are qualities often ascribed to agreeable people (Graziano & Eisenberg, 1997).

Experimental work has supported associations of this type. People prefer sweet food when induced to feel gratitude (Schlosser, 2015) and they rate food as sweeter when induced to feel love (Chan et al., 2013). People also find candy to be sweeter when it is given to them for benevolent reasons (Gray, 2012) and they rate hypothetical relationships more favorably after the ingestion of sweet food (Ren, Tan, Arriaga, & Chan, 2015). With particular relevance to agreeableness, people infer that others are more agreeable when others like sweet food (Study 1 of Meier, Moeller, Riemer-Peltz, & Robinson, 2012a) and eating sweet food may shift the self-concept in an agreeable direction (Study 4 of Meier et al., 2012a). There are certainly limitations to these findings (Gilead et al., 2015; Ren et al., 2015), but they do support the idea that people often associate prosocial thoughts and feelings with the perceptual quality of sweetness.

These sweet-prosocial associations should, potentially, have implications for personality factors and processes. For example, people scoring higher in agreeableness may like sweet foods

to a greater extent than people scoring lower in agreeableness (Meier et al., 2012a). To explain why links of this type are reasonable, we draw from both conceptual metaphor theory (Lakoff & Johnson, 1999) and recent extensions of balance theory (e.g., Greenwald et al., 2002). According to conceptual metaphor theory (CMT), people think metaphorically because it allows them to represent that which is abstract or intangible in terms of experiences that are more concrete and even perceptual in nature (Lakoff & Johnson, 1999; Landau, Meier, & Keefer, 2010). Consistent with these ideas, there are sources of data to suggest that we represent morality in terms of cleanliness (Zhong & Liljenquist, 2006), negative affect in terms of darkness (Crawford, 2009), and agreeableness in terms of sweetness (Meier et al., 2012a).

A further premise of CMT is that metaphors are conceptual rather than merely linguistic (Lakoff & Johnson, 1999). What this means is that prominent metaphors can be thought of in terms of associations in memory, or links between the metaphoric target, such as prosociality, and its metaphoric source, such as sweetness (Landau, Robinson, & Meier, 2014). Once established, these associations would be expected to prime each other, bidirectionally, with one element of the metaphoric pair activating the other one (Landau et al., 2014). In this way, metaphoric associations would act like other social cognitive associations, except that their effects would encompass perception-related primes and targets (Lee & Schwarz, 2012). By principles of this type, sweet taste experiences could prime prosocial thoughts (Meier et al., 2012a) and prosocial thoughts could prime perceptions of sweetness (Chan et al., 2013).

Thinking of conceptual metaphors in terms of mental associations allows them to contact personality processes. Specifically, if we think of the person as a self, and add the self to an associative memory network (Greenwald et al., 2002), then we can begin to explain how individual differences could emerge from the context of culturally shared metaphors. People

generally seek consistency among their social cognitions (Crandall, Silvia, N'Gbala, Tsang, & Dawson, 2007; Gawronski, 2012) and a modern take on Heider's (1958) balance theory has been particularly generative here (Cvencek, Greenald, & Meltzoff, 2012; Greenwald et al., 2002). Consider the generic mental elements of A, B, and C (Cvencek et al., 2012). If A and B are positively linked, whether by attitude or association, and B and C are positively linked, then the mind will seek a positive C to A link. By contrast, if elements A and B are positively linked but elements B and C are negatively linked, then the mind will seek a negative C-to-A association (Simon & Holyoak, 2002). Greenwald et al. (2002) show how such balance-related considerations allow us to better understand links between the implicit self-concept, stereotypes, and attitudes (also see Gawronski, Bodenhausen, & Becker, 2007). For example, if math is for males and the self is a female, then the self should gravitate away from math as a course of study and interest (Cvencek, Kapur, & Meltzoff, 2015; Nosek, Banaji, & Greenwald, 2002).

Conceptual metaphors could reasonably enter into cognitive triads of this type. A conceptual metaphor can be understood as a deep (implicit, but consequential) positive association between target (A) and source (B) concepts (Landau et al., 2014). If the self (C) shares a positive link with either of these concepts (e.g., there is a positive C-A association), consistency-seeking processes will favor a positive association with the remaining element as well (e.g., there should be a positive C-B association). By contrast, a negative C-A (or C-B) association should pressure the mind toward a negative C-B (or C-A) association as a way of preserving balance (Cvencek et al., 2012; Gawronski, 2012; Greenwald et al., 2002).

Following this logic, we display the conceptual metaphor linking prosociality and sweetness in the top and bottom portions of Figure 1. We have depicted this association as a positive one for everyone because it is a shared conceptual metaphor (Kövecses, 1988;

Schlosser, 2015). For a habitually prosocial person (top panel), balance dynamics should favor a positive attitude toward sweet foods. Similarly, considerable liking for sweet foods could influence the self-concept over time such that its prosocial attributes become more prominent (Cvencek et al., 2012). In either case, greater prosociality should covary with more positive attitudes toward sweet food. This can be contrasted with the dynamics depicted in the bottom portion of Figure 1. If prosociality is sweet and the self is not particularly prosocial, then balance dynamics should disfavor a strong liking for sweet food (Cvencek et al., 2015). Equally so, people not drawn to sweet food should not be drawn to its associated link with prosociality. In either case, one would expect less prosocial people to like sweet food to a lesser extent. In short, balance seeking could, over time (Simon & Holyoak, 2002), favor a positive correlation between prosocial personality tendencies and sweet food liking.

For these balance-related (Greenwald et al., 2002) predictions to work, people will need to vary in both their prosocial personality tendencies and their sweet food liking. In the first case, it is clear that some people are more prosocial than others and it is also clear that such differences are well-captured by the personality trait of agreeableness (Graziano & Eisenberg, 1997). Agreeableness, for example, is a good predictor of prosocial motivations (Graziano, Habashi, Sheese, & Tobin, 2007) and feelings (Penner, Fritzsche, Craiger, & Freifeld, 1995). In addition, there are also fairly pronounced individual differences in sweet taste preferences (Conner, Haddon, Pickering, & Booth, 1988; Rudenga & Small, 2013). Although there are likely a number of factors contributing to such preferences (Drewnowski, 1997), their core attitudinal component (Rudenga & Small, 2013) renders them likely participants in balance-related dynamics (Gawronski et al., 2007; Greenwald et al., 2002; Pelham, Carvallo, & Jones, 2005).

Thus, the sweet taste metaphor may provide potential insights into prosocial personality functioning. Meier et al. (2012a) examined this possibility in a single study in which they found a positive relationship between the prosocial trait of agreeableness (Graziano & Eisenberg, 1997) and the extent to which people liked sweet foods. That is, more agreeable people liked sweet foods to a greater extent. Whether this relationship can be systematically replicated is an important question both for CMT and for the personality literature, particularly in the context of some negative findings (Ashton, Pilkinton, & Lee, 2014a). Accordingly, one purpose of the present investigation was to determine how replicable and robust this relationship is. In investigating this question, we conducted six sub-studies with college student samples (Study 1). Balance-related considerations in concert with CMT led us to predict that agreeable people should like sweet-tasting foods to a greater extent than less agreeable people.

Whereas Study 1 assessed prosocial tendencies in trait-related terms, Studies 2 and 3 assess prosocial tendencies in state-related terms. Specifically, we sought to extend CMT in general and the sweet taste metaphor in particular to the sorts of personality process questions that can be answered by daily life protocols (Conner, Tennen, Fleeson, & Barrett, 2009). This concomitant shift also meant that we could focus on daily prosocial behaviors and feelings rather than on the somewhat more general, though related (Caprara, Alessandri, Di Giunta, Panerai, & Eisenberg, 2010; Graziano et al., 2007), tendencies captured by the trait of agreeableness.

We have suggested that people who like sweet food may be motivationally “sweet” (i.e., prosocial) as well. Such tendencies could take one of two forms in a daily diary protocol. Greater liking for sweet food could translate into more frequent daily prosocial behavior. Alternatively, such preferences might have a more subtle signature, albeit one consistent with the prosocial personality (Penner, Dovidio, Piliavin, & Schroeder, 2005). To the extent that sweet people like

helping others, they may derive more enjoyment from their prosocial behaviors (Brunstein, Schultheiss, & Grässman, 1998). In daily process terms, that is, the slope relating daily prosocial behavior to daily positive affect could increase as a function of sweet food preferences (Conner et al., 2009). Study 2 focuses on these alternative predictions.

Study 3 uses a different daily diary design to examine a further state-related implication of the present analysis. By the metaphor transfer principle (Landau et al., 2010) and the horizontal links of Figure 1, people may exhibit greater prosociality on days on which sweet food consumption is higher. Study 3 focuses on this prediction while also examining potential mediating processes related to positive affect and self-control.

Although we think there are strengths to the present analysis, there are weaknesses as well. This will become more apparent throughout the course of the studies and additional limitations will be touched upon in the General Discussion. Nonetheless, we reiterate that our goal was to extend conceptual metaphor theory to a possible understanding of personality processes. The three current studies seemed like reasonable ways to proceed along these lines.

Study 1

As intriguing as a metaphoric analysis of agreeableness might be, Meier et al. (2012a) reported only one study in which higher levels of agreeableness were shown to predict greater preferences for sweet foods. We therefore deemed it useful to engage in a systematic replication attempt in the context of a much larger total sample size (Nosek, Spies, & Motyl, 2012). We expected convergence across six independent samples in the form of positive correlations between agreeableness levels and sweet food liking along with discriminant validity in the form of inconsistent relations between agreeableness and preferences for other (salty, sour, spicy, & bitter) taste types.

Method

Samples and Procedures

All Study 1 samples consisted of undergraduate students from North Dakota State University (NDSU) seeking psychology course credit. In all cases, participants registered for an NDSU IRB-approved study online and then reported to the laboratory in groups of 6 or less. They received general instructions (i.e., that there would be various questionnaires and tasks) before completing the study materials on personal computers in private cubicles (via MediaLab programming and software). There were 6 samples, which we label A-F, involving 111 (51 female; 85% Caucasian; *M* age = 19.91), 124 (51 female; 88% Caucasian; *M* age = 19.69), 118 (55 female; 87% Caucasian; *M* age = 19.64), 98 (51 female; 89% Caucasian; *M* age = 19.40), 117 (59 female; 88% Caucasian; *M* age = 19.35), and 130 (53 female; 89% Caucasian; *M* age = 19.83) participants.[1] Samples for all studies were collected in an "as many as we can get" fashion. As such, any power considerations would be post-hoc.

Agreeableness Assessment

Individual differences in agreeableness were assessed using Goldberg's (1999) 10-item IPIP scale. The scale is reliable and valid (Goldberg et al., 2006), correlates positively with other agreeableness measures (John & Srivastava, 1999), and emphasizes relations between this Big 5 trait and the warmth dimension of the interpersonal circumplex (Wiggins & Trapnell, 1996). In specific terms, participants were asked to indicate the extent (1 = very inaccurate; 5 = very accurate) to which statements indicative of high (e.g., "am interested in other people") versus low (e.g., "insult people") levels of agreeableness generally describe the self, with the latter items reverse-scored. Means (4.04, 4.12, 4.02, 4.18, 4.14, & 4.20 for samples A-F, respectively),

standard deviations (0.56, 0.62, 0.72, 0.52, 0.54, & 0.62), and alpha reliabilities (.86, .85, .88, .81, .82, & .88) were fairly similar across samples.

Taste Preferences

We sought to assess liking for each of the 5 basic taste types in a straightforward, face-valid manner. Accordingly, participants were asked "How much do you like ___ food?" five times, once each for the adjectives "sweet", "sour", "spicy", "bitter", and "salty". All ratings were made using the same 1 ("dislike strongly") to 6 ("like strongly") rating scale. Liking was generally high for sweet (*M*s = 4.82, 4.72, 4.87, 4.75, 4.95, & 4.94 for samples A-F, respectively), salty (*M*s = 4.28, 4.27, 4.30, 3.80, 3.92, & 4.25), and spicy (*M*s = 4.14, 3.94, 4.26, 4.15, 4.08, & 4.12) foods, generally moderate for sour (*M*s = 3.32, 3.37, 3.52, 3.24, 2.96, & 3.26) foods, and generally low for bitter (*M*s = 2.31, 2.56, 2.53, 2.19, 1.98, & 2.21) foods. Standard deviations tended to be higher for foods with a spicy (average *SD* = 1.50) or sweet (average *SD* = 1.51) taste relative to foods with salty (average *SD* = 1.23), sour (average *SD* = 1.35), or bitter (average *SD* = 1.09) tastes.

Results

Sweetness seems a metaphorically and actually distinct taste. Consistent with this idea, the extent to which a person liked sweet food tended not to predict the extent to which the person also liked bitter (average *r* across samples = -.11), spicy (average *r* = .03), salty (average *r* = .21), or sour (average *r* = .13) foods. The average correlations among other taste types ranged from .06 (spicy & sour foods) to .31 (bitter & sour foods).

People higher in agreeableness were hypothesized to like sweet foods to a greater extent. Table 1 reports the relevant correlations. In all samples, there was a positive relationship between agreeableness and sweet food liking and in 5 of the samples the relationship was significant.

When we combined all the samples into one large data set, the correlation was significant and of moderate effect size, $r(696) = .25$, $p < .001$ (95% CI: .18 to .32). There was also specificity to the relationship in that agreeableness did not tend to predict liking for the other 4 taste types, as shown in Table 1. As a point of curiosity, it is somewhat intriguing that two of the samples found a significant negative correlation between agreeableness and liking for bitter foods, as "bitter" is metaphorically hostile, but this relationship was not particularly consistent. More consistent relations involving bitterness might have emerged had we assessed traits such as hostility, psychopathy, or sadism (Sagioglou & Greitemeyer, 2016).

Discussion

Consistent with a balanced version of conceptual metaphor theory (see Figure 1), we found a systematic relationship between trait agreeableness and the extent to which people reported liking sweet foods. Specifically, more agreeable people liked sweet food to a greater extent. This result replicates Meier et al. (2012a) and it replicates the unpublished data of Lucas and Donnellan (2014) as well as the recently published results of Sagioglou and Greitemeyer (2016). Lucas and Donnellan (2014) found a correlation of .22, which accords with the present combined sample figure of .25, and Sagioglou and Greitemeyer (2016) found a correlation of .16 using the shorter agreeableness scale of the TIPI (Gosling, Rentfrow, & Swann, 2003).

The present results, though, should be considered in the context of the results of Ashton et al. (2014a). Ashton et al. (2014a) found a positive relationship between sweet taste preferences and self-reports of agreeableness using the IPIP scale (Goldberg, 1999; Gow, Whiteman, Pattie, & Deary, 2005) that we also used. However, smaller (largely non-existent) correlations were observed with respect to the prosocial traits of the HEXACO inventory (Ashton, Lee, & de Vries, 2014b). In future research, therefore, it may be useful to gain a more fine-grained

understanding of the metaphoric processes depicted in Figure 1, likely by dropping down to a facet-related level of analysis (Miller, Gaughan, Maples, & Price, 2011). It seems likely that some facets of agreeableness, but not all facets, are responsible for the agreeableness-sweetness correlation of Study 1.

Along related lines, consider that the prosocial personality has at least two components to it – a motivational component, which should be reflected in thoughts and feelings, and a behavioral component (Penner et al., 1995). It is arguable that the IPIP version of agreeableness emphasizes the motivational component of prosociality ("am interested in people", "have a soft heart") more than its behavioral component (Habashi, Graziano, & Hoover, 2016). Further, what it means to be a "sweet" person, too, may emphasize motivations to a greater extent than behaviors (Schlosser, 2015). If so, sweet taste preferences may be a better predictor of agreeable thoughts and feelings than prosocial behaviors. Although this analysis is necessarily tentative, it will gain further traction in the results of Study 2.

Study 2

Study 1 examined the question of whether prosocial people are drawn to sweet tastes. Study 2 examines the related, but different (Robinson & Wilkowski, 2015), question of whether people who like sweet tastes are prosocial. To examine this question, we sought to determine whether one could make any predictions about daily feelings or behavior on the basis of individual differences in sweet food liking, assessed in a somewhat more comprehensive manner than in Study 1. We entertained two hypotheses. People who like sweet food may engage in prosocial behavior more frequently in daily life. This would manifest itself as a main effect for sweet food preferences, with daily prosocial behavior as the outcome. Alternatively, and more in keeping with a motivational perspective, "sweet" people may enjoy being prosocial. That is, the

positive emotional benefits of prosocial behavior (Baumann, Cialdini, & Kenrick, 1981; Williamson & Clark, 1989) may be amplified among people who like sweet food to a greater extent. Either result could tell us more about the social implications of liking sweet food.

Method

Participants and General Procedures

The sample initially consisted of 93 NDSU undergraduates seeking course credit who signed up for a "daily diary study". They reported to a laboratory in groups of 6 or less and completed a variety of tasks and measures, the vast majority of which pertained to other research projects (e.g., concerning cognitive control). Included among these was the sweet taste preference questionnaire described below. The laboratory sessions took place during a week and the daily protocol began the following Monday.

The protocol was to last 14 days and participants were encouraged to be compliant with it. Even so, we knew (based on past experience) that some participants would be minimally compliant and we sought to be proactive. Accordingly, we decided at the outset that a maximum of 5 missing reports would be tolerated. That is, an up-front quality control criterion was set in place. As soon as a person was delinquent with a 6^{th} report, at any time during the 2 week period, he or she was cordially told to cease participating and his/her minimal efforts were deleted. These procedures resulted in a high-quality data set of 66 participants (25 female; race & age not collected) who completed at least 9 of the 14 daily reports.

Individual Differences in Sweet Taste Preferences

The method for assessing sweet taste preferences in Study 1 was time-efficient, but we sought a more extensive assessment in Study 2. Accordingly, and following Study 2 of Meier et al. (2012a), participants were presented with a number of food items and asked how much they

liked each of them. Ten of the items were prototypically sweet ("candy", "caramel", "chocolate cake", "honey", "ice cream", "maple syrup", "pears", "raisins", "strawberries", & "sugar") and therefore of primary interest. Participants indicated their liking for these sweet food items, and 40 items targeting other taste types (e.g., "sauerkraut", "soy sauce", etc.), along a 1 ("dislike strongly") to 6 ("like strongly") scale. Individual differences in sweet food preferences were quantified by averaging across the 10 sweet food items (*M* = 5.05; *SD* = 0.60; alpha = .71).[2]

Daily Diary Protocol

For each of 14 days in a row, participants were to log onto a secure website, enter their participant number, and complete a survey. To capture the day in question while precluding undue retrospection, reports had to be completed between 5 p.m. and 8 a.m. the next morning. The average number of completed reports was 10.78.

Daily Prosocial Behavior. Variability across days is a natural feature of our lives and one that we sought to capitalize on. Participants indicated the extent to which (1 = "not at all true today"; 4 = "very much true today") they had engaged in 3 prosocial behaviors ("Today, I comforted someone", "Today, I forgave someone", & "Today, I helped someone") that should be reasonably common while also varying across days (Moskowitz, 1994). A predictor score was computed by averaging across items (*M* = 2.12; *SD* = 0.57; alpha = .65; descriptive statistics are based on days as the units of analysis).

Daily Positive Affect. Positive affect levels can be used to track the extent to which people enjoy engaging in an activity (Watson, 2000), a primary interest in Study 2. Accordingly, we asked people to report on their levels (1 = "not at all"; 5 = "extremely") of positive affect on each day using 2 common markers ("Today, I was *enthusiastic*", "Today, I was *excited*"). These items were averaged (*M* = 3.09; *SD* = 1.03; alpha = .81).

Results

Given the nested structure of the data (days within persons), we used multilevel modeling (MLM) procedures (Fleeson, 2007), which were instantiated using the PROC MIXED platform of SAS (Singer, 1998). A first analysis excluded daily predictors and considered whether sweet food preferences, as a level 2 variable (Singer, 1998), predicted average levels of daily prosocial behavior. This relationship was not significant, b = -.01, t(712) = -0.09, p = .926. Possible reasons for this null result are discussed below.

As a more nuanced idea, we considered whether "sweet" people would enjoy engaging in prosocial behavior to a greater extent, findings that would essentially implicate motivational processes (Brunstein et al., 1998; Penner et al., 1995). To examine this idea, we conducted a second analysis that focused on daily levels of positive affect as a function of prosocial behavior frequency (a level 1 predictor) and sweet food preferences (a level 2 predictor). Following recommendations, the level 1 predictor was person-centered (Enders & Tofighi, 2007) and the level 2 predictor was z-scored (Aiken & West, 1991). This analysis resulted in a main effect for prosocial behavior, b = .32, t(710) = 4.76, p < .001 (95% CI: .187 to .458), no main effect for sweet taste preferences, b = -.04, t(710) = -0.46, p = .645, and a significant interaction between the two predictors, b = .18, t(710) = 2.68, p = .008 (95% CI: .047 to .322). Importantly, that is, the slope linking daily prosocial behavior to daily positive affect varied as a function of individual differences along the sweet food preference continuum.

To gain further insight into the cross-level interaction, we calculated estimated means for daily positive affect at low (-1 *SD*) versus high (+1 *SD*) levels of each of the predictor variable continuums (Aiken & West, 1991). As shown in Figure 2, positive affect rose and fell as a function of prosocial behavior to a greater extent for the person that was prototypically high in

sweet food preferences (+1 *SD*) relative to the person that was prototypically low in sweet food preferences (-1 *SD*). Pursuant of this point, follow-up simple slope analyses (Preacher, Curran, & Bauer, 2006) showed that the slope linking prosocial behavior to positive affect was significant at the high level of sweet food preferences, $b = .51$, $t(710) = 5.37$, $p < .001$, but not at the low level, $b = .14$, $t(710) = 1.40$, $p = .168$. In other words, people who really like sweet foods can be considered prosocial in the following way: They are more excited when they do nice things for others and comparatively unhappy when they do not.[3]

Discussion

The goal of Study 2 was to show that sweet taste preferences matter – that is, that they predict something about daily affect or behavior. The initial study on this question was somewhat limited and the findings were mixed, but we think that the results were interesting nonetheless. People who liked sweet food did not engage in prosocial behavior more frequently in their daily lives. There could be a variety of reasons for this null result, including social network factors that have little to do with sweet food preferences. Alternatively, Study 2 may have lacked the power to obtain a level 2 main effect given that the sample size was 66 and the prosocial behavior scale was also less reliable than we would have liked. Accordingly, while we recognize that sweet food preferences did not predict prosocial behavior frequency in Study 2, we are reluctant to abandon the idea that sweet and non-sweet people should act differently under some circumstances (e.g., see Study 3 of Meier et al., 2012a).

Regardless, we do think that Study 2 points to some useful subtleties in thinking about sweet-preferring people. They may not always act in a prosocial manner, but their inner thoughts and feelings may reflect a prosocial orientation. The results of Study 1 are consistent with this idea as are the cross-level results of Study 2: People who liked sweet food were happier on days

on which they engaged in prosocial behavior and the same hedonic benefits were not evident at low levels of the sweet preference continuum. A similar profile seems to characterize the trait of agreeableness (Habashi et al., 2016; Penner et al., 1995). For example, Penner et al. (1995) found that agreeableness related more strongly to caring for others than it did to overt prosocial behavior. Perhaps people who like sweet food can be simlarly described. If so, future research might focus more attention on feeling-based measures such as empathy and caring. If we are correct, these sorts of variables should vary positively with sweet food preferences.

Study 3

Thus far, our analysis has focused on sweet food preferences. Yet, people also have sweet food experiences. That is, they sometimes eat sweet foods and sometimes do not. What happens to people when they eat sweet foods? According to the social cognitive extension of CMT (Landau et al., 2010), they may become nicer and more caring under such circumstances. The same prediction can be made in another way, specifically on the basis of the balance considerations of Figure 1. Eating sweet food will temporarily strengthen the link between sweet food and the self (Gawronski et al., 2007), which should in turn shift the working self-concept in a prosocial direction (Wheeler, DeMarree, & Petty, 2007). These effects may not be large, but they should perhaps be systematic. The purpose of Study 3, then, was to examine whether people are nicer and more caring on days on which they eat sweet foods. In addressing this question, we sought to improve the prosocial behavior scale of Study 2 while adding new measures tapping prosocial feelings and personality self-ascription.

In addition, Study 3 will seek to augment a metaphor-related interpretation of the results by considering two alternatives. Eating sweet foods can sometimes boost positive affect, which in turn has been linked to prosocial feelings and behavior in some analyses. Both of these links

are complex, however (Forgas, 1999). Rather than making strong directional predictions here, we simply hypothesized that sweet/prosocial relations would remain significant when controlling for daily levels of positive affect. Turning to a different potential mediator, there are times when acting prosocially seems to require self-control resources (Gailliot, 2010). We doubt whether this is typically the case, though (Penner et al., 2005), and sweet taste metaphors (e.g., "a sweet person") seem to emphasize natural, unforced forms of prosociality (Meier et al., 2012a; Schlosser, 2015). For this reason, self-control mechanisms may not account for the hypothesized relationships. We added daily measures of positive affect and self-control (as assessed by self-report) to explore these secondary questions.

Method

Participants and Procedures

Participants (initially 145) signed up for a 2 week "daily diary study" for course credit or monetary compensation. They were instructed to log onto a secure website for 14 days to complete a daily survey between 5 p.m. and 3 a.m. the next morning, a window designed to accommodate various sleep/wake schedules. As in Study 2, a maximum of 5 missing reports was deemed tolerable. If a participant missed a 6th report, at any time during the 2-week interval, he or she was sent an email and politely asked to withdraw from the study. A substantial sample of 132 (66 female; 89% Caucasian; *M* age = 19.00) participants completed at least 9 of the 14 daily reports and their average number of completed reports was 12.32.

Daily Diary Measures

Conceptual metaphor theory led us to predict higher levels of prosocial functioning on days on which more, relative to less, sweet food was consumed. To examine processes of this type, participants were asked "How much sweet food did you eat today?", which they answered

along a 4-point (1 = “none”; 4 = “a lot”) scale. Sweet food consumption was moderate and suitably variable from day to day (*M* = 2.14; *SD* = 0.86; descriptive statistics are based on days as the units of analysis).

We included 3 prosocial outcomes in Study 3. A prosocial feeling measure asked people the extent to which (1 = “not at all”; 4 = “very much”) they felt “caring” and “empathetic”. The 2 markers were averaged (*M* = 2.60; *SD* = 0.82; alpha = .84). A prosocial behavior measure asked participants how frequently (0 = “never”; 4 = “very often”) they “helped”, “did a favor for”, and “expressed gratitude to” someone on a given day, behaviors that cohered with each other better than those of Study 2 (*M* = 1.42; *SD* = 0.76; alpha = .85). A more general prosocial personality measure asked people to characterize the daily self (1 = “very inaccurate”; 5 = “very accurate”) in terms of 2 interpersonal warmth (Wiggins, Trapnell, & Phillips, 1988) adjectives (“Today, I was *caring*” & “Today, I was *warm*”) and an average score was computed (*M* = 3.45; *SD* = 0.86; alpha = .86). We emphasize the comprehensive nature of these outcomes rather than their orthogonal nature or distinctiveness.

Two control variables were also assessed. Daily levels of positive affect were assessed with 2 items (“felt enthusiastic” & “felt excited”) drawn from the PANAS (Watson, 2000). A 4-point scale was used (1 = “not at all”; 4 = “very much”) and a mean was computed (*M* = 2.59; *SD* = 0.88; alpha = .92). In addition, 3 trait self-control items (Tangney, Baumeister, & Boone, 2004) were selected (“exercised self-control”, “resisted temptation”, & “was self-disciplined”) and modified for daily purposes. A 5-point frequency scale was used (0 = “never”; 4 = “very often”) and items were similarly averaged (*M* = 1.42; *SD* = 0.76; alpha = .85).

Results

We hypothesized that people would feel and act more prosocially on days on which they ate more sweet foods. Multilevel modeling (MLM) procedures were used given the nested (days within persons) nature of the data. For computational ease, the sweet food predictor was person-centered (Enders & Tofighi, 2007) and then within-person z-scored (i.e., each person had a mean of 0 and a standard deviation of 1 for this predictor across his/her completed daily reports). The outcome measures retained their original units.

A first MLM showed that there was a positive relationship between sweet food consumption and prosocial feelings, $b = .05$, $t(1503) = 2.72$, $p = .007$ (95% CI: .013 to .080). Estimated means (+/- 1 *SD*) were computed to complement this slope-based analysis. Prosocial feelings were stronger on days that sweet food consumption was prototypically high (estimated $M = 2.64$) relative to prototypically low (estimated $M = 2.55$). Sweet food consumption also predicted prosocial behavior, $b = .04$, $t(1503) = 2.70$, $p = .007$ (95% CI: .011 to .071), such that people engaged in such behaviors more frequently on days on which sweet food consumption was high (estimated $M = 1.42$) in comparison to low (estimated $M = 1.34$). Finally, people characterized their personalities as more prosocial when they ate more (estimated $M = 3.51$) relative to less (estimated $M = 3.37$) sweet food, $b = .07$, $t(1503) = 3.41$, $p < .001$ (95% CI: .028 to .107). On a day-to-day basis, then, the sweet taste metaphor appears informative in understanding manifestations of prosociality.[4]

Turning to the potential mediators, there was a positive relationship between sweet food consumption and daily positive affect, $b = .04$, $t(1503) = 1.98$, $p = .048$ (95% CI: .005 to .075). With positive affect levels controlled, though, sweet food consumption continued to predict prosocial feelings, $b = .03$, $t(1502) = 2.18$, $p = .029$ (95% CI: .003 to .062), prosocial behavior, $b = .04$, $t(1502) = 2.46$, $p = .014$ (95% CI: .006 to .064), and prosocial personality self-ascriptions,

b = .06, t(1502) = 3.23, p = .001 (95% CI: .023 to .097). Thus, positive affect does not appear to be sufficient in understanding why sweet food consumption predicts prosociality.

Similar points can be made about self-control. Sweet food consumption was inversely rather than positively predictive of daily self-control, b = -.05, t(1503) = -2.67, p = .008 (95% CI: -.082 to -.012), probably because people sometimes eat sweet foods when they are trying not to (Baumeister & Heatherton, 1996). Further, sweet food consumption continued to predict the prosocial feeling, b = .05, t(1502) = 3.22, p = .001 (95% CI: .021 to .088), behavior, b = .05, t(1502) = 3.78, p < .001 (95% CI: .025 to .081), and personality, b = .08, t(1502) = 4.35, p < .001 (95% CI: .041 to .110), measures when controlling for daily self-control levels. Given these results, one might characterize the sweet food/prosocial relationship in terms of automatic rather than controlled processes, or "intuitive prosociality" (Zaki & Mitchell, 2013).

Discussion

We emphasize the ecological validity of the Study 3 results. People will somewhat naturally eat more sweet food on some days than others (Conner et al., 2009) and the question is whether this metaphor-rich input could affect their daily functioning (Landau et al., 2010). The results of Study 3 suggest that there may indeed be perturbations of this type in that prosocial feelings and behaviors varied positively with daily levels of sweet food consumption. These relationships were not large, but they were systematic.

There are a number of reasons why prosociality could vary with sweet food consumption and we examined two prominent ones in Study 3. Eating sweet foods could increase positive affect levels, which in turn could elicit greater prosociality. Such mood-related explanations would not be sufficient to account for the present findings because the sweet food/prosocial relationships remained significant when controlling for daily positive affect. As another

possibility, eating sweet foods could bolster self-control resources, which in turn could lead people to act in a more civilized manner (Gailliot, 2010). Inconsistent with this framework, people reported lesser self-control when they ate sweet food and yet they were still more prosocial. The results therefore seem consistent with a metaphor-related priming effect through which prosociality levels temporarily increase on days that sweet food is eaten.

We hasten to add, though, that daily diary studies cannot provide definitive proof for any causal relationship. For example, it is conceivable that prosocial thoughts and feelings led people to seek sweet-tasting food (Schlosser, 2015), though this interpretation of the findings would still be consistent with the balance-related model of Figure 1. Alternatively, unmeasured third factors like amount of daily leisure time could lead people to both (a) eat sweet foods and (b) experience prosocial inclinations for reasons that are not metaphor-related. We cannot rule out all such explanations. However, we do believe that studies of the present type can complement laboratory studies in making a case for metaphoric social cognition. While daily diary studies will be higher in ecological validity, laboratory studies are better suited to rule out possible confounds (Bolger, Davis, & Rafaeli, 2003).

Finally, we wish to highlight one difference between Studies 2 and 3. Although the sweet taste preference measure of Study 2 did not predict daily prosocial behavior, the sweet experience measure of Study 3 did. Hence, there could be a difference between preferring sweet foods and eating sweet foods, with the latter being a more proximate influence on behavior. Another possibility is that we simply had greater power to detect the level 1 main effects of Study 3 than the level 2 main effect of Study 2 (Fleeson, 2007). If so, other designs would seem necessary to distinguish the correlates of sweet taste preferences on the one hand from the correlates of sweet taste experiences on the other.

General Discussion

Whether shared conceptual metaphors can provide insights into individual differences has remained a largely unexamined issue in the metaphor literature (Meier, Schnall, Schwarz, & Bargh, 2012b). From one perspective, the shared nature of these metaphors would seem to resist an individual differences analysis (Lakoff, 1986). From another perspective, though, the consensual nature of metaphors may provide opportunities that can be capitalized on. Specifically, preferences for metaphor-rich stimuli may predispose people toward metaphor-consistent experiences (see Figure 1). The present studies are consistent with these ideas in the context of sweet-tasting foods and extensions to other metaphor-rich stimuli (e.g., light colors, warm temperatures) could be recommended in future research. Preference judgments, that is, could be used to extend CMT to the domain of personality processes.

In contributing to these ideas, Study 1 showed that agreeable people liked sweet food, but not other food types, to a greater extent. These results follow from our balance-related analysis and they replicate those of Lucas and Donnellan (2014), but there are further questions worth pursuing. We used a public-domain agreeableness scale (Goldberg, 1999) whose items were chosen to maximize correlations with the Big Five markers of Goldberg (1992). Although this IPIP agreeableness scale correlates reasonably well with other agreeableness scales (Gow et al., 2005), the relevant correlations are far from unity (John & Srivastava, 1999), and this suggests that different agreeableness scales tap somewhat different qualities. This is a pertinent discussion in part because the HEXACO version of agreeableness does not seem to systematically predict sweet taste preferences (Ashton et al., 2014a).

From this perspective, the findings of Study 1 could be considered a spur to further research. There is clearly a reliable association between the IPIP scale of agreeableness and

sweet taste preferences, but a closer analysis might be necessary to discern what it is about agreeableness that draws people to sweet-tasting foods and beverages. Including different versions of agreeableness can help this effort, but one could also consider a wider variety of prosocial traits and tendencies (Habashi et al., 2016; Penner et al., 1995). A possible clue here is that the IPIP scale of agreeableness emphasizes prosocial thoughts and feelings more than behavior (e.g., "have a soft heart", "sympathize with others' feelings") and the sweet taste metaphor also seems to emphasize these sorts of qualities (Gilead et al., 2015; Schlosser, 2015). We might therefore expect sweet taste preferences to vary with factors like empathy and caring relative to scales that emphasize more agentic forms of prosociality (Penner et al., 1995).

This distinction between motivation and behavior can help us interpret the results of Study 2. In a daily diary study, sweet-preferring people did not engage in prosocial behaviors more frequently. However, they did seem to enjoy engaging in prosocial behavior to a greater extent, in that they experienced greater positive affect on days that they helped and comforted others relative to days that they did not (Sheldon, Ryan, & Reis, 1996). The same contingency was not observed at low levels of the sweet preference continuum. We might therefore conclude that prosociality is more rewarding to sweet-preferring people than to people who do not like sweet foods. These results can be extended using the scales of Gebauer, Riketta, Broemer, and Maio (2008). Individual differences in sweet taste preferences should correlate positively with pleasure-based prosocial motivation, but not pressure-based prosocial motivation. Alternatively, one could redo Study 2 with a more extensive collection of daily prosocial measures, including more direct measures of prosocial motivation and feeling.

Previous laboratory research had suggested that sweet taste metaphors also have implications for more momentary forms of prosocial motivation (Meier et al., 2012a). The

findings of Study 3 extend this idea in the context of day-to-day differences in sweet food consumption. People felt more caring toward others, and they engaged in prosocial behavior to a greater extent, on days that they consumed more sweet food. These findings could not be ascribed to increases in positive affect or self-control and are therefore consistent with a personality process version of the metaphor transfer principle (Landau et al., 2010). We would like to see more evidence of this type in the literature because we think such evidence speaks to the idea that metaphoric processes pervade daily life (Lakoff & Johnson, 1999). However, we realize that daily diary designs cannot rule out the possibility of third variable confounds and they are not typically suited to examine directions of influence (Bolger et al., 2003). Thus, the Study 3 findings should be viewed in the context of weaknesses as well as strengths.

Although the three studies complement each other, each had somewhat distinct purposes, and this resulted in gaps across the studies. Studies 1 and 2 both assessed sweet taste preferences, but they did so in different ways. The Study 1 measure asked people how much they like sweet foods as a whole, whereas the Study 2 measure asked people how much they like particular food items that tend to have a sweet taste (e.g., chocolate cake & maple syrup). These types of measures can act somewhat differently (Sagioglou & Greitemeyer, 2016), rendering more detailed comparisons of the two types of measures important in future research. Studies 2 and 3 both examined prosocial tendencies in daily life, but they did so using different measures. Unfortunately, Study 2 did not have a measure of prosocial feelings and the prosocial behavior measure fell short of optimal levels of reliability. It could therefore be useful to revisit the daily correlates of sweet taste preferences in the context of a better prosocial battery.

Finally, we should perhaps say more about sweet taste preferences as an individual difference variable. Sweet taste preferences are not a trait, but they appear to possess

dispositional properties. For example, people are consistent in their liking of sweet tastes across multiple stimuli (Conner et al., 1988). There are both genetic and environmental influences on sweet taste preferences (Drewnowski, 1997), much as there are for personality traits (Plomin & Asbury, 2005). Sweet taste preferences have a significant attitudinal component to them and are thought to reflect how much one likes the sweet taste experience rather than mere sensory coding (Rudenga & Small, 2013). Because sweet taste preferences have a significant attitudinal component to them, one could expect them to interact with other mental associations involving the self and its attributes (Pelham et al., 2005). That is, from a balance-related perspective (Simon & Holyoak, 2002), sweet taste preferences could both reinforce and follow from one's tendencies toward prosociality (see Figure 1). Sweet taste preferences could thus be considered, at least in part, an implicit measure of personality with potential motivational and behavioral implications. We further elaborate on this point below.

Questions, Additional Considerations, and Future Directions

At least for certain people, prosociality may constitute a sort of default tendency (Zaki & Mitchell, 2013). We suggest that this should be particularly true of sweet taste likers and there are ways of extending this idea beyond the results of Studies 1 and 2. For example, there is evidence that some people make more prosocial choices when under time pressure or mental load (Zaki & Mitchell, 2013). We suggest that this could be particularly true of people with greater rather than lesser sweet taste preferences.

Linguistic metaphors are asymmetric in the sense that perceptual experiences (e.g., sweet tastes) are used to refer to more abstract entities (e.g., nice people) rather than vice versa (Gibbs, 1994). Once, established, however, conceptual metaphors seem to function symmetrically (Landau et al., 2014). For example, Lee and Schwarz (2012) found that fishy smells activated

thoughts of suspicion, but suspicion also sensitized people to fishy smells. Associations between sweet tastes and prosociality may function similarly. That is, agreeable people may be drawn to sweet foods (which seems likely in Study 1), but sweet taste experiences may also increase prosociality (an idea consistent with Study 3 results and Figure 1).

There is some experimental support for the latter direction of influence. Participants in Study 4 of Meier et al. (2012a) were randomly assigned to taste a sweet or non-sweet candy while completing cognitive tasks. Subsequently, higher levels of agreeableness were reported by the sweet candy group than the non-sweet candy group. The results were not due to mood states as eating sweet food did not alter levels of either positive or negative affect. Accordingly, there is some evidence that sweet food ingestion can prime agreeable views of the self, which seems useful to mention as a complement to the present correlational designs (also see Chan et al., 2013; Ren et al., 2015; Yu et al., 2013).

What about the potential role of mood states in the present studies? Although mood states were not assessed in Study 1, the focus was on chronic features of the individual that are not likely to vary much from moment-to-moment. As to whether people who like sweet food are generally happier people, Study 2 suggests a negative answer: Sweet food preferences did not predict average levels of positive affect in daily life. Finally, daily sweet food consumption continued to predict prosocial feelings and behaviors when controlling for levels of positive affect in Study 3. Altogether, these results would seem to discourage explanatory frameworks that emphasize mood states as a rationale for the correlates of liking or eating sweet foods.

Instead, conceptual metaphors are thought to have a bodily origin (Lakoff & Johnson, 1999). This seems plausible in the case of sweet taste metaphors because sweet tastes are innately pleasurable (Gilead et al., 2015). Further, some very similar neural regions respond to

both to sweet tastes and prosocial experiences (Ernst & Spear, 2009). We might particularly emphasize the ventromedial prefrontal cortex here given a comparison of the results of Rudenga and Small (2013) with those of Zaki, Lopez, and Mitchell (2014). In sum, we think that there are body-based factors that likely contribute to and reinforce sweet taste metaphors, though we do admit that such factors are somewhat speculative in the context of the present results.

One contribution of the present paper was to suggest that balance-related ideas (particularly those of Greenwald et al., 2002) can be used to extend CMT to the personality process literature. Within this model, conceptual metaphors are special in the sense that the relevant triads are built on metaphoric associations rather than those that are more conventional or schematic (Landau et al., 2014). However, once these metaphoric associations exist, their subsequent operations are not particularly special. Mental networks should function similarly regardless of whether the associations are metaphoric or not (Lee & Schwarz, 2012) and the same should be true of the balance-related dynamics depicted in Figure 1. From this perspective, the association between prosociality and sweetness may be metaphorically special (Schlosser, 2015), but the correlation between agreeableness and preferences for sweet foods (Study 1) may not be metaphorically special.

To appreciate these points, consider one's attitude toward social workers. As noted by an astute reviewer, social workers are prosocial because they care for and help other people. Through balance-related dynamics, one's attitude toward social workers might be expected to align itself with one's own level of prosociality (Gawronski et al., 2007; Simon & Holyoak, 2002). That is, for example, agreeable people may like social workers to a greater extent because social workers are prosocial, just as they themselves are. By contrast, disagreeable people may have less favorable attitudes toward social workers because they themselves neither possess

prosocial qualities nor desire them. One could therefore treat a person's degree of liking for social workers as a possible clue to their own tendencies toward prosociality.

In support of the preceding ideas, people who are affiliation-oriented do tend to like people-oriented careers more than thing-oriented careers (Lippa, 1991) and preferences of this type seem to provide clues to other aspects of personality as well (Woodcock et al., 2013). What our framework does is to nest processes of this type within recent models of balanced identity and its social cognitive basis (Cvencek et al., 2012; Greenwald et al., 2002). Even beyond preferences for sweet food and social workers, we suggest, balance-related considerations could be used to probe personality tendencies in an implicit manner, specifically through the use of preference-oriented judgments of external objects (e.g., social workers). Nonetheless, we emphasize that a number of these dynamics are likely to be metaphoric in nature and we have provided some initial evidence for this idea.

Conclusions

We sought to understand whether sweet taste metaphors possess predictive value in understanding prosocial tendencies. The relationship between individual differences in sweet taste preferences and the IPIP scale of agreeableness appears to be a fairly robust one (Study 1). Although we were not able to show that sweet taste preferences predict daily prosocial behavior, we were able to show that daily prosocial behavior was a more consequential predictor of positive affect among sweet-preferring people (Study 2). Finally, daily sweet food consumption covaried with daily levels of prosocial feeling and action (Study 3). These findings have their limitations, but encourage further applications of CMT to personality psychology.

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Footnotes

[1]All samples completed other measures and tasks that were heterogeneous by sample and effectively camouflaged the present focus. This heterogeneity also characterized measure order and there were always unrelated questions separating the measures of interest.

[2]Liking for the 5 taste types tended to be relatively independent and only sweet food preferences moderated relations between daily prosocial behavior and positive affect. Results involving the non-sweet food types are omitted for the sake of parsimony.

[3]The moderation-related hypothesis pertains to states of pleasure and therefore to the positive affect system (Watson, 2000). Consistent with this line of thinking, prosocial behavior and sweet food preferences did not interact to predict daily levels of negative affect.

[4]The conceptual association between sweetness and prosociality is likely a normative one (Lakoff & Johnson, 1999; Meier et al., 2012a). Because this is so, we might expect the results of Study 3 to be somewhat consistent across people (Landau et al., 2014).

Table 1

Correlations between the Trait of Agreeableness and Taste Preferences in Six Samples, Study 1

Sample	Sweet	Bitter	Spicy	Salty	Sour
A	.31**	-.27**	-.12	-.01	-.05
B	.20*	-.03	-.04	.34**	.04
C	.25**	-.29**	-.10	.05	-.00
D	.09	.05	.17	.09	.04
E	.23*	.03	-.06	.17	.02
F	.25**	-.09	.02	.13	-.21*

Note: * = $p < .05$; ** = $p < .01$

Figure 1

The Sweet Food Metaphor and the Self: Balance Dynamics That Could Contribute to Higher (Top) and Lower (Bottom) Levels of Prosociality

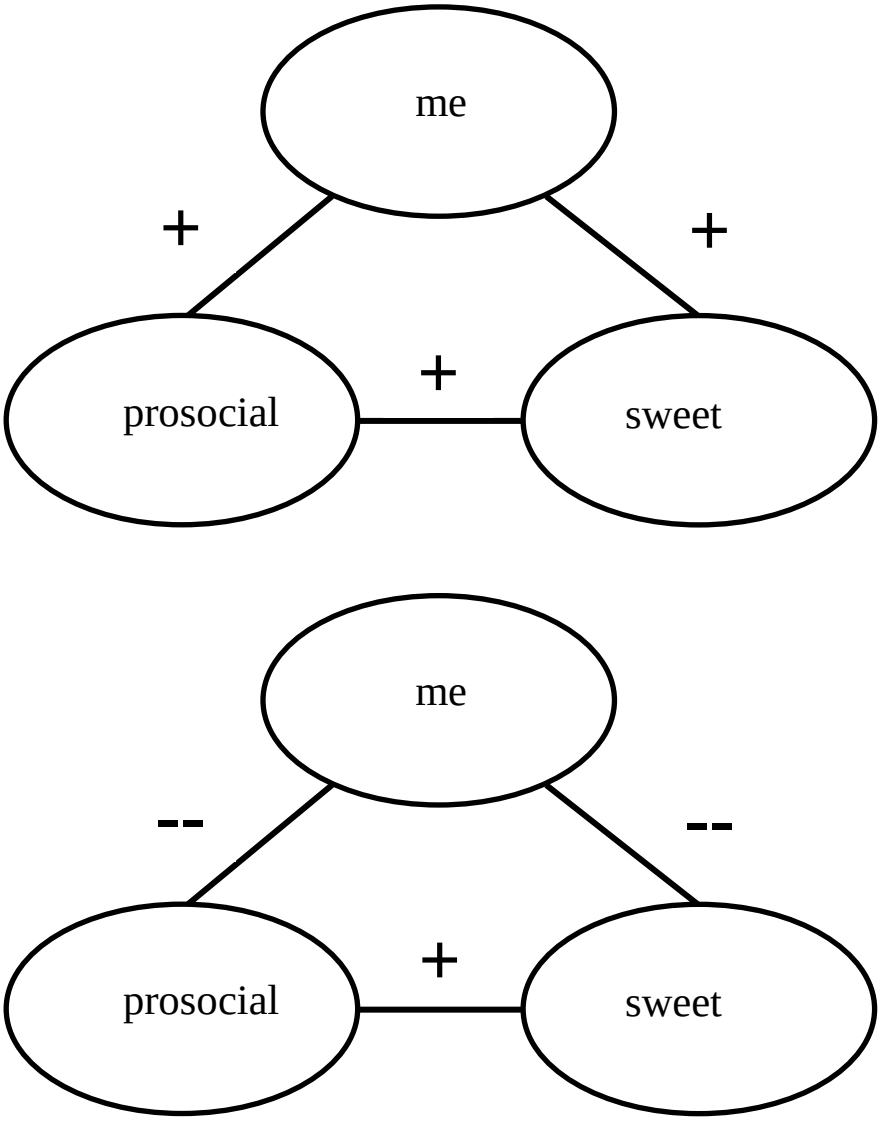

Figure 2

Sweet Food Preferences as a Moderator of the Relationship between Daily Prosocial Behavior and Daily Positive Affect, Estimated Means (+/- 1 SD), Study 2