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### Sweet love: The effects of sweet taste experience on romantic perceptions

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# Sweet love: The effects of sweet taste experience on romantic perceptions

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## Abstract

Terms of endearment such as “sweetie,” “honey,” and “sugar” are commonly used in the context of describing romantic partners. This article explores how a relatively subtle manipulation, namely taste sensations, might influence romantic perceptions of a non-established relationship. Consistent with predictions, results from Studies 1 and 2 ( $n = 280$ ) showed that participants evaluated a hypothetical relationship, but not an existing relationship, more favorably when exposed to sweet taste compared to non-sweet taste control. Study 3 ( $n = 142$ ) further showed that participants indicated greater interest in initiating a relationship with a potential partner when exposed to sweet taste, as compared to control participants. Implications for the role of sweet taste experiences in attraction and relationship initiation are discussed.

## Keywords

Attraction, metaphors, romantic interest, romantic relationships, sweet taste

Metaphors are used to represent relational bonds symbolically. In English, this is best captured by the oft-heard phrase, “love is sweet,” which brings to mind prevalent ideas of love and romance. For example, terms of endearment such as “sweetie,” “honey,” and “sugar” are commonly used with close others and especially in reference to romantic partners (with similarities in other languages, such as Mandarin, German, etc.).

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Recent research suggests that these terms may be more than mere metaphors (Chan, Tong, Tan, & Koh, 2013; Meier, Moeller, Riemer-Peltz, & Robinson, 2011). When words indicating sweet taste (e.g., honey or sweetie) are used in a romantic context of describing close others, they become cognitively mapped in such a way that triggering one concept (e.g., sweet taste) may make the other more accessible (e.g., romantic love). This article explores the idea that the experience of a sweet taste and the concept of love can become intertwined. This research specifically examines whether sweet taste experiences affect one's romantic perceptions.

We posit that sweet taste experiences may direct romantic perceptions in the form of romantic interest and evaluations of a potential romantic relationship. These romantic perceptions matter because they can orient people toward some romantic partners and/or away from others. Romantic perceptions can be the basis for initiating new relationships, and this is especially important as romantic bonds figure prominently in adult social lives, given that they satisfy important needs and can have important consequences for short- and long-term well-being (Kielcolt-Glaser & Newton, 2001). Hence, we sought to establish whether something as subtle as a sweet taste experience might alter one's perceptual orientation toward a potential romantic relationship.

## **Metaphorical thinking: Sweet taste and love**

Metaphors are useful linguistic tools to understand abstract concepts by using the knowledge of more concrete examples (Lakoff & Johnson, 1980), such as when emotions are communicated by being paired with terms of physical positions (e.g., "I feel down today" or "Cheer up!"), or when morality is communicated by being paired with words conveying cleanliness or disgust (e.g., "dirty behaviors"). Metaphors, however, not only figure in speech, but may even influence a wide range of psychological functioning and behaviors (Lakoff & Johnson, 1999; Landau, Meier, & Keefer, 2010).

Sweetness and love is one such metaphor pairing that may have psychological consequences, particularly in directing romantic perceptions. Existing research has established that metaphors can direct perceptions of others (Ijzerman & Semin, 2009, 2010; Williams & Bargh, 2008) and one's self (Meier et al., 2011). More specific to our thesis, sweet taste experiences elicit prosocial self-perceptions and behavioral intentions (Meier et al., 2011), which suggests the potential for an association between sweet taste and romantic feelings. Indeed, evidence from current functional magnetic resonance imaging research reveals that sweet taste and feelings of love share similar neural substrates (anterior cingulate cortex; Bartels & Zeki, 2000; De Araujo, Kringelbach, Rolls, & Hobden, 2003), which makes it plausible that the activation of one (e.g., regions associated with sweet taste experiences) may facilitate activation of the other (e.g., regions associated with romantic perceptions).

## **Sweet taste and romantic perceptions of a nonestablished relationship**

How might sweet taste experiences affect romantic perceptions? We posited that sweet taste experiences, relative to non-sweet taste experiences, might lead to more positive

evaluations of a relationship that has not yet been initiated (a relationship with a potential or hypothetical partner) and more romantic interest. We expected to obtain effects of a taste experience on perceptions of a nonestablished relationship for two reasons.

First, there is abundant evidence that psychological manipulations that are relatively subtle work well on novel or ambiguous targets of evaluation, as in the case when evaluating a stranger (Asch, 1946; Higgins, Rholes, & Jones, 1977; Williams & Bargh, 2008) or letters (“B” or “13”; Balcetis & Dunning, 2006). Furthermore, past research (Keefer, Landau, Sullivan, & Rothschild, 2011) has also indicated that individuals are more likely to rely on metaphors to interpret target-relevant information when target uncertainty is high. In this study, we examined a hypothetical or potential relationship, which is likely to be more uncertain than an established relationship. Hence, we expected that taste would create a subtle experience that uniquely affects perceptions of a novel or ambiguous relationship as compared to an established relationship.

In addition, when making judgments in a romantic context, the judgments of non-established relationships may entail information processing that is relatively less elaborated and simpler (Reis, Maniaci, Caprariello, Eastwick, & Finkel, 2011), arguably because the target of evaluation is more psychologically distant than would be the case when evaluating an actual relationship (cf. Trope & Liberman, 2010). If, by contrast, participants judge a current relationship, they may invoke relationship-specific motives and evaluate the relationship with their partner through information processing that is relatively more elaborate and deliberate (Eastwick, Eagly, Finkel, & Johnson, 2011; Rusbult, Arriaga, & Agnew, 2001), resulting in readily accessible, concrete, and stable representations (Hamilton & Thompson, 2007). Thus, patterns of motivated information processing in an established relationship may override the effect of subtle influences on judgments. In sum, taste is a subtle cue that is likely to direct romantic perceptions related to nonestablished relationships, and this subtle cue may not generalize to a more established relationship.

## Current research

The reviewed literature suggests that sweet taste sensations might be associated with romantic feelings. In fact, it has been demonstrated that thinking about romantic love makes individuals perceive a variety of tastants to be sweeter (Chan et al., 2013). However, no research has directly examined whether a sweet taste experience affects romantic perceptions, which was the aim of the current studies. We hypothesized that sweet taste would affect romantic perceptions by eliciting more positive evaluations of a hypothetical relationship and more romantic interest than would non-sweet taste control. We tested this hypothesis in three studies.

## Studies 1 and 2

Studies 1 and 2 provided initial tests on how taste influences romantic perceptions. The primary aim of both studies was to examine the effect of taste on evaluations of a relationship not yet initiated. Specifically, individuals who were not involved in a romantic relationship evaluated a hypothetical relationship, while being exposed to

either sweet taste or non-sweet taste. To provide a point of comparison, currently involved individuals, who underwent the same taste manipulation, evaluated their existing relationship. Our hypothesis was that a sweet taste experience, relative to a non-sweet taste experience, would have a positive effect on evaluations of a hypothetical relationship. We did not expect to see an effect of sweet taste on evaluations of established relationships.

To assess the role of mood states as a possible means by which taste affects relationship evaluations, we also measured mood in Studies 1 and 2. It is conceivable that taste experiences may exert effects on perceptions by altering one's general mood. Therefore, we examined, both, whether the taste manipulation affects mood and whether the effect of the taste manipulation on relationship evaluations remains after controlling for mood.

## **Method**

### *Design and participants*

Both studies involved a  $2 \times 2$  between-subject design: Taste Experiences (control and sweet) and Rating Target (current relationship and hypothetical relationship). In both studies participants underwent a taste experience; the taste experience was manipulated with food in Study 1 and drinks in Study 2. Participants who were romantically involved evaluated their current relationship, whereas those who were not involved evaluated a hypothetical relationship with an imaginary partner. Table 1 summarizes each sample's characteristics ( $n_{\text{Study 1}} = 155$ ,  $n_{\text{Study 2}} = 125$ ). Both samples consisted of college students who received course credit for an introductory psychology course in exchange for their participation.

### *Procedure*

The procedure of both studies was identical except for the substance used in manipulating the taste sensation (food vs. drink). The experimenter provided a cover story indicating that the aim was to examine how the consumption of certain snacks/drinks might influence energy levels. Participants were ushered into individual cubicles and were provided with 50 ml distilled water to cleanse their palate.

Participants were then instructed to consume the snack/drink that was provided while completing a survey on the computer. Participants were randomly assigned to either the sweet condition or the control condition. In Study 1, participants were provided with four Oreo mini cookies (sweet condition) or six Lays salt-vinegar chips (control condition); the amounts provided were equivalent in calories. In Study 2, participants were provided with 5 oz. of Fanta drink (sweet condition) or distilled water (control condition). They were instructed to consume the snack/drink slowly and over the entire session so as to provide an accurate evaluation of the taste.

While tasting the snack/drink, participants completed a survey, including filler questions that supported the cover story, demographic and relationship status questions, and the dependent variables (i.e., relationship evaluations of a current partner or a

**Table 1.** Summary of participant characteristics (Studies 1 and 2).

	Study 1 (N = 155)	Study 2 (N = 125)
Gender (male:female), <i>n</i>	67:88	68:57
Age (years), <i>M</i> ( <i>SD</i> )	19.13 (1.63)	19.56 (1.63)
Entire sample, romantically involved, %	48%	42%
Relationship duration (months), <i>M</i> ( <i>SD</i> )	29.69 (19.96)	27.70 (19.84)
Involved sample, exclusive relationships, %	85%	83%

Note. Of the data collected ( $n_{\text{Study 1}} = 182$ ,  $n_{\text{Study 2}} = 132$ ), 34 participants were eliminated; specifically, 9 withdrew permission to use their data, 20 participants did not complete the survey, and 5 barely consumed their snack/drink (as checked by the experimenter at the end of the session), failed to follow the procedures, or lacked English proficiency.

hypothetical partner). At three different points throughout the survey (beginning, middle, and near the end), participants also reported the percentage of the product they had consumed and as part of the cover story, their current energy level. Finally, participants completed a mood measure. Upon completing the survey, participants were probed for suspicion,<sup>1</sup> fully debriefed, and thanked.

## Measures

**Manipulation check.** Participants were asked to indicate how sweet the snack/drink was, using a 7-point scale (e.g., 1 = *not sweet*, 7 = *very sweet*).<sup>2</sup>

**Relationship evaluations.** Participants completed the well-validated Perceived Relationship Quality Components (PRQC) Inventory as an indicator of their relationship evaluation (Fletcher, Simpson, & Thomas, 2000). Participants received instructions that:

Please indicate the degree to which you agree with the following statements regarding your current romantic relationship. If you are not involved in a romantic relationship right now, please answer the following questions regarding a hypothetical relationship you could typically have.

The 21 items measure specific components of a relationship's quality (satisfaction, commitment, intimacy, trust, passion, love, and romance), each using 3 items (e.g., "How intimate is your relationship?"). All 21 items used a 7-point scale (1 = *not at all* and 7 = *extremely*) and were averaged to form a single index such that higher numbers reflected a more positive relationship evaluation ( $\alpha_{\text{Study 1}} = .95$ ,  $\alpha_{\text{Study 2}} = .97$ ).

**Mood.** Participants completed 10 items to indicate their current mood (anxiety, happiness, worry, excitement, nervousness, fear, calm, upset, and general positivity and negativity) using 7-point scales ("How [mood] do you feel right now?"; 1 = *not at all* and 7 = *very much*). Negative mood items were reverse coded, and all items were averaged to provide a positive mood index ( $\alpha_{\text{Study 1}} = .85$ ,  $\alpha_{\text{Study 2}} = .83$ ).

**Table 2.** Descriptive statistics and ANOVA analyses (Studies 1 and 2).

	Hypothetical relationship		Current relationship		<i>F</i>	<i>p</i>	$\eta^2$
	Control <i>M</i> ( <i>SD</i> )	Sweet <i>M</i> ( <i>SD</i> )	Control <i>M</i> ( <i>SD</i> )	Sweet <i>M</i> ( <i>SD</i> )			
Study 1	( <i>n</i> = 40)	( <i>n</i> = 41)	( <i>n</i> = 36)	( <i>n</i> = 38)			
Relationship quality	4.54 <sup>a</sup> (1.09)	5.31 <sup>b</sup> (0.81)	5.70 <sup>a</sup> (1.09)	5.83 <sup>a</sup> (0.77)	4.40	.038	.028
Mood	4.72 <sup>a</sup> (0.90)	5.04 <sup>a</sup> (0.90)	5.03 <sup>a</sup> (1.16)	5.11 <sup>a</sup> (0.99)	0.64	.427	.004
Study 2	( <i>n</i> = 35)	( <i>n</i> = 37)	( <i>n</i> = 28)	( <i>n</i> = 25)			
Relationship quality	4.47 <sup>a</sup> (1.44)	5.20 <sup>b</sup> (1.22)	5.68 <sup>a</sup> (0.94)	5.50 <sup>a</sup> (0.90)	4.59	.034	.037
Mood	4.65 <sup>a</sup> (0.94)	4.71 <sup>a</sup> (1.01)	5.19 <sup>a</sup> (0.83)	4.87 <sup>a</sup> (0.97)	1.18	.279	.010

Note. *F*, *p*, and  $\eta^2$  values correspond to the Taste Manipulation  $\times$  Rating Target interaction. Different superscripts within each rating target indicate a significant ( $p < .05$ ) simple effect of the taste manipulation.

## Results and discussion

### Manipulation check

Analyses of variance (ANOVAs) were conducted to examine the effects of the taste manipulation (control and sweet) and rating target (current relationship and hypothetical relationship) on participants' perception of the taste. As expected, across both studies, participants in the sweet condition reported experiencing sweeter taste than those in the control group, Study 1:  $M_{\text{sweet}} = 5.75$ ,  $SD = 1.03$ , vs.  $M_{\text{control}} = 2.07$ ,  $SD = 1.59$ ,  $F(1, 151) = 293.14$ ,  $p < .001$ ,  $\eta^2 = .66$ ; Study 2:  $M_{\text{sweet}} = 5.13$ ,  $SD = 1.06$ , vs.  $M_{\text{control}} = 1.49$ ,  $SD = 0.10$ ,  $F(1, 121) = 380.09$ ,  $p < .001$ ,  $\eta^2 = .76$ . Neither rating target nor its interaction with the taste manipulation affected sweet experiences, Study 1:  $F_{\text{rating target}}(1, 151) = .25$ ,  $p = .619$ ,  $\eta^2 = .002$ ;  $F_{\text{interaction}}(1, 151) = .35$ ,  $p = .557$ ,  $\eta^2 = .002$ ; and Study 2:  $F_{\text{rating target}}(1, 121) = 1.12$ ,  $p = .293$ ,  $\eta^2 = .009$ ;  $F_{\text{interaction}}(1, 121) = 0.09$ ,  $p = .769$ ,  $\eta^2 = .001$ .

### Relationship evaluations

Table 2 summarizes mean levels of relationship evaluations, as a function of the taste manipulation and rating target. An ANOVA was conducted on relationship evaluations, testing the effects of the taste manipulation, rating target, and their interaction.

There was a main effect of the taste manipulation on relationship evaluations in Study 1,  $F(1, 151) = 8.68$ ,  $p = .004$ ,  $\eta^2 = .05$ , but not in Study 2,  $F(1, 121) = 1.67$ ,  $p = .199$ ,  $\eta^2 = .01$ . Although this main effect is inconsistent across both studies, both studies revealed the same pattern of a significant interaction between the taste manipulation and rating target (see Table 2). Decomposing the interaction revealed a simple effect of the taste manipulation on perception of hypothetical relationship: Experiencing a sweet taste caused uninvolved participants to evaluate a hypothetical relationship more positively, Study 1:  $F(1, 151) = 13.32$ ,  $p < .001$ ,  $\eta^2 = .08$ ; Study 2:  $F(1, 121) = 6.96$ ,  $p = .009$ ,  $\eta^2 = .05$ , as was hypothesized. In contrast, the effect of the taste manipulation was not significant on evaluations of current relationship,  $F_s < 1$ ,  $p_s > .558$ ,  $\eta^2_s < .01$ .

### Ancillary analysis: Mood

It is conceivable that taste exerts an effect on evaluations of a current relationship merely because taste affects one's mood, and mood in turn affects evaluations. We conducted several analyses to examine the role of mood.

First, for each study, an ANOVA examined whether taste affected mood, with mood as the dependent variable in a model that included the taste manipulation, rating target, and their interaction. There were no main or interaction effects involving the taste manipulation, suggesting that any observed effects of the taste manipulation did not occur via mood, Study 1:  $F_{\text{taste}}(1, 151) = 1.56, p = .214, \eta^2 = .01$ ;  $F_{\text{rating target}}(1, 151) = 1.43, p = .233, \eta^2 = .009$  and Study 2:  $F_{\text{taste}}(1, 121) = 0.59, p = .446, \eta^2 = .005$ ;  $F_{\text{rating target}}(1, 121) = 4.11, p = .045, \eta^2 = .03$ ; see Table 2 for interactions.

Second, we examined whether taste exerts effects that are independent of mood. We repeated the analyses on relationship evaluations including mood as a covariate. The general pattern of results remained the same, Study 1:  $F_{\text{taste}}(1, 150) = 7.27, p = .008, \eta^2 = .046$ ;  $F_{\text{rating target}}(1, 150) = 28.74, p < .001, \eta^2 = .161$ ;  $F_{\text{interaction}}(1, 150) = 3.79, p = .053, \eta^2 = .025$  and Study 2:  $F_{\text{taste}}(1, 120) = 2.02, p = .158, \eta^2 = .017$ ;  $F_{\text{rating target}}(1, 120) = 10.30, p = .002, \eta^2 = .079$ ;  $F_{\text{interaction}}(1, 120) = 3.91, p = .050, \eta^2 = .032$ . Simple effect analyses revealed that sweet taste continued to cause more positive evaluations of a hypothetical relationship, Study 1:  $F(1, 78) = 11.12, p = .001, \eta^2 = .125$  and Study 2:  $F(1, 69) = 5.29, p = .024, \eta^2 = .071$ . Thus, the effect of sweet taste on evaluations of a hypothetical relationship remained above and beyond the effect of mood variable.<sup>3</sup>

### Summary

The results of these studies provide evidence that across different types of sweet tastes (i.e., food vs. drink), participants who experienced a sweet taste evaluated a hypothetical relationship more positively than those who experienced a non-sweet taste, as hypothesized. However, the effect of sweet taste did not generalize to evaluations of an established relationship. This suggests that a subtle cue such as taste can influence perceptions in a romantic context, but the effect is specific to novel perceptions. In contrast, perceptions of established relationships may be relatively immune to the effects of sweet taste. A limitation of these studies is that it may have been unclear to participants how to interpret the task of evaluating a hypothetical relationship without being given more information about the target person. Study 3 was designed to overcome this limitation.

### Study 3

The results from Studies 1 and 2 revealed that sweet taste experiences elicit positive evaluations of a relationship that has not yet been initiated. A primary aim of Study 3 was to provide more information about the relationship to be evaluated, by expanding what participants read about a target person whom they might date. Specifically, participants were provided with the profile of a fictitious target person that they were told they could meet later. Subsequent questions measured, both, general interest in starting a romantic

relationship and romantic interest specifically related to the target person. Study 3 also included the measure of relationship evaluations used in Studies 1 and 2. Thus, Study 3 provided a replication of the effects of sweet taste on relationship evaluations and also extended the scope to examine romantic interest. Our hypothesis was that a sweet taste experience, relative to a non-sweet taste experience, would have a positive effect not only on evaluations of a hypothetical relationship but also on romantic interest in a potential partner.

A second aim of Study 3 was to hold constant the target of evaluation. Therefore, another departure from Studies 1 and 2 was that in Study 3, all participants rated a potential relationship with a specific target person (rather than having a subset of participants rate an existing relationship).

A third aim of Study 3 was to explore whether the amount of information received about a specific target person might moderate the effects of taste on romantic perceptions. Some of the prior research reviewed earlier suggests that metaphorical effects are most salient under conditions of uncertainty (e.g., Keefer et al., 2011). Physical appearance, as a strong cue for romantic interest (Eastwick & Finkel, 2008; Finkel, Eastwick, Karney, Reis, & Sprecher, 2012; Walster & Aronson, 1966), may reduce uncertainty in a dating context and thus dampen the metaphorical effect of sweet taste on romantic perceptions of a potential partner. Hence, Study 3 manipulated the profile of the target person participants received by including (vs. omitting) the target's photo to test whether the presence of visual information would moderate the effect of taste. Specifically, the effect of sweet taste on romantic perceptions may be more pronounced in judging a target profile without a photo, relative to a profile with a photo.

## **Method**

### *Design and participants*

The study involved a  $2 \times 2$  between-subject design: taste experiences (control and sweet) and target's profile (no photo and photo). The sample consisted of  $n = 155$  college students who received course credit like in Studies 1 and 2. They tasted a sweet (or non-sweet) drink and were presented with an opposite-sex target person's profile that either included a photo or not. Thirteen participants were excluded from analyses (1 participant withdrew data permission, 2 participants barely drank, and 10 reported they were not heterosexual). Our final sample consists of 142 heterosexual participants ( $M_{\text{age}} = 19.76$ ,  $SD = 1.53$ ; 86 males; 120 were romantically uninvolved).<sup>4</sup>

### *Procedure*

The procedure was similar to Studies 1 and 2, except for the following two things. First, the tastants were a 5 oz. sweet drink (Sprite and 7-Up in a 1:1 ratio prepared by the experimenter before each session to mask any potential recognition of either product) or 5 oz. distilled water.

Second, instead of providing relationship evaluations of a hypothetical or current partner as in Studies 1 and 2, participants were asked to indicate their interest in starting a new romantic relationship. Participants were then told that we were piloting materials for

an event to meet potential romantic partners, and they were presented a gender-neutral self-introduction from a target person of the opposite sex:

Hi! I enjoy listening to music, watching movies, trying new restaurants and travelling. I am an outgoing individual who is looking for someone who wants to enjoy themselves as well.

Participants were then asked how interested they would be in this person if they were at the event for meeting potential partners and how their relationship with the target would be. Half of the participants only received the profile; the other half of the participants also received a photo of the target accompanying the profile (a male or a female photo was presented; both photos were pretested as moderately attractive).

### Measures

*Manipulation check.* As in Studies 1 and 2, participants were asked to indicate how sweet the drink was.

*General romantic interest.* Participants completed 3 items to indicate their interest in starting a romantic relationship now, in the near future or in the distant future, on a 9-point scale (e.g., “In general, how interested are you in starting a romantic relationship now?”; 1 = *not at all* and 9 = *extremely*). The items were averaged to form a single index of general romantic interest ( $\alpha = .70$ ).

*Romantic interest in the target.* Participants completed 11 items to indicate their romantic interest in the target on a 9-point scale (e.g., “I would be interested in going on a date with this person”; 1 = *strongly disagree* and 9 = *strongly agree*; modified from Eastwick & Finkel, 2008; Eastwick, Richeson, Son, & Finkel, 2009). All items were averaged to form a single index of their romantic interest in the target ( $\alpha = .96$ ).

*Relationship evaluations.* Participants rated their evaluations about being in a hypothetical relationship with the target by completing a modified PRQC where items were reworded using future tense (e.g., “How intimate would your relationship be?”; Fletcher et al., 2000). All 21 items were averaged to form a single index ( $\alpha = .97$ ).

*Mood.* Participants completed the same mood measure that we used in Studies 1 and 2. Negative emotion items were reverse coded, and all items were averaged to provide a positive mood index ( $\alpha = .69$ ).

### Results and discussion

We tested the effect of sweet taste, target’s profile, and relationship status on the dependent variables and mood. Relationship status exhibited a main effect on general interest—as expected, involved participants were less interested generally in starting a relationship than uninvolved participants,  $F(1, 134) = 12.88, p < .001, \eta^2 = .088$ —but relationship status did not moderate the effect of sweet taste on dependent variables or

mood. We also ran separate analyses controlling for the effect of relationship status on all dependent variables presented below; the general pattern of results did not change. Therefore, the variable was dropped from the main analyses. We address issues regarding this variable in the General Discussion section.

### *Manipulation check*

As expected, participants in the sweet condition reported experiencing sweeter taste than those in the control group,  $M_{\text{sweet}} = 5.15$ ,  $SD = 0.98$ , vs.  $M_{\text{control}} = 1.21$ ,  $SD = 0.67$ ,  $F(1, 138) = 767.28$ ,  $p < .001$ ,  $\eta^2 = .85$ . Neither the target profile manipulation nor its interaction with the taste manipulation affected sweet experiences,  $F_s < 1$ ,  $p_s > .774$ ,  $\eta^2_s = .001$ .

### *General romantic interest*

Consistent with our hypothesis, participants in the sweet condition indicated more interest in starting romantic relationships than those in the control group,  $M_{\text{sweet}} = 6.51$ ,  $SD = 1.60$ , vs.  $M_{\text{control}} = 5.62$ ,  $SD = 1.92$ ,  $F(1, 138) = 9.03$ ,  $p = .003$ ,  $\eta^2 = .06$ . Neither the target profile manipulation nor its interaction with taste affected general romantic interest,  $F_s < 1$ ,  $p_s > .538$ ,  $\eta^2_s < .003$ .

### *Romantic interest in the target*

Both main effects of taste and profile were significant. As hypothesized, participants in the sweet condition indicated more romantic interest in the target than those in the control group,  $M_{\text{sweet}} = 5.31$ ,  $SD = 1.74$ , vs.  $M_{\text{control}} = 4.80$ ,  $SD = 1.80$ ,  $F(1, 138) = 5.00$ ,  $p = .027$ ,  $\eta^2 = .04$ . In addition, when the target's photo was not provided, participants indicated more romantic interest,  $M_{\text{no-photo}} = 5.96$ ,  $SD = 1.47$ , vs.  $M_{\text{photo}} = 4.08$ ,  $SD = 1.58$ ,  $F(1, 138) = 56.34$ ,  $p < .001$ ,  $\eta^2 = .29$ . The interaction between taste and profile was not significant,  $F(1, 138) = 0.17$ ,  $p = .684$ ,  $\eta^2 = .001$ .

### *Relationship evaluations*

A similar pattern of results was observed for the relationship evaluations measure with significant main effects of taste and profile. Participants in the sweet condition perceived the relationship with the target more positively than those in the control group,  $M_{\text{sweet}} = 4.69$ ,  $SD = 1.14$ , vs.  $M_{\text{control}} = 4.33$ ,  $SD = 1.35$ ,  $F(1, 138) = 4.53$ ,  $p = .035$ ,  $\eta^2 = .03$ . In addition, when the photo was not provided, participants perceived the relationship more positively,  $M_{\text{no-photo}} = 4.97$ ,  $SD = 1.00$ , vs.  $M_{\text{photo}} = 4.01$ ,  $SD = 1.32$ ,  $F(1, 138) = 25.23$ ,  $p < .001$ ,  $\eta^2 = .16$ . The interaction between taste and profile was not significant,  $F(1, 138) = 3.01$ ,  $p = .085$ ,  $\eta^2 = .02$ .

### *Ancillary analysis: Mood*

As in Studies 1 and 2, we conducted several analyses to examine the role of mood. First, an ANOVA examined whether taste affected mood, with mood as the dependent variable in a model that included the taste manipulation, profile, and their interaction. There were

no main effects of taste and profile on mood,  $F(1, 138) = 0.36, p = .551, \eta^2 = .003$ ;  $F(1, 138) = 1.76, p = .186, \eta^2 = .013$ . However, the interaction between taste and profile was significant,  $F(1, 138) = 5.91, p = .016, \eta^2 = .04$ . Simple effects analyses revealed that participants who received a profile with a photo reported a worse mood when they were tasting a sweet drink compared to those who tasted a non-sweet drink,  $M_{\text{sweet}} = 4.91, SD = 0.71$ , vs.  $M_{\text{control}} = 5.26, SD = 0.62, F(1, 138) = 4.40, p = .038, \eta^2 = .03$ ; the effect of taste on mood for participants who received the profile without a photo was not significant,  $M_{\text{sweet}} = 5.35, SD = 0.72$ , vs.  $M_{\text{control}} = 5.14, SD = 0.70, F(1, 138) = 1.75, p = .188, \eta^2 = .01$ .

Second, we repeated the analyses including mood as a covariate to examine whether taste exerts effects that are independent of mood. The general pattern of results remained the same. Sweet taste continued to cause more romantic interest in general,  $F_{\text{taste}}(1, 137) = 8.66, p = .004, \eta^2 = .059$ ;  $F_{\text{profile}}(1, 137) = 1.07, p = .304, \eta^2 = .008$ ;  $F_{\text{interaction}}(1, 137) = 1.19, p = .278, \eta^2 = .009$ ; more interest in a specific target,  $F_{\text{taste}}(1, 137) = 5.56, p = .020, \eta^2 = .039$ ;  $F_{\text{profile}}(1, 137) = 53.50, p < .001, \eta^2 = .281$ ;  $F_{\text{interaction}}(1, 137) = 0.65, p = .423, \eta^2 = .005$ ; and a more positive evaluation of a hypothetical relationship with the target,  $F_{\text{taste}}(1, 137) = 4.74, p = .031, \eta^2 = .033$ ;  $F_{\text{profile}}(1, 137) = 23.80, p < .001, \eta^2 = .148$ ;  $F_{\text{interaction}}(1, 137) = 3.63, p = .059, \eta^2 = .026$ . Thus, the effect of sweet taste on romantic interest and evaluations of a hypothetical relationship remained above and beyond the effect of mood variable.<sup>3</sup>

## Summary

The results of Study 3 replicated the predicted pattern of results from Studies 1 and 2. Relative to the control condition, participants in the sweet taste condition were more likely to imagine a more positive romantic relationship with the target. Furthermore, participants in the sweet taste condition (vs. control condition) indicated more interest in starting a romantic relationship in general and with the target person in particular.

Contrary to our hypothesis that the presence of a photo would reduce the effect of a sweet taste experience, the effect of sweet taste generalized across both types of presentation profiles (including vs. omitting a photo). This lack of moderation might reflect the fact that all conditions involved high uncertainty, given that regardless of the presence of a photo, participants were rating an online stranger with vague information. The profile manipulation did produce a main effect, whereby participants who received a photo indicated less interest and rated the relationship to be less positive. Perhaps receiving a photo that is only moderately attractive, as opposed to highly attractive as might have been desired or expected when one is presented with a potential romantic partner, had the effect of disappointing participants, which caused relatively less positive evaluations regardless of taste condition.

## General discussion

Despite the popularity of many studies on metaphorical thinking and its application to different psychological contexts, no research to date has examined metaphorical thinking in a romantic interest context. The results of the current studies supported our hypotheses

that a sweet taste experience caused more romantic interest and positive evaluations of a relationship that has not been initiated. Importantly, the effects of sweet taste were obtained using different manipulations and with varying amounts of information about a hypothetical target person.

It has been suggested that metaphorical thinking is one fundamental way of perceiving the world; metaphors facilitate social cognition by applying concrete concepts (e.g., sweet taste) to understand abstract concepts (e.g., love; Landau et al., 2010). The current findings support this notion by demonstrating that changes in bodily experiences result in relationship perceptions that are congruent with the love as sweet metaphor. Furthermore, these findings complement other research demonstrating that love leads to biased sweet taste perceptions (Chan et al., 2013). Taken together, these studies add support to the bidirectionality of metaphorical effects (Lee & Schwarz, 2012), suggesting that just as a concrete taste experience can influence romantic perceptions, feelings of love might influence gustatory experience as well.

The novel demonstration of taste experiences as being consequential in a romantic context has interesting implications for initial attraction. Previous research has revealed multiple predictors of attraction, such as physical attractiveness (Eastwick & Finkel, 2008; Walster & Aronson, 1966), proximity (Festinger, Back, & Schachter, 1950), familiarity (Reis et al., 2011), and similarity (Luo & Klohnen, 2005; Newcomb, 1961). Even though bodily experiences constitute an important part of our perceptual process, they have largely been neglected in the attraction literature. Notable exceptions are prior research on the misattribution of physiological arousal (Dutton & Aron, 1974) and body odor (Singh & Bronstad, 2001; Wedekind & Furi, 1997), both of which influenced romantic attraction. By investigating taste, this research reinforces and expands on the understudied idea that romantic interest can be redirected even through sensory experiences.

More generally, this initial set of studies opens the door for efforts to identify mechanisms by which taste might affect romantic perceptions. Whereas metaphorical thinking may rely solely on a cognitive process, it is also conceivable that taste directs romantic evaluations and interest through a biological process. For example, research has shown that sweet food taste increases dopamine levels (Hajnal, Smith, & Norgren, 2004), a key biological substrate of passionate love (Fisher, Aron, & Brown, 2005). Although dopamine is involved in many experiences, it may be part of the link between taste and romantic interest.

Regarding the role of mood, our initial studies are inconclusive. The first two studies revealed no effects of taste on mood. In contrast, the third study revealed a significant interaction between taste and profile on mood. It is conceivable that under certain conditions, the effects of taste experiences operate via mood, whereby taste affects mood, which in turn affect romantic perceptions. However, the inconsistent effect of taste on mood suggests that although mood may be one such pathway, additional pathways likely exist. More generally, the issue of the exact pathway by which taste affects romantic perceptions remains to be examined further in future research.

Our studies provide evidence that sweet taste affects evaluations of a relationship with a potential romantic partner. The taste effects seem to be limited to such relationships and did not occur for established relationships in Studies 1 and 2. The specific effect on

potential relationships fits with prior research that suggested metaphorical effects are most salient under situations of uncertainty (Keefer et al., 2011). Given that potential relationships involved many unknowns (high uncertainty), these relationships may provide the conditions under which taste is most likely to matter. This is also consistent with previous literature showing that representations that are stable and concrete, such as representations of a current partner, may be more difficult to manipulate than representations based on more abstract and indirect information (Eastwick et al., 2011; Eastwick, Finkel, & Eagly, 2011; Reis et al., 2011). In short, representations of established romantic relationships are elaborated and entrenched and they may be immune to the subtle effects of taste.

One issue concerns whether the effects of sweet taste only influence participants who are not currently involved in a relationship or whether it might also affect currently involved individuals. It is conceivable that for involved participants, bringing to mind a current partner might taint ratings of a new partner and lessen interest regardless of taste experiences. Study 3 provided an opportunity to explore this issue by comparing the ratings of currently involved vs. uninvolved participants. No differences emerged in rating a potential partner. This may have been because the small sample of involved participants produced an underpowered analysis. Therefore, it remains to be shown in future research whether the effect of taste generalizes to currently involved individuals as well. As for ratings of established relationships, Studies 1 and 2 tentatively suggest that the effect of external sensations (i.e., taste) does not affect evaluations of an existing relationship. As relationships develop and become established, relationship-specific beliefs and experiences may exert greater influence in directing perceptions than external sensations such as taste.

The current research also has important practical implications. It is possible that sweet taste experiences could be used to create a favorable environment to establish positive relationships. Perhaps this is one reason why sweet taste foods (e.g., chocolate and candy) often are provided in contexts that require interacting and connecting socially with others (e.g., reception desks and social parties). Of course, sweetness is not the only taste experience that might influence romantic perceptions. We also use metaphors like hot and spicy to describe sexually attractive people. Future research could explore whether these oral sensations indeed predict sexual attraction.

The broader implication is that gustatory experience may direct initial romantic perceptions. Future research might examine whether the effects can be generalized to non-romantic contexts, for example, interest in forming friendship and evaluation of a job applicant. One limitation of the current research is that the snacks and drinks we used were of well-known brands, and it is unclear whether the perceptions of brands might influence the current results. However, we believe it is unlikely that current results can be simply explained by potential effects of brands. First, the information of brands was not disclosed to our participants until after the study; second, the effects of taste were replicated across three studies, and the brands in the sweet conditions (Oreo, Fanta, mixture of 7-Up and Sprite) were not stereotypically associated with romance. Another limitation of this research was that it relied on self-reports of relationship evaluations and romantic interest in a hypothetical scenario. Future research can manipulate taste experiences within actual social interactions, for example, speed-dating paradigms (Finkel,

Eastwick, & Matthews, 2007) to test whether participants become more proactive in initiating relationships with actual potential romantic partners.

In conclusion, this study provides the first evidence to support that sweet taste experiences make individuals perceive potential romantic relationships in a more positive light. It sheds light on an important aspect of the psychological experience involved in thinking about potential romantic relationships, that is, the sensation of taste. As such, it not only contributes to the literature on metaphorical thinking but also sheds light on an understudied factor that influences relationship initiation, that of taste.

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## Notes

1. Participants were asked what they think the hypothesis of the study is. None of the participants were able to describe our hypotheses accurately. However, eight participants from Study 1 and nine participants from Study 2 indicated they were suspicious of the connections between the taste task and the survey questions on intimate relationships. We reran our analyses after excluding these participants from the two samples and found the same pattern of results.
2. As part of the research, we also asked participants to rate the snack/drink in terms of other gustatory experiences (bitter, sour, spicy, salty, and pleasant). In Study 1, participants in the sweet condition evaluated the taste to be less bitter, less sour, less spicy, less salty, and more pleasant than those who were in control condition ( $ps \leq .002$ ). In Study 2, reported taste experiences did not differ in the tastes of bitter, spicy, and salty across conditions ( $ps > .217$ ); but participants in the sweet condition evaluated the taste to be more sour and more pleasant than those in the control condition ( $ps < .001$ ). Therefore, only pleasantness covaried with sweet taste in both studies. Mediation analyses were conducted in order to determine whether pleasantness mediated the conditional effect of the taste manipulation on relationship evaluation (rating target as the moderator) and results indicated that pleasantness did not mediate the conditional effects of the taste manipulation on relationship perceptions in either study. Specifically, following the suggestion of Preacher and Hayes (2008), we used 5,000 bootstrap samples for each test to estimate 95% confidence intervals (CIs) for the indirect effects. This bootstrap technique provides point estimate and bias-corrected and accelerated (BCA) CI for the indirect effect (see Efron, 1987). Bootstrapping analyses were conducted using Preacher and Hayes's (2008) 'INDIRECT' SPSS syntax. Results showed that pleasantness did not mediate the conditional effect of the taste manipulation on relationship evaluations with a point estimate of .08 (BCA CI  $-.10, .30$ ) in Study 1 and with a point estimate of  $-.11$  (BCA CI  $-.33, .13$ ) in Study 2.
3. We repeated the analyses on relationship evaluations and romantic interest including the composite of positive mood as a covariate to examine whether taste exerts effects that are independent of positive mood. The general pattern of results remained the same in Studies 1 and 2, Study 1:  $F_{\text{taste}}(1, 150) = 8.61, p = .004, \eta^2 = .054$ ;  $F_{\text{rating target}}(1, 150) = 28.63, p < .001, \eta^2 = .160$ ;  $F_{\text{interaction}}(1, 150) = 2.98, p = .086, \eta^2 = .019$ ; Study 2:  $F_{\text{taste}}(1, 120) = 2.06, p = .153, \eta^2 = .017$ ;  $F_{\text{rating target}}(1, 120) = 10.76, p = .001, \eta^2 = .082$ ;  $F_{\text{interaction}}(1, 120) = 3.83, p = .053, \eta^2 = .031$ . Simple effect analyses revealed that sweet taste continued to cause more positive evaluations of a hypothetical relationship, Study 1:  $F(1, 78) = 10.82, p = .002, \eta^2 = .122$ ; Study 2:

- $F(1, 69) = 5.25, p = .025, \eta^2 = .071$ . Across the three dependent variables of Study 3, the pattern of results generally remained the same for two of the dependent variables: general romantic interest:  $F_{\text{taste}}(1, 137) = 13.47, p < .001, \eta^2 = .089$ ;  $F_{\text{profile}}(1, 137) = 0.57, p = .451, \eta^2 = .004$ ;  $F_{\text{interaction}}(1, 137) = 0.48, p = .490, \eta^2 = .003$ ; and evaluation of a hypothetical relationship with the target,  $F_{\text{taste}}(1, 137) = 3.00, p = .086, \eta^2 = .021$ ;  $F_{\text{profile}}(1, 137) = 24.68, p < .001, \eta^2 = .153$ ;  $F_{\text{interaction}}(1, 137) = 3.47, p = .065, \eta^2 = .025$ . The effect on romantic interest in a specific target became nonsignificant (albeit in the predicted direction):  $F_{\text{taste}}(1, 137) = 2.29, p = .133, \eta^2 = .016$ ;  $F_{\text{profile}}(1, 137) = 56.48, p < .001, \eta^2 = .292$ ;  $F_{\text{interaction}}(1, 137) = 0.50, p = .480, \eta^2 = .004$ . Taken together, there is evidence of an independent effect of sweet taste on evaluations of a hypothetical relationship and romantic interest, beyond the effect of positive mood.
4. Initially the study was made available only to students who reported on a pretest that they were uninvolved. When they completed this study 1 month after the pretest, 22 indicated being romantically involved. Only after data collection was completed did we recognize an advantage of including involved participants. Specifically, it may not be the case that ratings of established relationships are immune to taste but rather that the involved participants in Studies 1 and 2 would be immune to taste effects regardless of who they evaluated (their current relationship or a hypothetical relationship). We explored this idea on the small sample of involved participants in this study (i.e., whether relationship status moderates the effects of taste).

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