

Failure to Report Social Influences on Food Intake: Lack of Awareness or Motivated Denial?

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Objective: Two studies examined whether people are aware of social influences on food intake, and whether recognition of those influences is driven by the observation of mimicked eating and/or matching the amount of food eaten. **Method:** In Study 1, participants watched a video of 1 person eating alone, or a video of 2 people eating together that varied in the extent to which the target's eating behavior mimicked or matched that of the model. Participants then made attributions for the eating behavior of the target person. In Study 2, each participant watched a video of herself eating with a confederate and made attributions for her own eating behavior. In both studies, the outcome of interest was the extent to which each participant acknowledged the influence of the model's eating behavior on the target's (or her own) food intake. **Results:** In Study 1, participants accurately recognized social influences on the food intake of the target person, and this recognition was facilitated by the presence of mimicked eating, but not by matching the total amount eaten. Study 2 showed that the extent to which people acknowledge social influences on their own food intake depended on their self-reported general responsiveness to social cues on eating. **Conclusion:** Overall, people seem to be aware that social factors can influence others' food intake. Whereas some people (high social eaters) are able to accurately report social influences on their own food intake, others (low social eaters) seem to deny those influences for reasons that merit future investigation.

Keywords: external influences, social influences, food intake, awareness, motivated denial

Internal signals of hunger and satiety play a role in regulating food intake (Friedman, 2009), but a substantial body of research has demonstrated that external factors can also exert a strong influence on people's food intake. For example, research on the effects of portion size has consistently shown that people's food intake is governed by how much food is available to them (e.g., Rolls, Morris, & Roe, 2002). Other research has shown that social factors are important determinants of people's food intake. For example, people tend to adjust their food intake to match that of their eating companion, eating sparingly when their companion eats sparingly, and eating a lot when their companion eats a lot (e.g., Herman et al., 2003). People who rely on external cues when eating may face considerable difficulty in regulating their food intake, especially given that modern food environments are characterized by widespread availability of high-calorie foods and oversized portions (Brownell & Horgen, 2004). The ability to

overcome external influences on food intake may depend on recognizing the impact that these influences have on one's eating behavior, but the extent to which people recognize these influences remains unclear.

Although there is strong empirical evidence that external factors have a powerful impact on food intake, people typically fail to report the influence of these external factors on their own eating behavior (Vartanian, Herman, & Wansink, 2008). Instead, people tend to account for their food intake in terms of (a) internal factors such as hunger and satiety, and/or (b) palatability (Roth, Herman, Polivy, & Pliner, 2001; Vartanian et al., 2008). It may be that people regard hunger and taste as "common-sense factors" determining food intake, whereas other factors, such as the behavior of other people, are regarded as "inappropriate" and are therefore less likely to be acknowledged (Vartanian et al., 2008; cf. Nisbett & Wilson, 1977). Not only do people fail to report external influences on their eating behavior, but they also appear to be inaccurate in their overall explanations for their food intake. For example, Vartanian et al. (2008) found that participants rated hunger and taste as the most important determinants of their food intake even though these factors correlated only weakly with the actual amount that participants ate.

The fact that people fail to report external influences on their food intake suggests that they are either unaware of these influences or that they are aware of them but unwilling to admit to them. A substantial amount of social psychological research has demonstrated that people's behavior can be influenced by many factors without their awareness (Bargh, 2006). Other research suggests that people are often motivated to deny external influ-

This article was published Online First November 18, 2013.

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This research was supported under Australian Research Council's Discovery Projects funding scheme (Grant DP110101124).

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ences on their behavior (e.g., Brehm, 1966) and are motivated to feel a sense of control over their environment (e.g., Burger, 1987). Elucidating whether people are unaware of external influences on food intake or if they are aware but motivated to deny those influences could have important implications for people's ability to resist external influences, to make optimal food choices, and to maintain a healthy diet.

Research in domains other than food intake has shown that, although people fail to acknowledge external influences on their behavior, they are willing to acknowledge those influences when it comes to other people's behavior. This tendency is referred to as the *third-person effect* (e.g., Douglas & Sutton, 2004). Furthermore, a number of studies have shown that people can make accurate judgments for the behavior of others (e.g., Ambady, Hallahan, & Rosenthal, 1995; Colvin & Funder, 1991), but are generally inaccurate in their self-judgments (e.g., Epley & Dunning, 2000). Taken together, these findings suggest that these self-serving assessments tend to reflect errors in self-judgment, rather than errors in judgments of others. It may be that people's explanations for their eating behaviors reflect similar processes. Exploring this possibility may provide insights into the mechanisms underlying people's failure to report external influences on their food intake.

The primary purpose of the present research was to tease apart whether failure to report external influences on food intake is due to lack of awareness or to motivated denial. Study 1 examined whether people can recognize external influences on the food intake of others. Study 2 examined participants' attributions for their own food intake when viewed from a third-person perspective. If people can accurately identify external influences on other people's food intake, but not on their own food intake, this would suggest that they are, to some degree, aware of these influences, but they might be motivated to deny these influences on their own food intake. We examined people's acknowledgment of external influences in the context of social influences on food intake, specifically the modeling of food intake. The majority of studies on the modeling of food intake have operationalized modeling in terms of the degree of correspondence in the amount eaten between two people over the course of an eating occasion (what we refer to as degree of matching). Hermans et al. (2012) recently suggested that behavioral mimicry (i.e., temporal congruence) in people's eating behavior might be an important process in modeling food intake. Thus, the present research examined the importance of these two constructs (i.e., matching and mimicking) in the recognition of social influence on food intake. Finally, we also examined whether people's self-reported tendency to eat in response to social cues was related to their acknowledgment of the influence of social cues in an experimental setting.

Study 1

Participants watched a video of a social eating situation that varied in the extent to which a target person modeled the food intake of another person. Participants were then asked to indicate the extent to which the target person's food intake was influenced by various factors (e.g., hunger, the eating behavior of the other person). On the basis of the evidence supporting people's accuracy in judging the behavior of others, we predicted that people would accurately identify social influences on the target's food intake; in

other words, they would indicate the presence of social influence only when it was in fact present. We also examined whether the recognition of social influence occurs primarily by way of close temporal correspondence between companions' eating behaviors (i.e., mimicry) or occurs as a result of the companions eating the same overall amount (i.e., matching). If perceptions of social influence are driven by mimicry, then participants should report social influence in the presence of mimicry, regardless of whether or not companions ate the same amount.

Method

Participants. A total of 133 women participated in exchange for either \$10 or course credit. Participants signed up for the study of their own volition, using the university's experiment sign-up computer system. Only women were eligible to participate, and all potential participants were included in the study. Data from two participants were excluded from the study due to their suspicion about the manipulation. Thus, data from 131 participants were included in the analyses below. The mean age of the participants was 19.9 years (range = 17–33), and their mean body mass index (BMI; kg/m²) was 21.4 (range = 16.7–33.2). With respect to ethnicity, 31% ($n = 40$) were Caucasian, 54% ($n = 71$) were Asian, and 15% ($n = 20$) identified as "other." This study was approved by the university's ethics committee.

Materials.

Videos. Five stimulus videos were used in this study, and each video was approximately 6 min in duration. Four of the videos showed two Caucasian women (a "target" and a "model") seated at a table engaging in a computer task (two-person conditions). Each of the women in the video had her own identical bowl of popcorn from which she could snack throughout the interaction, and each took a total of six bites of popcorn throughout the course of the video. The behavior of the target and model was scripted and varied along two dimensions: (a) whether or not the target mimicked the behavior of the model, and (b) whether or not the target matched the amount eaten by the model. Thus, each of the four 2-person videos showed only mimicry ($n = 27$), only matching ($n = 25$), both mimicry and matching ($n = 27$), or neither mimicry nor matching ($n = 25$). Based on Hermans et al. (2012), mimicry was operationalized as a bite taken by the target within 5 s of the model taking a bite, whereas unmimicked bites were defined as bites taken outside that 5-s interval. Matching was operationalized as both the target and the model eating one piece of popcorn per bite. Nonmatching was defined by one person in the video eating three pieces of popcorn per bite, and the other person eating only one piece per bite. In addition to these four 2-person videos, we included an *eat alone* control condition. Participants in the control condition ($n = 27$) were shown a video of one woman eating while engaging in a computer task (and thus did not show any social influences on eating behavior). All features of this video were consistent with those of the two-person conditions. The target person ate one piece of popcorn approximately every minute (i.e., six eating occasions in total).

Factors influencing food intake. Participants completed a 20-item questionnaire (based on Vartanian et al., 2008), rating the extent to which various factors influenced the food intake of the target person. Only two of these factors were relevant to this study, with the others serving as filler items. To test the main hypotheses,

the extent to which participants rated “the eating behavior of the other person” to be an influence on the target’s food intake was used as an index of participants’ acknowledgment of social influences on eating behavior. To draw comparisons between social influences and more commonly cited factors influencing food intake, participants also rated the influence of hunger on the target’s food intake. All items were rated on a 7-point scale, ranging from 1 (*not at all an influence*) to 7 (*very much an influence*).

Potential moderator. A scale modeled on the External Eating subscale of the Dutch Eating Behavior Questionnaire (Van Strien, Frijters, Bergers, & Defares, 1986) was included to test whether people who report a general tendency to eat in response to social cues are more likely to recognize social influences on the food intake of others. The items included in the original External Eating subscale mainly assess responsiveness to sensory cues (e.g., “If food looks and smells good, do you eat more than usual?”), and only two of the items tap into social cues (e.g., “If you see others eating, do you also have the desire to eat?”). These two items were retained. Because the current study focused specifically on social influences on food intake, four additional items were added (e.g., “If the person you are eating with eats a lot, do you also eat a lot?”) to create a Social Eating scale that assesses reported responsiveness to social cues on food intake. Each item was rated on a 5-point scale ranging from 1 (*never*) to 5 (*very often*). The six social items were averaged, with higher scores indicating a greater general tendency to eat in response to social cues ($M = 2.87$, $SD = 0.64$, range = 1.50 to 4.67, $\alpha = .71$).

Procedure. Participants signed up for a study on “judging social interactions,” and were assigned to a specific condition before arriving at the laboratory. Participants were told that they would be watching a short video of a social interaction and would subsequently complete a few brief questionnaires. Participants were assigned to either a two-person condition or the eat-alone condition. After the video had elapsed, participants responded to the Reasons for Eating Questionnaire (Vartanian et al., 2008). A screenshot of the interaction viewed in the video was visible onscreen while participants completed this questionnaire to ensure that participants remembered which individual was the target. Next, participants completed the Social Eating scale. Participants then provided some basic demographic information, including their age, height and weight (used to calculate their BMI), and ethnicity. Finally, participants were fully debriefed.

Results

Baseline characteristics. There were no baseline differences between groups in age ($p = .13$), BMI ($p = .88$), Social Eating scale scores ($p = .46$), or ethnicity ($p = .13$).

Factors influencing food intake. To test the hypothesis that participants would be able to accurately recognize social influences when these influences were present, a univariate analysis of variance (ANOVA) was conducted on participants’ ratings of the degree to which the target was influenced by the eating behavior of the other person (the model). The independent variable was the presence or absence of social influence in the video that they viewed, and the videos were grouped as follows: (a) one person, no social influence (eat-alone condition); (b) two people, no social influence (no-social-influence condition); and (c) a combined two-

person social-influence condition (which included the mimicry, matching, and mimicry/matching videos). Ratings of the influence of the other person’s eating behavior did vary significantly by condition, $F(2, 128) = 20.36$, $p < .001$, $\eta_p^2 = .24$. Planned contrasts indicated that the eating behavior of the other person was rated as much more of an influence on the target’s food intake for participants in the social-influence condition ($M = 5.51$, $SD = 1.83$) than it was for participants in the no-social-influence condition ($M = 3.80$, $SD = 1.63$) and for participants in the eat-alone condition ($M = 3.19$, $SD = 1.90$), both $ps < .001$. There was no significant difference between ratings for participants in the eat-alone condition and participants in the no-social-influence condition, $p = .22$.

To test the second aim of this study, gauging the extent to which recognition of social influence is driven by mimicry versus matching when two people are eating together, a 2×2 ANOVA was conducted, with mimicry and matching as the independent variables (omitting the eat-alone condition). The dependent variable was again participants’ ratings of the degree to which the target’s food intake was influenced by the eating behavior of the other person. There was a main effect of mimicry, such that ratings of the influence of the other person’s eating behavior were significantly higher for participants who saw mimicked eating ($M = 6.09$, $SD = 1.57$) than for participants who did not see mimicked eating ($M = 4.02$, $SD = 1.68$), $F(1, 100) = 41.99$, $p < .001$, $\eta_p^2 = .30$. There was, however, no main effect of matching, $F(1, 100) = 1.46$, $p = .23$, $\eta_p^2 = .01$, and the interaction between mimicry and matching was also not significant, $F(1, 100) = 0.03$, $p = .87$, $\eta_p^2 < .001$.

Potential moderator. A regression analysis was conducted to determine whether participants’ reported tendency to eat in response to social cues moderated the effect of recognizing social influences on the food intake of others. The predictors entered into the regression were mimicry (coded as *no mimicry* = 0, *mimicry* = 1), matching (coded as *no matching* = 0, *matching* = 1), the Social Eating scale, all two-way interactions, and the three-way interaction. Scores on the Social Eating scale were mean-centered before the interaction term was created to control for multicollinearity. The dependent variable was participants’ ratings of the degree to which the target’s food intake was influenced by the eating behavior of the other person. The overall regression model predicting recognition of social influences was significant, $F(7, 96) = 6.01$, $p < .001$, $R^2 = .31$. Consistent with the ANOVA results reported earlier, the regression analysis produced a main effect of mimicry, which was the only significant independent predictor of recognition of social influences. There were no significant interactions with mimicry or matching conditions.

External versus internal influences on food intake. Further analyses were conducted to compare the extent to which the target’s food intake was seen as being influenced by internal factors (i.e., hunger) as opposed to external factors (i.e., the eating behavior of the other person). Only data for the interaction effects involving factor type (internal vs. external) are reported here because the main effects were not theoretically meaningful. First, a 3×2 mixed-model ANOVA was conducted with the presence or absence of social influence as the between-subjects independent variable (eat-alone vs. no-social-influence vs. social-influence conditions), and factor type (hunger vs. the eating behavior of the other person) as the within-subjects independent variable. There

was a significant interaction between factor type and condition, $F(2, 128) = 19.42, p < .001, \eta_p^2 = .23$. Not surprisingly, for participants in the eat-alone condition (in which there was no eating companion), hunger was rated as a more important influence ($M = 4.63, SD = 1.50$) than was the eating behavior of the other person ($M = 3.19, SD = 1.90$), $p = .01$. For participants in the no-social-influence condition, there was no significant difference between ratings of the influence of hunger ($M = 3.60, SD = 1.66$) and the eating behavior of the other person ($M = 3.80, SD = 1.63$), $p = .73$. Finally, for participants in the social-influence condition, the eating behavior of the other person was rated as a stronger influence ($M = 5.51, SD = 1.83$) than was hunger ($M = 3.15, SD = 1.73$), $p < .001$.

We repeated this analysis using a $2 \times 2 \times 2$ mixed-model ANOVA, with the presence or absence of mimicry and the presence or absence of matching as the between-subjects independent variables, and factor type as the within-subjects independent variable. There was a significant interaction between mimicry and factor type, $F(1, 100) = 39.50, p < .001, \eta_p^2 = .28$. For participants who saw mimicked eating, the eating behavior of the other person was rated as a much more important influence ($M = 6.09, SD = 1.57$) than was hunger ($M = 2.70, SD = 1.48$), $p < .001$. For participants who did not see mimicked eating, there was no significant difference between ratings for the influence of hunger ($M = 3.86, SD = 1.76$) and the eating behavior of the other person ($M = 4.02, SD = 1.68$). There was no interaction between matching and factor type, $F(1, 100) = 1.24, p = .27, \eta_p^2 = .01$, and there was no significant three-way interaction, $F(1, 100) = 1.61, p = .21, \eta_p^2 = .02$.

Discussion

The findings of Study 1 provide some initial support for the suggestion that people are aware of social influences on food intake. First, participants were more likely to report social influences when the target's food intake was actually influenced by her eating companion. Second, participants were no more likely to cite social influences when viewing one person eating alone than when they viewed two people eating together, but with no social influences present. This latter finding suggests that people are accurate in their identifications of social influences, and are not biased to simply assume that any two-person eating situation necessarily involves social influences on food intake. Study 1 also found that mimicked eating (i.e., temporal congruence of eating) facilitated the recognition of social influences. The presence of food matching (i.e., similarity of overall intake amount), however, did not enhance participants' recognition of social influences.

The fact that people accurately recognize social influences on the food intake of others (at least when there is behavioral mimicry) suggests that they are aware of these influences, and further suggests that the failure to report these influences on their own food intake may be due to an unwillingness to admit to them. However, observing the behavior of others might be different from the experience of observing one's own behavior. Therefore, the ability to recognize social influences on food intake when observing others does not necessarily indicate that people would be aware of social influences on their own food intake; it simply indicates that people have the capacity to recognize social influences on food intake. Study 2 builds upon Study 1 by having participants

make attributions for their own food intake in an experimental setting.

Study 2

The aim of Study 2 was to explore whether people can accurately recognize social influences on their own eating behavior when viewing themselves from a third-person perspective, and specifically whether this recognition is driven by the presence of mimicry or matching. If failure to report social influences on one's own food intake in previous studies was due to a problem of recognizing social influences when in the situation, participants might nevertheless be able to recognize these influences when viewing their behavior from a third-person perspective. If people do not accurately recognize social influences on their own food intake from this third-person perspective, this would suggest that they might be unwilling to admit to social influences on their own food intake, despite being aware of these influences on others (as was found in Study 1). Furthermore, because Study 1 found that the presence of mimicry facilitated participants' recognition of social influences, we predicted that the recognition of social influences on one's own food intake would be highest when people mimicked the eating behavior of their eating companions.

Method

Participants. Fifty-nine female undergraduate students participated in the study for course credit. Participants signed up for the study of their own accord using the university's sign-up computer system. Only women were eligible to participate, and all potential participants were included in the study. Data from 14 participants were excluded from the study, either because they did not consume any food during the study session ($n = 8$) or because of technical difficulties ($n = 6$). Thus, data from 45 participants were included in the analyses below. The mean age of the participants was 19.2 years (range = 18–30), and their mean BMI was 21.3 (range = 15.8–32.5). With respect to ethnicity, 16 were Caucasian, 23 were Asian, and 6 identified as "other." This study was approved by the university's ethics committee.

Experimental confederate. Participants watched a 9-min clip of a TV program with a supposed other participant, who was actually an experimental confederate. Four female confederates were used, all of whom were between the ages of 19 and 21 and had BMIs within the normal range. Before participants (and confederates) watched the clip, they were given their own individual bowls of M&Ms and were told that they could help themselves to the M&Ms during the task. Experimental confederates were instructed to eat at specific times throughout the task, either 8 M&Ms (the low-intake group) or 20 M&Ms (the high-intake group). The purpose of including both low- and high-intake groups was to ensure that any observed effects were not limited to a particular intake level. There were no group effects on intake ($p = .91$) or on recognition of modeling ($p = .17$), and there were no interactions with the amount eaten by the confederate in any of the analyses. Therefore, the analyses reported were collapsed across the low- and high-intake groups. Each bowl was preweighed and contained 188 g of M&Ms. (Each M&M weighed approximately 1 g.) Each bowl was reweighed after the study session to determine

the number of M&Ms eaten by the participant and by the confederate.

Measures.

Factors influencing food intake. Participants completed the same 20-item eating questionnaire used in Study 1, except that the wording was modified so that it asked participants to rate the extent to which the factors influenced *their own* food intake during the experimental session.

Potential moderator. Participants also completed the Social Eating scale used in Study 1 ($M = 3.00$, $SD = 0.74$, range = 1.50 to 4.83, $\alpha = .78$).

Procedure

Participants signed up for an “advertising study.” A few minutes after participants arrived for their study session, a female confederate arrived as if she were a participant who was also signed up for the study. After completing a few filler tasks, participants (and confederates) were informed that they would be watching a short TV program together. Before leaving the room, the experimenter told the participants (and confederates) to “feel free to help yourself to M&Ms as you watch” and placed a bowl of M&Ms in front of each of them. A video camera was then set to record the session and the experimenter left the room to allow the participants to complete the task. After the TV program ended, participants were given 2 min to discuss a specific question about the program, after which time the experimenter entered the room, turned off the video camera, and removed the bowls of M&Ms. While participants (and confederates) completed a subsequent filler task, the experimenter transferred the video recording of the participant and the confederate onto a computer in preparation for the next task. After completing the filler task, the participant was seated at the computer in the same room, and the confederate was asked to leave the room, supposedly for the purpose of completing the next task in an adjacent room.

After completing some filler questionnaires, each participant watched the recording of herself and the other participant watching the TV program and having a subsequent discussion. Participants were told that the purpose of watching this video recording was “to refresh your memory of the interaction you had with the other participant.” The audio component of the video recording was turned off to ensure that participants could focus on their own and the confederates’ eating behaviors, rather than on the content of the program or the subsequent discussion. After watching the recording, participants were asked to indicate how many M&Ms they had eaten during the task and to rate the influence of various factors (including the eating behavior of the other person) on their own food intake. Finally, participants completed the Social Eating scale, provided some demographic information, i.e., age, ethnicity, and height and weight (used to calculate BMI), and were debriefed about the true nature of the study. After participants left the experiment room, both bowls of M&Ms were reweighed to determine the amount eaten by the participant and the confederate.

Results

Coding of mimicking and matching. The primary independent variables in this study were the degree of mimicking and the degree of matching. To quantify the degree of mimicking, the

timing of the confederates’ and participants’ eating was recorded by two independent coders. A single bite was defined as a discrete touch of fingers to the mouth, holding at least one M&M. Following Hermans et al. (2012), participants’ bites that occurred within 5 s after the confederate touched her bowl were considered to be “mimicked,” whereas bites that occurred outside of this 5-s interval were considered to be “nonmimicked.” Touching the bowl was used as the reference point for the timing of a mimicked bite because it is unlikely that participants would have been able to see the confederate’s mouth while sitting adjacent to her. The intra-class correlation between the two coders for the number of total bites was 1.00 and for the number of mimicked bites was .99. An index of mimicking was created for each participant by calculating the percentage of total bites mimicked. Higher values indicated a greater degree of mimicking. On average, 15% of a participants’ bites ($SD = 18\%$) mimicked the confederates’ bites. Of note, there was also considerable variability in the degree of mimicking (range = 0–100%). The degree to which participants matched the food intake of the confederate was assessed by weighing participant and confederate bowls before and after the experimental session. The discrepancy between the total amount eaten by the participant and the total amount eaten by the confederate was calculated, and the absolute value was taken to index the degree of matching. In this case, a value of zero indicated perfect matching, and higher values indicated a lower degree of matching (i.e., a greater absolute discrepancy). The mean discrepancy between participants’ intake and the confederates’ intake (i.e., the degree of matching) was 8.67 M&Ms ($SD = 6.87$). As with mimicking, there was also considerable variability in the degree of matching (range = 0–29). For all analyses, controlling for participants’ BMI had no impact on the results.

Factors influencing food intake. A regression analysis was conducted to determine whether mimicry or matching facilitated reporting of social influences. The predictors entered into the model were degree of mimicry, degree of matching, and the interaction between mimicry and matching. Each continuous variable was mean-centered prior to creating the interaction term to control for multicollinearity. The dependent variable was participants’ self rating of the extent to which her food intake was influenced by the eating behavior of the other person (the confederate). The overall regression model predicting recognition of social influences was not significant, $F(3, 44) = 1.17$, $p = .33$, $R^2 = .08$.

To determine whether participants’ own reported tendencies to eat in response to social cues moderated recognition of social influences, the regression analysis was repeated, adding the Social Eating scale as a predictor as well as the additional two-way and three-way interactions. In this analysis, the overall model predicting recognition of social influences was significant, $F(7, 37) = 3.20$, $p = .02$, $R^2 = .34$. The only significant predictor was an interaction between mimicry and self-reported responsiveness to social cues on eating (Social Eating, $p = .001$). Following Aiken and West (1991), simple slopes were plotted at 1 SD above and below the mean for the Social Eating scale (labeled as high social eaters and low social eaters) and for the degree of mimicry (labeled as high mimickers and low mimickers; see Figure 1). Among low social eaters, those who mimicked the confederate to a greater degree were actually *less likely* to report social influences on their food intake than those who mimicked the confederate to a lesser

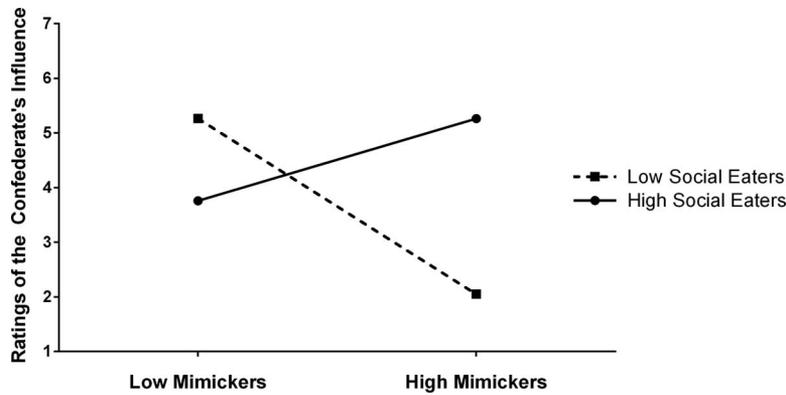


Figure 1. Regression analyses predicting ratings of the confederate's influence (recognition of modeling) as a function of social eating and mimicking behavior. Following Aiken and West (1991), simple slopes were calculated at 1 *SD* above and below the mean.

degree, $t(41) = -3.88, p < .001$. Among high social eaters, there was a marginally significant effect suggesting that those who mimicked the confederate to a greater degree were somewhat more likely to report social influences on their food intake than were those who mimicked the confederate to a lesser degree, $t(41) = 1.62, p = .06$.

External Versus Internal Influences on Food Intake

Further analyses were conducted to examine the extent to which participants perceived their food intake to have been influenced by internal factors (hunger) compared to external factors (the eating behavior of the other person). Only data for interactions involving factor type (internal vs. external) are reported because the main effects were not theoretically meaningful. So that we could draw parallels to Study 1 and more easily interpret results, we created a dichotomous mimicry variable, whereby the sample was split at the median into high mimickers ($n = 23$) and low mimickers ($n = 22$), as well as a dichotomous matching variable, whereby the sample was split at the median into high matchers ($n = 21$) and low matchers ($n = 24$). A $2 \times 2 \times 2$ mixed-model ANOVA was conducted with mimicry and matching status as the between-subjects independent variables, and factor type as the within-subjects independent variable. There was no significant interaction between factor type and mimicry status, $F(1, 41) = 3.71, p = .06, \eta_p^2 = .08$, or between factor type and matching status, $F(1, 41) = 0.68, p = .41, \eta_p^2 = .02$. There was also no significant interaction between mimicry, matching, and factor type, $F(1, 41) = 0.05, p = .82, \eta_p^2 = .001$.

Next, in order to examine whether ratings of internal versus external factors differed as a function of scores on the Social Eating scale, the sample was split at the median into high ($n = 24$) and low social eaters ($n = 21$). A 2×2 mixed-model ANOVA was conducted with social eating status (high vs. low social eaters) as the between-subjects independent variable, and factor type as the within-subjects independent variable. There was a significant interaction between factor type and Social Eating status, $F(1, 43) = 11.38, p = .002, \eta_p^2 = .21$. Low social eaters rated hunger as a stronger influence ($M = 5.00, SD = 1.61$) on their food intake than they rated the eating behavior of the other person ($M = 3.33,$

$SD = 1.77$), $p = .003$. For high social eaters, ratings of the influence of hunger ($M = 3.83, SD = 2.06$) and the eating behavior of the other person ($M = 4.58, SD = 1.47$) did not differ, $p = .13$.

Discussion

The findings of Study 2 suggest that, overall, people fail to acknowledge social influences on their own food intake even after viewing their eating behavior from a third-person perspective. Furthermore, in contrast to Study 1, Study 2 found that mimicked eating did not facilitate the recognition of social influences on one's own food intake. Importantly, however, the effect of mimicked eating on recognition of social influences was moderated by participants' reported tendency to eat in response to social cues (i.e., whether participants were high social eaters or low social eaters). High social eaters were marginally more likely to report being influenced by the confederate when they mimicked the confederate to a greater degree. In contrast, low social eaters were actually *less likely* to report social influences when they mimicked the confederate to a greater degree. These findings suggest that whereas some people are reasonably accurate in acknowledging social influences on their food intake, some people might actively deny those influences.

General Discussion

People's failure to report social influences on their food intake might reflect either unawareness of these social factors, or a reluctance to admit the influence of these factors (Vartanian et al., 2008). On the basis of research showing that people tend to be accurate when making inferences about the behavior of others (e.g., Douglas & Sutton, 2004; Epley & Dunning, 2000), we predicted that people would acknowledge social influences on the food intake of others. Indeed, Study 1 showed that participants were more likely to report social influences on the food intake of others when modeling was actually present compared to when there was no modeling. It should be noted that this finding does not simply reflect a bias toward the indiscriminate attribution of modeling of the food intake of others: participants were no more likely

to report modeling when they viewed two people eating together if there was no modeling present than when they viewed one person eating alone. Study 1 further showed that the presence of mimicked eating drives recognition of modeling among others. These findings suggest that people are indeed aware of social influences on food intake, and may just be reluctant to admit to these influences on their own food intake.

To bridge the gap between people's acknowledgment of social influences on other people's food intake and their acknowledgment of social influences on their own food intake, participants in Study 2 made attributions for their own food intake when viewed from a third-person perspective. Following Study 1, it was hypothesized that participants who mimicked the confederates' eating behaviors would be more likely to recognize social influences on their own food intake. Contrary to our prediction, there was no overall difference in recognition of social influences for high mimickers and low mimickers. We did, however, find that recognition of social influences was moderated by participants' reported tendency to eat in response to social cues. Participants who reported a low responsiveness to social cues on eating (i.e., low social eaters) were *less likely* to report social influences when they mimicked confederates to a high degree than when they mimicked confederates to a low degree. In contrast, participants who reported high responsiveness to social cues on eating (i.e., high social eaters) were somewhat (though not significantly) more likely to report social influences when they mimicked confederates to a high degree than when they mimicked confederates to a low degree. Thus, mimicked eating appears to increase the likelihood that people will recognize social influences on the food intake of others (Study 1); mimicked eating also has an impact on people's recognition of social influences on their own food intake, but the nature of this impact depends on an individual's reported tendency to eat in response to social cues (Study 2).

The results of these two studies suggest a difference between recognition of external influences on food intake for self and for others, similar to self–other differences in judgments that have been observed in other research domains (Douglas & Sutton, 2004; Epley & Dunning, 2000; Jones & Nisbett, 1971). A substantial body of research has shown that people are often motivated to view their behavior as uninfluenced by external factors (e.g., Brehm, 1966; Burger, 1987; Duck & Mullin, 1995), and to see themselves as more behaviorally free and independent than other people (Wolosin, Sherman, & Mynatt, 1972). Our results extend these findings by suggesting that the motivation to deny external influences on one's own behavior may apply only to certain people (e.g., low social eaters), whereas others might actually be willing to acknowledge these influences (e.g., high social eaters).

Previous research has found that people typically account for their food intake in terms of internal factors, such as hunger and satiety, and fail to report the influence of external factors, such as the eating behavior of others (Vartanian et al., 2008). We found that this bias does not extend to judgments of other people's food intake. Specifically, when viewing two people modeling each other's food intake, "the eating behavior of the other person" was rated as a stronger influence on the target's food intake than was hunger. Furthermore, this effect was driven by the presence of mimicked (but not matched) eating. We also found that the extent to which participants rated hunger and the eating behavior of the other person as influences on their own food intake depended on

their reported tendency to eat in response to social cues. For high social eaters, the other person's eating behavior was rated as just as influential in determining their own food intake as was hunger. For low social eaters, however, hunger was rated as a more important influence on food intake than was the other person's eating behavior. Given that previous studies have shown that social influences can often have a stronger impact on people's food intake than does hunger (Goldman, Herman, & Polivy, 1991; Vartanian et al., 2008), these findings lend further support to the notion that low social eaters may be motivated to actively deny social influences on their food intake, and prefer to explain their eating behavior in terms of common-sense factors such as hunger.

There are some limitations of the present studies that warrant discussion. First, a potential explanation for the discrepancy in recognition of social influences between Studies 1 and 2 is the relative salience of mimicry and matching. In Study 1, the scripted videos contained perfect mimicking and matching (or no mimicking or matching), whereas in Study 2, there was considerable variability in the degree to which participants mimicked and matched confederates. Second, there are limits to the generalizability of our findings, as the samples consisted of female university students who were predominantly in the normal-weight range, and included a large number of participants of Asian backgrounds. Future research should examine the recognition of external influences on food intake among more diverse groups of people. Third, in Study 2, the sample was relatively small and a number of participants were excluded from the analyses because they did not eat or because of technical difficulties, which may have limited statistical power.

In the current Study 2, as in other studies examining the recognition of social influences on food intake (Roth et al., 2001; Vartanian et al., 2008), participants were unacquainted with the confederate with whom they ate. The social processes involved in eating with familiar people may differ from those involved when eating with unfamiliar people (Clendenen, Herman, & Polivy, 1994; de Castro, 1994; Salvy, Jarrin, Paluch, Irfan, & Pliner, 2007). Therefore, future studies might focus on establishing whether people are more likely to acknowledge social influences on their food intake when they model familiar people. Another avenue for future research would be to develop a more refined understanding of the nature of modeling. Hermans et al. (2012) showed that mimicry is important in the modeling of food intake, and our studies found mimicry to be important in the recognition of social influences. Future research might explore the degree to which mimicked eating emerges in naturalistic contexts, the extent to which mimicry is influenced by individual differences, and the factors that predict acknowledgment of mimicked eating.

The findings of the current study suggest that people can recognize social influences on the food intake of others, at least when mimicry is present. With respect to their own food intake, however, some people appear to actively deny social influences, whereas others appear to be reasonably accurate in their acknowledgment of those influences. Failure to acknowledge social influences on food intake can have implications for people's evaluations of their personal ability to control their eating behaviors. For example, if people believe that their food intake is excessive or otherwise inappropriate, but fail to acknowledge the possible influences of external factors, they might overestimate the influence of personal factors (e.g., willpower and self-control) when ac-

counting for their failure to achieve their dietary goals. These misattributions might, in turn, result in a greater likelihood of experiencing self-blame and a sense of personal failure. Furthermore, if people erroneously believe that their food intake is less influenced by social factors than it is by hunger or the taste of the food, they may become overly complacent about social influences (or about their ability to withstand social influences) when eating in the company of others. Extending this notion to modern society's "toxic" food environment featuring widespread availability of high-fat foods and overlarge portion sizes (Brownell & Horgen, 2004), we suggest that ignoring external influences on food intake in general may be detrimental to an individual's ability to maintain a healthy diet and weight, which can have significant implications for his or her health and well-being.

References

- Aiken, L. S., & West, S. G. (1991). *Multiple regression: Testing and interpreting interactions*. Newbury Park, CA: Sage.
- Ambady, N., Hallahan, M., & Rosenthal, R. (1995). On judging and being judged accurately in zero-acquaintance situations. *Journal of Personality and Social Psychology, 69*, 518–529. doi:10.1037/0022-3514.69.3.518
- Bargh, J. A. (2006). What have we been priming all these years? On the development, mechanisms, and ecology of nonconscious social behavior. *European Journal of Social Psychology, 36*, 147–168. doi:10.1002/ejsp.336
- Brehm, J. (1966). *A theory of psychological reactance*. New York, NY: Academic Press.
- Brownell, K. D., & Horgen, K. B. (2004). *Food fight: The inside story of the food industry, America's obesity crisis, and what we can do about it*. New York, NY: McGraw-Hill, Contemporary Books.
- Burger, J. M. (1987). Effects of desire for control on attributions and task performance. *Basic and Applied Social Psychology, 8*, 309–320. doi:10.1207/s15324834basp0804_4
- Clendenen, V. I., Herman, C. P., & Polivy, J. (1994). Social facilitation of eating among friends and strangers. *Appetite, 23*, 1–13. doi:10.1006/appe.1994.1030
- Colvin, C. R., & Funder, D. C. (1991). Predicting personality and behavior: A boundary on the acquaintanceship effect. *Journal of Personality and Social Psychology, 60*, 884–894. doi:10.1037/0022-3514.60.6.884
- de Castro, J. M. (1994). Family and friends produce greater social facilitation of food intake than other companions. *Physiology and Behavior, 56*, 445–455. doi:10.1016/0031-9384(94)90286-0
- Douglas, K. M., & Sutton, R. M. (2004). Right about others, wrong about ourselves? Actual and perceived self–other differences in resistance to persuasion. *British Journal of Social Psychology, 43*, 585–603. doi:10.1348/0144666042565416
- Duck, J. M., & Mullin, B. A. (1995). The perceived impact of the mass media: Reconsidering the third-person effect. *European Journal of Social Psychology, 25*, 77–93. doi:10.1002/ejsp.2420250107
- Epley, N., & Dunning, D. (2000). Feeling "holier than thou": Are self-serving assessments produced by errors in self- or social prediction? *Journal of Personality and Social Psychology, 79*, 861–875. doi:10.1037/0022-3514.79.6.861
- Friedman, J. M. (2009). Causes and control of excess body fat. *Nature, 459*, 340–342. doi:10.1038/459340a
- Goldman, S. J., Herman, C. P., & Polivy, J. (1991). Is the effect of a social model on eating attenuated by hunger? *Appetite, 17*, 129–140. doi:10.1016/0195-6663(91)90068-4
- Herman, C. P., Roth, D. A., & Polivy, J. (2003). Effects of the presence of others on eating: A normative interpretation. *Psychological Bulletin, 129*, 873–886. doi:10.1037/0033-2909.129.6.873
- Hermans, R. C. J., Lichtwarck-Aschoff, A., Bevelander, K. E., Herman, C. P., Larson, J. K., & Engels, R. C. M. E. (2012). Mimicry of food intake: The dynamic interplay between eating companions. *PLoS ONE, 7*, e31027. doi:10.1371/journal.pone.0031027
- Jones, E. E., & Nisbett, R. E. (1971). *The actor and the observer: Divergent perceptions of the causes of behavior*. Morristown, NJ: General Learning Press.
- Nisbett, R. E., & Wilson, T. D. (1977). Telling more than we can know: Verbal reports on mental processes. *Psychological Review, 84*, 231–259. doi:10.1037/0033-295X.84.3.231
- Rolls, B. J., Morris, E. L., & Roe, L. S. (2002). Portion size of food affects energy intake in normal-weight and overweight men and women. *American Journal of Clinical Nutrition, 76*, 1207–1213.
- Roth, D. A., Herman, C. P., Polivy, J., & Pliner, P. (2001). Self-presentational conflict in social eating situations: A normative perspective. *Appetite, 36*, 165–171. doi:10.1006/appe.2000.0388
- Salvy, S.-J., Jarrin, D., Paluch, R., Irfan, N., & Pliner, P. (2007). Effects of social influence on eating in couples, friends and strangers. *Appetite, 49*, 92–99. doi:10.1016/j.appet.2006.12.004
- Van Strien, T., Frijters, J. E., Bergers, G. P. A., & Defares, P. B. (1986). The Dutch Eating Behavior Questionnaire (DEBQ) for assessment of restrained, emotional and external eating behavior. *International Journal of Eating Disorders, 5*, 295–315. doi:10.1002/1098-108X(198602)5:2<295::AID-EAT2260050209>3.0.CO;2-T
- Vartanian, L. R., Herman, C. P., & Wansink, B. (2008). Are we aware of the external factors that influence our food intake? *Health Psychology, 27*, 533–538. doi:10.1037/0278-6133.27.5.533
- Woloshin, R., Sherman, S. J., & Mynatt, C. R. (1972). Perceived social influence in a conformity situation. *Journal of Personality and Social Psychology, 23*, 184–191. doi:10.1037/h0033041

Received December 13, 2012

Revision received June 4, 2013

Accepted June 10, 2013 ■