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Modeling of palatable food intake. The influence of quality of social interaction

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ABSTRACT

This study investigates the effects of the quality of social interaction on modeling of food intake among young women. A two (confederate's food intake: high versus low) by two (confederate's sociability: sociable versus unsociable) between-participant factorial design was employed. A total of 100 young women (18–27 years) participated. Findings indicated that young women generally ate more when exposed to a high-intake peer than women exposed to a low-intake peer. However, this modeling effect was only found in the unsociable context. This study underscores the influence of social atmosphere on modeling effects of palatable food intake and suggests that contextual uncertainty or ingratiation strategies may be important in explaining the magnitude of modeling effects.

In modern society, the consumption of food has implications beyond merely providing nutrients and energy needed to sustain life. Food and eating also play a major role in our social lives; we eat with or in the presence of other people. Therefore, we should not be surprised if there were a strong connection between social context and the amount of food consumed. Research on modeling of food intake reveals that people tend to eat more when others eat more and less when others eat less (cf. Herman, Roth, & Polivy, 2003). Despite the numerous studies showing the robustness of modeling of food intake, little is known about why individuals model other people's food intake.

Rather than pursuing individual-difference moderators, we will focus on the conditions under which an individual's food intake becomes more like of that of their eating companion. Modeling is beneficial for various reasons, but of particular importance might be its social function. It might constitute the social glue that makes people social animals (Dijksterhuis, 2005). It is suggested that the primary force behind modeling among humans is a desire to be like others and belong to others (De Waal, 2001). Additionately, modeling can be used as a tool to communicate liking for and rapport with another (LaFrance & Ickes, 1981). It was found that when people have a goal to affiliate, they model more (Lakin & Chartrand, 2003). There is also experimental evidence that modeling leads to rapport. Chartrand and Bargh (1999) showed that individuals who were modeled liked the other person more and indicated that the interaction had been more smooth and harmonious. Further, modeling increases as social interactions become more personal (Jefferis, Van Baaren, & Chartrand, 2003). Sharing personal information may lead to greater rapport, which is expressed through increased modeling. Given the importance of the social function of modeling, we propose that the extent to which the eating behavior of the model will be reproduced by the observer might be influenced by the nature of the relationship between both.

To our knowledge, no experimental studies in the field of social modeling of food intake have investigated whether the quality of social interaction between young women (i.e., a confederate and a participant) affects the magnitude of the modeling effect. However, studies in other research fields have explicitly paid attention to the nature of the social interaction. Already in the 1960s, it was demonstrated that maternal nurturance was related to the child's tendency to imitate the mother's behavior (Bandura & Huston, 1961). In the warm and rewarding interactions, the children were more likely to imitate the mother's behavior as opposed to the children from which the mother avoided any interaction. Studies that have focused on the influence of social interaction on modeling of cigarette smoking or drinking, and therefore more comparable with our research aim, have all revealed the same: participants were more inclined to model a warm and interactive person than an unsociable person (Collins, Parks, & Marlatt, 1985).

The main aim of the current study was to investigate whether the quality of the social interaction affects the magnitude of the modeling effects of palatable food intake. An experimental-observational paradigm was used in which we varied the confederate's food intake (i.e., low versus high-intake) and sociability (sociable versus unsociable) during a 15-min break. We also made use of a control condition in which the participant was alone to test whether the presence of an eating companion increased or suppressed participants' food intake (cf. Zentall & Levine, 1972).

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Previously, it has been found that when participants are left alone, thus in a no-model condition, they eat intermediate amounts (Conger, Conger, Costanzo, Wright, & Matter, 1980). First, we expected the participants' intake to be strongly affected by the confederate's intake. Second, in line with studies on modeling of alcohol and smoking, we expected the modeling effects of food intake to be stronger when the confederate was sociable than when the confederate was unsociable. Third, we expected that participants who were alone in the room consumed an intermediate number of M&Ms, closer to the number consumed in the high-intake condition than to the number consumed in the low-intake condition.

Method

Design and participants

The experiment involved a 2 (eating condition: low- versus high-intake confederate) by 2 (nature of social interaction: sociable versus unsociable confederate) factorial design. The eating condition consisted of confederates eating 6 M&Ms (low-intake condition) or 24 M&Ms (high-intake condition). We restricted our study to female participants, since conforming to social norms with regard to eating may be more important for women than for men, due to impression management strategies (Pliner & Chaiken, 1990). We received approval for conducting the present study of the ethical committee of the Faculty of Social Sciences, Radboud University Nijmegen.

One hundred female undergraduate students (mainly in psychology or educational sciences) participated in this study. All participants were between 18 and 27 years of age ($M = 20.20$; $SD = 1.99$). Eighty-three percent of our sample had a Body Mass Index (BMI = weight in kilograms divided by the square of height in meters) within the normal range ($18 < \text{BMI} < 25$) ($M = 22.50$; $SD = 3.34$). Participants were tested either alone ($N = 22$) or together with a same-sex confederate ($N = 78$). The participants received course credits or payment (€ 8) for their participation.

Confederates

Seven female undergraduate students volunteered as confederates in our study. Their ages ranged from 19 to 24 ($M = 20.83$; $SD = 1.63$). They had a mean BMI of 20.69 ($SD = 0.94$). Before each session, the confederate was told whether she had to eat 24 or 6 M&Ms during the break and whether she had to act sociable or unsociable. In the sociable condition, the confederate was warm and friendly, and reacted naturally to remarks of the participant (cf. Harakeh, Engels, Van Baaren, & Scholte, 2007). In the unsociable condition, the confederate read some magazines and did not initiate or maintain a conversation with the participant. All confederates were trained in the procedure by participating in a workshop run by a professional drama coach. The confederates were instructed to remain sociable or unsociable during the whole session.

Setting and procedure

The experiment took place in a laboratory furnished as an ordinary living-room. The room was decorated with paintings, plants, and small decorations. It was furnished with two comfortable couches positioned at a 90° angle, a coffee table and a side table on which a pitcher of water, four glasses, and a bowl of M&Ms were placed. The bowl of M&Ms and pitcher of water were within easy reach of both participants. A wall unit with a projector, a DVD player and a sound system was placed behind one of the couches. During the experimental break, popular music was played. The participants were invited to our laboratory on weekdays between 10 a.m. and 7 p.m., in the period February–April 2008. All sessions took about 60 min in total.

Participants registered for a study on evaluation of movie trailers, which was a cover story to prevent the participants from becoming aware of the true aim of the study (i.e., modeling of food intake). The experimenter met both the participant and the confederate at the front office of the lab facilities. They were accompanied to the laboratory where the procedure of the study was explained to them. They were required to individually evaluate three different movie trailers. This task was very straightforward and took approximately 10 min.

There was a break after completion of this first task. Participants could spend their time as they wished but had to stay in the room. They could read some magazines, background music was put on, and they were told they were free to help themselves to M&Ms and water. These instructions were used during all sessions. The experimenter did not specify how long the break would last. In the sociable condition, the confederate was instructed to directly initiate a conversation with the participant on topics in which the participant seemed to be interested (e.g., education or sports). In the unsociable condition, the confederate avoided eye-contact and started reading a magazine after 2 min. When the participant talked to the confederate, the confederate responded with a single word or short phrase. The confederate was instructed to directly pick one (low-intake) or four (high-intake) M&Ms at the beginning of the break. Because we were interested in modeling behavior, the confederate always had to pick the first M&Ms. During all sessions, the confederates did not make any remarks on the taste, colour or the perceived palatability of the M&Ms. Standardized time instructions were provided by a small light in the corner of the room (i.e., the confederate saw the light six times). When the confederate saw the light flashing, she had to pick the predetermined number of M&Ms (for a more detailed overview of the instructions, see Hermans, Larsen, Herman, & Engels, 2008). The experimental break was video-recorded by an unobtrusive camera hidden in the corner of the room. After 15 min, the experimenter re-entered the room and gave instructions about the second evaluation task. Participants had to evaluate the three movie trailers again, but were now free to engage in discussion. This task took approximately 10 min.

Finally, both participants were told that they had to fill in some personal questionnaires. The confederate was asked to fill in the questionnaire in an other room due to privacy matters. However, the actual reason was that only the participant had to fill in a questionnaire about the atmosphere of the break, the impression of the other person, dietary restraint, subjective rating of hunger and liking of the M&Ms. After the participant completed this questionnaire, the experimenter measured her height and weight. Debriefing took place after the data collection for the entire experiment was completed.

Measurements

M&M consumption during the break

In the observation room, a research assistant counted the total number of M&Ms consumed. The total quantity of food consumed (i.e. single pieces of M&Ms) was used as our dependent variable. M&Ms are a preferred snack food for young women, at least in The Netherlands, (Anschutz, Van Strien, & Engels, 2008) and it is known that sweet and high-fat snacks are highly rewarding (e.g. Olszewski & Levine, 2007).

Hunger

Participants' subjective hunger was recorded on a 10-point rating scale, with possible responses ranging from 1 = not at all hungry, to 10 = very hungry (Hermans et al., 2008).

BMI

The research assistant measured the participants' height to the nearest 0.5 cm. and weight was measured to the nearest 0.1 kg using a digital balance. BMI was calculated as weight in kilograms divided by the square of height in meters.

Dietary restraint

Restrained eating was measured with 10 items in the Dutch Eating Behavior Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986) with response categories ranging from 1 ('never') to 5 ('very often'). Cronbach's alpha was 0.93. Participants' mean score on this subscale of the DEBQ was 2.53 ($SD = 0.80$). This score is close to the norm group score ($M = 2.60$; $SD = 0.80$) for Dutch female college students ($N = 405$) (Van Strien, 2005).

Results

Manipulation checks

Participants rated the confederates in the sociable condition as more friendly, pleasant, kind and less annoying and arrogant than the confederates in the unsociable condition ($p < 0.001$). Furthermore, participants perceived the break as more pleasant, more relaxing and less uncomfortable when they were in the presence of a sociable confederate than when in the presence of an unsociable confederate ($p < 0.01$). Second, ninety-six percent of the participants ($N = 75$) noticed that the other person consumed some M&Ms. Participants exposed to a high-intake confederate reported the confederates' total number of M&Ms consumed as higher ($M = 17.63$; $SD = 7.03$) than did participants exposed to a low-intake confederate ($M = 6.42$; $SD = 2.97$), $t(74) = -9.05$, $p < 0.001$.

BMI, dietary restraint, participants' subjective hunger and liking of M&Ms were not significantly correlated with participants' M&M consumption ($p > 0.10$) and therefore not included in the model as potential confounds. Additionately, participants in the four conditions did not differ on the above mentioned variables ($p > 0.10$).

Impact of eating condition and nature of social interaction on intake

The main question is whether the confederates' warmth (or coldness) and intake (high or low) affected the participants' total intake during the break. Table 1 shows the total number of M&Ms consumed in the different conditions.[1] Participants exposed to a confederate who ate a large number of M&Ms consumed marginally more than did those exposed to a confederate who ate only a small number of M&Ms, $F(1, 74) = 3.81$, $p = 0.06$. This main effect was qualified by a significant interaction between eating condition and the nature of the social interaction condition $F(1, 74) = 5.81$, $p < 0.05$. The pattern of this interaction indicates that the customary modeling effect was found only in the unsociable condition. Post hoc tests revealed a strong difference in intake between the participants exposed to an unsociable confederate consuming either a few or a many M&Ms, $t(38) = -2.67$, $p = 0.01$. No significant differences in consumption were found when participants were exposed to a low- or high-intake sociable confederate. When excluding the non-M&Ms eaters from our sample, we found a stronger interaction effect between eating condition and nature of social interaction, $F(1, 36) = 10.77$, $p < 0.01$. The pattern of the interaction was similar as in the overall analysis.

Finally, when comparing the four separate conditions with the control condition, we found that participants exposed to an unsociable low-intake confederate consumed significantly fewer M&Ms than participants who were eating alone $t(41) = -2.72$, $p < 0.01$). Participants who were alone in the room consumed approximately 8 M&Ms, which is in the middle in terms of total number of M&Ms consumed in the other conditions.

Table 1
Total number of M&Ms consumed in the different conditions.

	Low-intake confederate		High-intake confederate	
	M	*SE*	*M*	*SE*
Sociable confederate	6.58	1.97	5.68	1.97
Unsociable confederate	2.14	1.87	10.63	1.97

Note: In the control condition participants consumed a mean number of 8.45 M&Ms ($SE = 2.17$).

Additional analyses

Since it might take some time before the participant finds out that the confederate is not responsive and warm and that the interaction will not be so cordial, we conducted the analyses again but now omitting intake within the first 2 min of the session. The interaction between eating condition and nature of social interaction remained significant, $F(1, 74) = 5.99$, $p < 0.05$. Finally, we also used a difference score between what the confederate ate and what the participant ate as an alternative dependent variable. Again, the interaction between eating condition and nature of social interaction remained significant, $F(1, 74) = 4.31$, $p < 0.05$.

Discussion

This study examined how and under what circumstances young female adults adjust their level of eating to a same-sex peer. We investigated whether the quality of the social interaction between the two people would influence the modeling effect.

The present study showed, first, that young women who were exposed to a same-sex peer eating a large amount of high calorie palatable food ate more than those exposed to a peer who ate a small amount of high calorie palatable food. This finding is in accordance with other research on modeling of palatable food intake. Young women tend to adjust their food intake to those with whom they eat (e.g. Herman, Koenig-Nobert, Peterson, & Polivy, 2005). Additionately, this study showed that young women eating alone consumed an intermediate amount compared to individuals eating together with an other woman. If we assume that young women use an other women's intake as a guide for their own eating behavior to ensure that they eat an appropriate amount, then the absence of such a model will lead to an eating pattern that is not affected by social norms (apart from personal norms). The modeling effect on eating, however, was qualified by an interaction between confederate's intake and the nature of the social interaction. In line with observational studies in the field of alcohol consumption (e.g., Collins et al., 1985), we expected to find stronger modeling effects in the sociable context. Our results seem to indicate the opposite. In the sociable context, there was no indication of modeling, whereas there was a strong modeling effect in the unsociable condition. Young women exposed to a low-intake unsociable peer consumed less than those exposed to a high-intake unsociable peer.

We offer two possible explanations for this unexpected finding. First, it may be that the unsociable atmosphere generates feelings of contextual uncertainty among the female participants. An important factor contributing to increased modeling is the uncertainty of how one should behave in a given situation (Deutsch & Gerard, 1955). By accommodating one's own behavior to that of others one

[1] Only 38.1 percent of the women took some M&Ms when exposed to an unsociable low-intake confederate as opposed to 47.37, 68.42 and 52.63 percent of the women exposed to an unsociable high-intake confederate, sociable low- or high-intake confederate, respectively. In the no-model control condition, 81.20 percent of the women took some M&Ms.

might resolve feelings of uncertainty about how much food is appropriate to consume in a given situation (Herman et al., 2003). This uncertainty-reduction explanation for modeling seems to be apparent in the unsociable conditions. Participants in the unsociable conditions perceived the break as more uncomfortable and less relaxing, which may have made the participant more uncertain about the appropriate amount of food to consume and therefore more likely to use the behavior of the confederate as a guide to behavior, leading to more modeling. Furthermore, the finding that participants in the two high-intake conditions differed in their level of accuracy of their eating partner's consumption might indicate that an unsociable eating context makes young women more aware of the other's eating behavior.

Another possibility, not incompatible with the first, is that the enhanced modeling in the unsociable condition may reflect an attempt at ingratiation. Modeling the behaviors of others is a common response in situations in which there is a desire to affiliate (Lakin & Chartrand, 2003). Imitation may be also used to build liking and rapport between people (Chartrand & Bargh, 1999). Perhaps the participants were trying to ingratiate themselves with the unsociable confederate by modeling her intake. There might be less need to establish a strong bond with the sociable confederate who was already friendly and showing interest. The unsociable confederate, however, was unresponsive and did not show any interest in the participant. Perhaps the participants tried to win the aloof confederate over by emulating her (''imitation is the sincerest form of flattery'') (Colton, 1837).

By using observational data from young adults in a (semi-) naturalistic setting, we enhanced the ecological validity of the study. Despite this strength, some limitations should be considered. Although the results of the present study are justifying the generalization that young women eat more palatable snack food when exposed to a high-intake model than when exposed to a low-intake model, it was found that the overall degree of intake during the 15-min break was relatively low. At best, participants consumed a mean number of 11 M&M's, which is still half of the confederate's intake. The finding that participants eat less than the confederate is not uncommon in the literature on social modeling of food intake (e.g., Conger et al., 1980). The question, however, is whether we have to expect exact matching of the confederate's intake. A possible reason why we might not expect exact modeling effects is that when the confederate eats a large amount of snack food in short period of time, nonsocial factors such as sensory-specific satiety (Rolls, Rolls, & Rowe, 1982) may place a upper limit of how much one should eat. This might also be the case in our study. Second, future studies might manipulate portion size or should give participants a choice between different types of snacks (e.g. pizza slices or chicken wings), as we expect more variation in the amount of food consumed when they have to choose among a variety of foods. Third, we concentrated on young women, which restrict the generalizability of our findings. It is important to replicate findings with men. Previously, it has been found that female participants eat less in the presence of an opposite-sex eating companion (versus a same-sex eating companion) (e.g., Mori, Chaiken, & Pliner, 1987). Therefore, it would be interesting to replicate findings with opposite-sex partners in order to determine whether the modeling effect is restricted to the sex of the eating partner.

We have articulated that the quality of the social interaction affects young women's modeling behavior. However, empirical studies are needed to gain more insight into the underlying mechanisms why and under what circumstances people model each other's eating behaviors. The impact of ambience on social modeling of food intake should be tested, for example in studies that manipulate the relationship between the people present. These studies might examine the moderating effects of type (i.e., familiar or unfamiliar eating companions) and duration of the relationship on social modeling of food intake. In general, people will be more relaxed and comfortable with familiar people than with strangers (Stroebele & de Castro, 2004). Although this relaxation might increase overall food intake, our present findings suggest less modeling among familiar people than among strangers. Moreover, to further understand social modeling of food intake in this context it is important to focus on personal factors relevant to the participant and the confederate that might have influenced the results. For instance, future studies could examine whether or how participants' own sociability is influencing social modeling in a sociable or unsociable context.

All in all, the present study demonstrates that the quality of social interaction affects young women's modeling of palatable food intake. Young women are more likely to model the high-calorie intake of an unsociable eating companion than the intake of a sociable companion. In order to provide a better understanding of the mechanisms underlying this modeling effect of food intake, future research should further examine the impact of social atmosphere on people's modeling behavior.

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