Appetite 51 (2008) 512–518

Contents lists available at ScienceDirect

Appetite

journal homepage: www.elsevier.com/locate/appet

Research report

Modeling of palatable food intake in female young adults. Effects of perceived body size

Roel C.J. Hermans [a,*], Junilla K. Larsen [a], C. Peter Herman [b], Rutger C.M.E. Engels [a]

[a] Behavioural Science Institute, Radboud University Nijmegen, P.O. Box 9104, 6500 HE Nijmegen, The Netherlands
[b] Department of Psychology, University of Toronto, 100 St. George Street, Toronto, Ontario, Canada M5S 3G3

ARTICLE INFO

Article history:
Received 5 December 2007
Received in revised form 7 March 2008
Accepted 31 March 2008

Keywords:
Social modeling
Food intake
Physical appearance
Impression management
Perceived body size

ABSTRACT

Laboratory taste-test studies have shown that social modeling effects on food intake are powerful. The aim of the present study was to examine the degree to which people model food intake in a more naturalistic eating setting. After completing a cover task, female participants ($N = 102$) spent a 15-min break with a female confederate who ate a large amount or a small amount of M&Ms or no M&Ms at all. Further, the confederate had a slim or (subtly manipulated) normal-weight appearance. Females who were exposed to a confederate who ate much consumed more than those who were confronted with a confederate who ate only a little or nothing at all. Although the manipulation of the confederate's appearance had no significant main effect on the amount of food that participants consumed, a significant interaction effect was found, such that the modeling effect of eating was present only in the normal-weight appearance condition. Our findings suggest that normal-weight young women are more inclined to imitate the food intake of a female confederate if they are more similar to the confederate.

Introduction

Food and eating play an important role in social life: the majority of our meals or snacks are consumed in the presence of other people. In general, people eat more when eating with others than when eating alone (de Castro & de Castro, 1989; Redd & de Castro, 1992). In addition to this social facilitation effect, people model each other's eating behaviors. In a typical modeling experiment, the participant eats in the presence of a confederate who has been instructed to eat either a lot or a little. Previous experiments on the modeling of food intake made use of taste-test or incidental-eating designs with a confederate present or with information provided to participants about what alleged former participants ate (remote-confederate paradigms). Such studies, regardless of the participants' hunger status, dieting status, or weight, have all found the same pattern: people tend to eat more when confederates eat more and less when confederates eat less (Conger, Conger, Costanzo, Wright, & Matter, 1980; Goldman, Herman, & Polivy, 1991; Herman, Roth, & Polivy, 2003; Rosenthal & Marx, 1979; Roth, Herman, Polivy, & Pliner, 2001). This modeling effect appears to be so powerful that it may even overwhelm feelings of hunger, satiety or dieting intentions.

Although these effects are quite strong, they have been observed primarily in laboratory taste-test studies in which participants are required to taste different kinds of foods and are allowed to eat as much as they like. This paradigm suffers from some limitations. Although 'rating the taste of food' is not a particularly difficult or exhausting performance task compared to many other performance tasks (e.g., solving mathematical problems), taste rating may nevertheless interfere with normal eating. Second, the taste-rating design forces people to eat at least something, which could be very difficult or disruptive for certain types of people (e.g., restrained eaters). Third, and probably most important, the taste-test design is not comparable with a real-world social eating situation. Experiments conducted in more naturalistic settings are more suitable to test the generalization of modeling effects (Bot, Engels, Knibbe, & Meeus, 2007; Engels & Granic, 2005).

The extent to which people model other's eating behavior is likely to depend not only on the context in which the eating takes place, but also on the characteristics of the model. Some researchers (e.g., Salvy, Romero, Paluch, & Epstein, 2007) have suggested that the model's physical appearance is important in explaining the magnitude of modeling effects. Although the availability of palatable food generally motivates eating in humans, the presence of social company might have an independent (or interactive) effect on eating. To avoid making the wrong impression, people are guided not only by the normative

* Corresponding author.
E-mail address: r.hermans@pwo.ru.nl (Roel C.J. Hermans).

0195-6663/$ – see front matter © 2008 Elsevier Ltd. All rights reserved.
doi:10.1016/j.appet.2008.03.016

standards that others establish by their own eating patterns but also by what they think that others would think of them when they eat too much. This latter consideration can be explained by the fact that overeating in social contexts has negative connotations; for instance, overeaters are seen as being deficient in self-control (low delay of gratification) (Puhl, Schwartz, & Brownell, 2005). Whether people inhibit their tendencies to eat, especially in novel social contexts with strangers, may also depend on the weight of the other persons (e.g., slim, normal weight, or overweight) as this provides clues about whether the others will accept the intake of palatable food.

A few studies have examined the role of the physical appearance of the model. De Luca and Spigelman (1979) found that obese females ate more in the presence of a large-eating obese confederate than in the presence of a large-eating non-obese confederate. Similarly, Salvy et al. (2007) found that overweight girls who were with overweight peers ate more than did overweight girls who were accompanied by normal-weight peers. These studies compared modeling of food intake when the confederate is normal weight versus overweight or obese, creating large contrasts in physical appearance of the model. We were interested in seeing whether normal-weight young women are affected by the example of a slim versus a normal-weight model. The assumption is that normal-weight females will more strongly model the food intake of a normal-weight confederate than of a slim confederate, because eating too much, particularly in the company of a slim model, might lead to negative judgments and social disapproval (Vartanian, Herman, & Polivy, 2007).

The main aim of the current study was to examine modeling effects on food intake in normal-weight young women. An experimental–observational paradigm was used in which we varied the confederate's physical appearance and food intake during a 15-min break in an experimental session. Two hypotheses were tested. First, we predicted that participant's food intake would be strongly affected by confederate's food intake (with three conditions: no intake, small intake, and large intake). Second, we predicted that these modeling effects would be stronger if the confederate was of normal weight than if the confederate was slim. We manipulated the confederates' physical appearance by having the same slim confederates wear a soft silicon belt underneath their clothes in the normal-weight condition.

Method

Design

An experimental design with a three (confederate intake: high, low, none) by two (confederate-weight status: slim, normal weight) factorial design was used. Participants were randomly assigned to one of the six conditions. Confederates were instructed to eat nothing (no-intake condition), 4 M&Ms (low-intake condition), or 25 M&Ms (high-intake condition). The weight condition consisted of confederates wearing either a tummy belt (normal-weight condition) or not (slim condition). In the normal-weight condition, the confederate wore a custom-made (SKM Rapid Modelling BV, Helmond, The Netherlands) tummy belt of soft silicon which made her look visibly thicker around her belly (Figs. 1 and 2).

Participants

A total of 127 young women (university students) volunteered for the study. All participants were recruited via an Internet sign-up program of the Behavioural Science Institute of the Radboud University Nijmegen. Registration for our study was restricted to female students. We excluded 7 participants from further analyses because they became aware of the actual aim of the study. Additionally, as our aim was to examine whether normal-weight young women were affected by the example of slim versus normal-weight models, we excluded 25 overweight participants (BMI $>$ 25) from our study. The final sample, then, consisted of 102 participants with a mean age of 20.50 (S.D. = 2.09) and a mean BMI of 21.50 (S.D. = 1.76). All participants were of normal weight.

Confederates

Seven female students at the Radboud University Nijmegen acted as confederates. They had a mean age of 22.86 (S.D. = 2.61) and a mean BMI of 20.90 (S.D. = 1.10). These girls all had relatively slim figures, which was necessary for the success of the weight manipulation. Although it is difficult to control for individual characteristics (e.g., attractiveness or friendliness), we tried to select confederates of whom the physical appearances were almost the same. Furthermore, they were all socially skilful and therefore capable to start and maintain a conversation with an unknown other. The confederates were carefully instructed and trained in

Fig. 1. Digital photo of a confederate whose physical appearance was not manipulated.

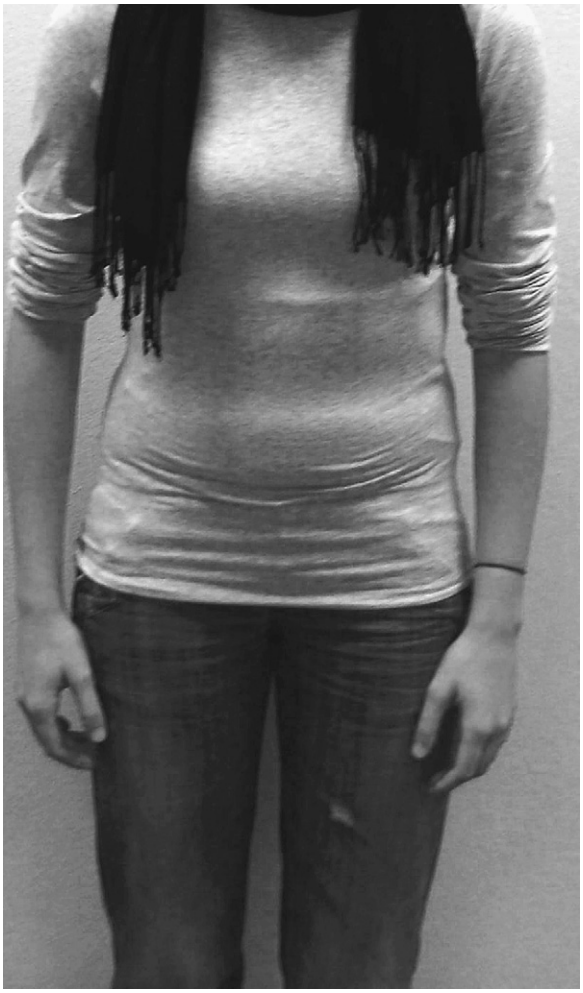

Fig. 2. Digital photo of a confederate whose physical appearance was manipulated with a custom-made soft silicon belt.

the procedures. Each session included two people: one was the actual participant and the other was the confederate who acted as if she was an ordinary participant (cf. Harakeh, Engels, Van Baaren, & Scholte, 2007). The confederates were randomly assigned to one of the six conditions in a given session. They were not informed about the exact hypotheses. The seven confederates were dressed almost identically during all experimental sessions, wearing blue jeans and a form-fitting top to reduce the possibility that differences in clothing might bias the results (see Krones, Stice, Batres, & Orjada, 2005). Before the start of each session, the confederate was told to eat either nothing, a small amount, or a large amount of M&Ms during the break and to wear the tummy belt or not beneath her clothes. The confederates were assigned equally to the various conditions.

Procedure

Participants were invited to engage in a study on evaluation of TV commercials. This was a cover story to prevent the participant's attention from being drawn into the actual aim of the study, i.e., examining social modeling of food intake. No further details were given with respect to the content of the study. This type of procedure has been used in several experiments conducted in our lab on modeling of alcohol consumption or cigarette smoking (e.g., Bot, Engels, & Knibbe, 2005; Harakeh et al., 2007). To simulate a naturalistic setting, we made use of a small room that was furnished as a living room, in which a relaxing atmosphere was created. The experimental living room was furnished with a table on which was placed a pitcher of water, six glasses, and a bowl of M&Ms. Food and drinks were easily reachable by both persons from two chairs which were situated facing each other so that the confederate and the participant could easily see each other. In the corner of the room stood a small table with a TV and DVD player and two comfortable viewing chairs.

Participants were invited to our laboratory during the period April–June 2007. All sessions took place on weekdays from 11 a.m. to 5 p.m. The participant, confederate and experimenter met each other at the front office of the research department. Then the experimenter accompanied the confederate and participant to the observation room, where the procedure of the study was explained. First, the participant and confederate were told to sit in front of the TV screen. The first task involved evaluating five commercials shown on the TV screen (neutral commercials without women or references to weight or food); they had 30 s to individually complete questions assessing whether the advertisement was irritating or appealing. This task took approximately 5 min. After completion of the task, there was a break. The participants were obliged to stay in the room, but were free to sit down at the table. They were told that they were free to help themselves to M&Ms and water. This instruction was used during all sessions. Participants were told they could talk with their partner (i.e., the alleged other participant) and recorded music was played to create a relaxing atmosphere. Type of music (*Ready to go Women of the* 90s, Sony BMG Music Entertainment (Netherlands) BV, 1998) and volume was kept constant. The experimenter did not specify how long the break would last, unless it was specifically asked. Then the experimenter left the room. The confederate was instructed to directly take an M&M at the beginning of the break if she had been instructed to eat 4 or 25 M&Ms.[1] Further, we standardized the timing of the confederate's food intake. We gave confederates instructions with a small light in the corner of the room (invisible to the participant). When she saw the light flash, the confederate was to take a predetermined number of M&Ms. The timing was kept stable over sessions for the low- (4 M&Ms) and high- (25 M&Ms) intake conditions. During the 15-min break, video and audio recordings were made. One flexible camera (with zoom) was hidden in the same corner of the room as was the flashing light used for the confederates' instructions. In another room, the experimenter operated the camera and observed the behavior of the participant. After the break, the experimenter entered the room and gave instructions about the second 5-min task, in which the participant and the confederate were instructed to evaluate the commercials together and to complete the questionnaire together.

Finally, both women were asked to complete some questions about their impression of the break, judgment of the confederate's figure, hunger ratings, liking of M&Ms and the actual aim of the study. They were told that they were guided to different rooms because of the personal nature of the questions. However, the actual reason for this separation was that the confederate had a shortened version of the questionnaire, including only the questions on the atmosphere of the break and her impression of the participant. After the participant had completed the questionnaire, she was taken to another room where her weight and height were measured.

[1] Before starting our study, a pilot study was performed among female undergraduate and graduate students to determine a reasonable amount of M&Ms in the low- and high-intake conditions. It appeared that approximately 4 and 25 M&Ms corresponded with what people perceived as a small or large amount of M&Ms.

Each participant received 8 euros or 1 course credit (for educational requirements) for participating in this study. After all data were collected, participants were debriefed about the actual purpose of the study by sending an e-mail to their university e-mail address.

Measures

Food intake

In the observation room, the experimenter counted the number of M&Ms eaten by the participant. At the end of the session, the total number of M&Ms eaten was counted and converted into kcal in line with Anschutz, Van Strien and Engels (in press), we used total kcaloric intake as the dependent variable instead of total grams of food consumed. We measured the mean weight of a single M&M by weighing ten M&Ms and dividing this by ten (mean = 2.1 g). According to the food label of a bag of M&Ms, 100 g of M&Ms contains 516 kcal. So, a single M&M contains 10.84 kcal (5.16 multiplied by 2.1).

Hunger

We measured the participants' subjective hunger on a 10-point rating scale (from 1 = not at all hungry, to 10 = very hungry).

Confederate's physical appearance

The physical appearance of the confederate was assessed by asking participants to evaluate the figure of the female confederate. We made use of a scale that was based on that of Stunkard, Sorensen and Schulsinger (1983). Participants saw nine drawings with female figures and they had to choose the figure that corresponded most closely to that of the confederate. We further split these figures into upper- and lower-body drawings. The participants had to choose the upper- and lower-body pictures that most closely corresponded to the confederate's upper and lower body, respectively.

BMI

Height and weight were measured, with participants wearing light clothing without shoes. Height was measured to the nearest 0.5 cm with an adjustable tape line attached to the wall, and weight to the nearest 0.1 kg using a digital balance (Mettler PM3000). Body mass index was calculated by the weight in kilograms divided by the square of height in meters.

Dietary restraint

To measure dietary restraint we made use of The Dutch Eating Behavior Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986). Examples of items were 'Do you deliberately eat less in order not to become heavier?' and 'Do you take your weight into account when eating?' Restrained eating was measured with 10 items on a 5-point scale with responses ranging from 1 ('never') to 5 ('very often'). This scale has good internal reliability and good concurrent, construct, and predictive validity (Van Strien, Engels, Van Staveren, & Herman, 2006). Cronbach's α coefficient was 0.93. Participants' mean scores on the restraint subscale of the DEBQ (Van Strien et al., 1986) was 2.57 (S.D. = 0.84). This score is similar to the norm group score ($M = 2.60$; S.D. = 0.80) for Dutch female college students ($N = 405$) (Van Strien, 2005).

Strategy for analyses

Before performing our main analyses, we first checked whether the manipulation of the confederate's physical appearance was successful. Independent-sample t-tests were used to compare participants' rating of the confederate's figure to check whether they had different perceptions of the confederate's figure in the slim and normal-weight conditions. We also examined whether participants in the various conditions differed with respect to how they perceived the experimental break and how they judged the personal characteristics of the confederate, using analyses of variance. For our main question, an analysis of variance was used to examine the main effects of the intake and confederate-weight conditions and the interaction between them on participants' total kcaloric intake. BMI and dietary restraint were not significantly correlated with food intake ($p > 0.10$) and were not included in the model. However, hunger, $r(102) = 0.27$, $p < 0.01$, and liking of the M&Ms, $r(102) = 0.22$, $p < 0.01$, were significantly correlated with food intake and were entered into our model as covariates.

Results

Manipulation checks

Participants' ratings varied significantly as a function of the confederates' physical appearance, $t(100) = 2.71$, $p < 0.01$. Participants rated the figure of the model as slimmer ($M = 3.13$, S.D. = 0.71) in the slim condition than in the normal-weight condition ($M = 3.58$, S.D. = 0.93). Participants significantly differed in their rating of the upper part of the confederate's body $t(100) = 3.26$, $p < 0.01$, but not in the lower part rating, $t(100) = 1.39$, *n.s.* In sum, our appearance manipulation was successful in the sense that participants noticed the difference between the slim and normal-weight confederate. Randomization over the six conditions was also successful: participants in the various weight manipulation and eating conditions did not differ on BMI, hunger, liking of M&Ms and dietary restraint ($p > 0.10$), nor were there any significant interactions between the eating and weight condition on the above-mentioned variables.

Furthermore, the majority of the participants perceived the break as relaxing (86.3%), nice (87.3%), entertaining (86.3%) and interesting (66.7%). There were no differences between participants in the different conditions as to how they rated the atmosphere during the break. It appeared that there were no differences between participants in the different conditions as how they rated the personal characteristics of the confederates. Our confederates were evaluated as generally friendly, attractive, sociable and healthy. Moreover, there were no differences

Table 1
Total amount consumed in each condition

	N	Mean kcaloric intake	Standard deviation	Adj. mean	Standard error	Total amount of M&M's consumed in pieces		N	Mean kcaloric intake	Standard deviation	Adj. mean	Standard error	Total amount of M&M's consumed in pieces
Slim confederate							Normal weight confederate						
No intake	17	18.49	46.26	23.60	16.28	2.18	No intake	16	5.97	21.64	6.42	16.72	0.59
Low intake	20	21.13	28.01	23.61	14.97	2.18	Low intake	17	28.86	41.38	27.00	16.23	2.49
High intake	15	52.67	56.26	47.29	17.40	4.36	High intake	17	117.16	147.79	115.33	16.27	10.64

($p > 0.05$) between confederates as how their personal characteristics were perceived by the participants.

Food intake

Our primary question was whether participants' intake varies when in the presence of a slim or normal-weight model who eats either nothing, a small amount, or large amount of M&Ms. Table 1 shows the total amount consumed in the different conditions. We controlled (through covariation) for individual variations in hunger and liking of M&M's, as these were associated with food intake. There was a significant main effect for eating condition on the amount of kcalories consumed, $F(2, 100) = 9.18$, $p < 0.001$.

Although the weight manipulation had no significant main effect on the amount of kcalories that the participants consumed, $F(1, 101) = 1.84$, *n.s.*, there was a significant interaction effect between eating condition and weight condition on total amount of kcalories consumed, $F(2, 100) = 3.54$, $p < 0.05$. The total model (participants' food intake; confederates' weight status; participants' hunger level; participants' liking of M&Ms; and the interaction between these variables) explained 27% of the variance in total kcaloric intake. Closer inspection revealed a significant modeling effect in the normal-weight condition, $F(2, 50) = 7.26$, $p < 0.05$, but not in the slim model condition, $F(2, 52) = 1.96$, $p = 0.15$. Scheffé post hoc tests showed that within the normal-weight condition, the high-intake condition differed from the control ($p < 0.01$) and low-intake ($p < 0.05$) conditions. In terms of effect sizes these effects were large and moderate–large, respectively; participants consumed more kcalories when with a high-intake, normal-weight confederate than when with a normal-weight confederate who ate nothing ($d = 0.86$) or a small amount ($d = 0.72$).

Although participants consumed more kcalories when in the presence of a large-eating confederate, their actual intakes were less than half of the models'. An increase of 21 M&Ms in the intake of the model only induced an increase of approximately 8 M&Ms in the participants'. As a result, the intake of the participant was substantially lower than the confederate's. Additional analyses revealed no differences in findings for the different confederates. Furthermore, equivalent results were found when using the participants' total number of M&M's eaten as the dependent variable.

Although all our participants were in the normal BMI range, differences in weight were still substantial. We also performed an additional regression analysis to test whether variation in participants' BMI influenced the modeling effects found. Results showed no significant two- and three-way interactions between participants' BMI (continuous variable), eating condition and weight condition.[2]

Discussion

The present study examined social modeling effects on intake of snack food in young women. We aimed to test whether women would imitate the eating behavior of a previously unknown same-sex peer and whether imitation is moderated by the physical appearance of this model. To our knowledge, this is the first experimental study in which social modeling of eating is tested in young women in a more naturalistic environment (i.e., a living-room setting and not within the context of a taste-test study). In our opinion, using such a paradigm strengthens the generalizability of our results to real-world eating contexts. The extent to which people model others' eating behavior might depend on characteristics of the model. Therefore, we subtly manipulated the physical appearance of slim models by having them wear a soft silicon belt which made them look visibly thicker. By doing so we avoided problems that might have biased the results of earlier studies on social modeling of food intake and weight status; prior studies used different models varying in weight (i.e., De Luca & Spigelman, 1979; Salvy et al., 2007).

It is clear that the presence of a female eating confederate had a significant effect on food intake of our young female participants. This result corresponds to the results of other social modeling studies on food intake; people eat more when their eating companion eats more (Conger et al., 1980; Goldman et al., 1991; Herman et al., 2003; Rosenthal & Marx, 1979; Roth et al., 2001). However, we found that normal-weight female participants displayed imitation (i.e., eating substantially more when the confederate ate substantially more) only when their eating companion was also of normal weight and not when their eating partner was rather slim. This suggests that young women's modeling behavior is affected by the physical appearance of the eating partner.

A few possible explanations for this pattern of results may be offered. First, because overeating has some negative connotations (Puhl et al., 2005) and women who eat less are generally judged more positively (Chaiken & Pliner, 1987), women may inhibit their eating under conditions in which it appears that making a good impression is important. Roth et al. (2001) showed that women inhibit their eating when observed by an experimenter. In our study, the relatively slim models may have induced minimal-eating impression-management strategies among the normal-weight participants. Being thin is generally viewed as a sign of status, discipline and healthfulness (Leary, Tchividijian, & Kraxberger, 1994). Therefore, the young women in our study may have been more concerned with impressing the slim confederate than with impressing the normal-weight confederate and may have presented themselves as disciplined eaters by restricting their snack intake (irrespective of how much the confederate ate). Second, a slim confederate may be seen as more likely to be judgmental than a normal-weight confederate, so women interacting with a slim confederate may have felt more self-conscious about their weight, resulting in a restricted snack intake (and thus less modeling of the high-intake confederate). In contrast, in situations in which a normal-weight model consumes large amounts of snack food, it may be more acceptable for participants to consume more. In this particular situation, their desire to be perceived as more feminine, or their fear of being negatively evaluated, could be reduced because the physical appearance of the eating partner was less than "perfect". We found that the participants more closely resembled (or thought that they more closely resembled) the normal-weight confederates than the slim confederates on the figure rating scale of Stunkard, Sorensen, and Schulsinger (1983), suggesting that social modeling effects could be strengthened by feelings of similarity. Third, eating and weight are acknowledged as socially acceptable competition motives among women (Rodin, Silberstein, & Striegel-Moore, 1985). Perhaps women are more motivated to compete (by restricting their food intake) when with a visibly slimmer woman.

Further research is required to explore the mechanisms underlying the stronger modeling effects in the normal-weight models. Such exploration is rendered difficult (see also Herman et al., 2003; Salvy et al., 2007), since psychological states that occur *during* social interactions are not easily measurable if one wants to keep the situation as natural as possible. Furthermore, impression management and competition motives are often unconscious

[2] We also tested whether restrained eating influenced the modeling effects, but no significant two- or three-way interactions between restraint ($M = 2.57$, S.D. = .84), eating and weight condition were found.

processes and therefore difficult to identify, because people may be not fully or even partially aware of their own intentions in this regard (Herman et al., 2003).

We would like to stress that our findings were independent of participants' BMI – which was of course of restricted range as no very thin or overweight persons were included – and dietary restraint, which underscores the robustness of these findings. A study by Anschutz et al. (in press) showed that exposure to slim media models 'reminded' restrained eaters of their diets, and therefore they ate less than did unrestrained eaters. We assume that the features and consequences of social interactions between women are so important that they might overrule participants' dietary intentions. Therefore, in future studies it would be interesting to focus not only on physical appearances of partners but also on dynamic social aspects of the interaction. In the area of substance use, research has examined the nature of the social interaction by using so-called warm and cold models (i.e., sociable and unsociable models) (Quigley & Collins, 1999). The findings of some of these studies support the notion that the magnitude and duration of smoking or drinking depends on the quality of the social interaction (Collins, Parks, & Marlatt, 1985; Harakeh et al., 2007). Transposed to the domain of eating, not only the presence of an eating partner but also the quality of interaction with this partner might affect food intake. When the individual interacts with a warm and friendly model who shows some interest in her – instead of acting in an unresponsive way – we assume that the individual will be more likely to imitate the food intake of the model. The finding that an increase of 21 M&Ms in the confederate's intake (i.e., large-eating normal-weight confederate) only induced an increase of 8 M&Ms in the participant could be explained by the notion that individuals use other people's intakes as ways of determining how much they themselves may eat without eating excessively (Herman et al., 2003). So, they do not exactly match or model the other's intake, but they use it as a guideline for how much food is appropriate to eat in the given situation. The confederate in our study established a maximum amount that may have operated as an indication of the maximum that the participants can safely eat. We suppose that young women consider an intake of approximately 10 M&Ms in the presence of a large-eating normal-weight woman as a safe and appropriate amount (i.e., an amount that not raises negative judgments). Furthermore, it appeared that there were no differences between the participants' intake in the none- and small-eating conditions. This finding suggests that if the amount of food consumed is very small, no modeling behavior will occur among female young adults. During the break the participants were free to pick some M&Ms from a large bowl present on the table. Our confederates were instructed to pick only 4 M&Ms from this large bowl. We assume that this amount was too small to cause effects among female young women. Probably, the young women in our sample did not notice the difference between a young woman who eats nothing and one who only eats 4 pieces from a large bowl of M&Ms present during an experimental break.

Some limitations of the present study should be mentioned. The first is that we cannot determine whether the presence of a female eating partner has restricted or enlarged the amount of food consumed. Future studies should preferably include a control condition in which participants spend the break alone in order to determine whether the presence of an eating partner per se has stimulative or suppressive effect on eating. Second, we chose to offer participants only highly palatable food. Instead of offering chocolate-coated peanuts, it would be interesting to try to replicate the findings with less palatable food (e.g., stale popcorn or chips) or healthy food snacks (e.g., cucumber, carrots or cherry tomatoes). Do individuals model other people's eating patterns even if the food is less palatable or so healthy that it makes no difference for their weight (or for the impression that they convey) how much they eat? Third, we concentrated on female university students, which restrict the generalizability of our findings. Future studies should also include males and people with a more diverse social and educational background. Fourth, we tested our hypotheses using only normal-weight women (BMI between 18 and 25). Replication of our findings with lean, overweight and obese individuals (including children, adolescents, or adults) in a naturalistic eating environment would be a useful addition to research in the field of social modeling. Finally, it appeared that restrained eating did not moderate our findings on imitation of eating, which is in line with previous findings (Polivy, Herman, Younger, & Erskine, 1979; Rosenthal & Marx, 1979) and indicated that dieters and non-dieters are equally vulnerable to modeling effects (Herman, Roth, & Polivy, 2003). However, it should be noted that our study population consisted of normal-weight female college students with normal dietary restraint scores. These normal and generally low restraint scores could have limited the ability to detect effects of restraint.

All in all, our study shows that the physical appearance of a female eating partner, as well as her intake per se, affects the modeling behavior of young normal-weight women. It was found that young women ate more when eating alongside a normal-weight, high-intake confederate than when eating with a slimmer confederate. However, further research is needed to gain insight into the mechanisms underlying social modeling.

References

Anschutz, D. J., Van Strien, T., & Engels, R. C. M. E. (in press). Exposure to slim images in mass media: Television commercials as reminders of restriction in restrained eaters. Health Psychology.

Bot, S. M., Engels, R. C. M. E. , & Knibbe, R. A. (2005). The effects of alcohol expectancies on drinking behaviour in peer groups: Observations in a naturalistic setting. *Addiction, 100*, 1270–1279.

Bot, S. M., Engels, R. C. M. E. , Knibbe, R. A., & Meeus, W. H. J. (2007). Sociometric status and social drinking: Observations of modelling and persuasion in young adult peer groups. *Journal of Abnormal Child Psychology, 35*, 929–941.

Chaiken, S., & Pliner, P. (1987). Women, but not men, are what they eat: The effect of meal size and gender on perceived femininity and masculinity. *Personality and Social Psychology Bulletin, 13*, 166–176.

Collins, R. L., Parks, G. A., & Marlatt, G. A. (1985). Social determinants of alcohol consumption: The effects of social interaction and model status on the self-administration of alcohol. *Journal of Consulting and Clinical Psychology, 53*, 189–200.

Conger, J. C., Conger, A. J., Costanzo, P. R., Wright, K. L., & Matter, J. A. (1980). The effects of social cues on the eating behavior of obese and normal subjects. *Journal of Personality, 48*, 258–271.

de Castro, J. M., & de Castro, E. S. (1989). Spontaneous meal patterns of humans: Influence of the presence of other people. *American Journal of Clinical Nutrition, 50*, 237–247.

De Luca, R. V., & Spigelman, M. N. (1979). Effects of models on food intake of obese and non-obese female college students. *Canadian Journal of Behavioral Science, 11*, 124–129.

Engels, R. C. M. E. , & Granic, I. (2005). Experimental observational studies on peer influence processes and alcohol consumption. *Research proposal NWO Open Competitie* .

Goldman, S. J., Herman, C. P., & Polivy, J. (1991). Is the effect of a social model attenuated by hunger? *Appetite, 17*, 129–140.

Harakeh, Z., Engels, R. C. M. E. , Van Baaren, R. B., & Scholte, R. H. (2007). Imitation of cigarette smoking: An experimental study on smoking in a naturalistic setting. *Drug and Alcohol Dependence, 86*, 199–206.

Herman, C. P., Roth, D. A., & Polivy, J. (2003). Effects of the presence of others on food intake: A normative interpretation. *Psychological Bulletin, 129*, 873–886.

Krones, P. G., Stice, E., Batres, C., & Orjada, K. (2005). In vivo social comparison to a thin-ideal peer promotes body dissatisfaction: A randomized experiment. *Journal of Eating Disorders, 38*, 134–142.

Leary, M. R., Tchividijian, L. R., & Kraxberger, B. E. (1994). Self-presentation can be hazardous to your health: Impression management and health risk. *Health Psychology, 13*, 461–470.

Polivy, J., Herman, C. P., Younger, J. C., & Erskine, B. (1979). Effects of a model on eating behavior: The induction of a restrained eating style. *Journal of Personality, 47*, 100–117.

Puhl, R. M., Schwartz, M. B., & Brownell, K. D. (2005). Impact of perceived consensus on stereotypes of obese people: A new approach for reducing bias. *Health Psychology, 24*, 517–525.

Quigley, B. M., & Collins, R. L. (1999). The modeling of alcohol consumption: A meta-analytic review. *Journal of Studies on Alcohol, 60*, 90–98.

Ready to go: Women of the 90s (1998). [CD]. Hilversum: Sony BMG Music Entertainment (Netherlands) BV.

Redd, M., & de Castro, J. M. (1992). Social facilitation of eating: Effects of social instruction on food intake. *Physiology and Behavior, 52*, 749–754.

Rodin, J., Silberstein, L. R., & Striegel-Moore, R. H. (1985). Women and weight: A normative discontent.. In T. B. Sonderegger (Ed.), *Psychology and gender: Nebraska symposium on motivation* (pp. 267–307). Lincoln: University of Nebraska Press.

Rosenthal, B., & Marx, R. D. (1979). Modeling influences on the eating behavior of successful and unsuccessful dieters and untreated normal weight individuals. *Addictive Behaviors, 4*, 215–221.

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.

Salvy, S.-J., Romero, N., Paluch, R., & Epstein, L. H. (2007). Peer influence on pre-adolescent girls' snack intake: Effects of weight status. *Appetite, 49*, 177–182.

Stunkard, A. J., Sorensen, T., & Schulsinger, F. (1983). Use of the Danish Adoption Register for the study of obesity and thinness. *Association for Research in Nervous and Mental Disease, 60*, 115–120.

Van Strien, T. (2005). *Nederlandse Vragenlijst voor Eetgedrag 2005. Handleiding en verantwoording*. Amsterdam: Boom test uitgevers

Van Strien, T., Engels, R. C. M. E. , Van Staveren, W., & Herman, C. P. (2006). The validity of dietary restraint scales: Comment on Stice et al. (2004). *Psychological Assessment, 18*, 89–94.

Van Strien, T., Frijters, J. E. R., Bergers, G. P. A., & Defares, P. B. (1986). The Dutch Eating Behaviour Questionnaire (DEBQ) for assessment of restrained, emotional and external eating behaviour. *International Journal of Eating Disorders, 5*, 295–315.

Vartanian, L. R., Herman, C. P., & Polivy, J. (2007). Consumption stereotypes and impression management: How you are what you eat. *Appetite, 48*, 265–277.