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Food intake norms increase and decrease snack food intake in a remote confederate study

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Abstract
Social factors have been reported to influence food intake. In the remote confederate paradigm, naive participants are led to believe that previous study participants have consumed a small or large amount of food. To date, there has been no demonstration using this paradigm that information about how much previous participants eat (food intake norms) both increase and decrease food intake in the same study. In the present experiment, we tested 64 undergraduate psychology students using a remote confederate design. We investigated the effect of both a high intake and low intake norm on food intake under the same conditions. We also tested whether a variable shown previously to predict food intake matching amongst eating partners (trait empathy) predicted the influence of food intake norms on intake. Compared with a no norm control condition, leading participants to believe that the intake norm was to eat a lot of cookies increased cookie intake and leading participants to believe the intake norm was to eat few cookies reduced intake. Trait empathy did not moderate the influence of food intake norms on consumption. These findings add to evidence that perceived intake norms exert strong bi-directional effects on food intake.

Introduction
Social factors have been reported to influence human eating behaviour (Herman, Roth, & Polivy, 2003; Robinson & Higgs, in press). For example, the number of people present during an eating occasion and the extent to which an eater is eager to make a good impression influence amounts consumed (de Castro & Brewer, 1992; De Castro, Brewer, Elmore, & Orozco, 1990; Pliner & Chaiken, 1990). Recently, it has also been suggested that social factors may contribute to the spread of eating patterns and weight gain through social networks (Christakis & Fowler, 2007; Pachucki, Jacques, & Christakis, 2011).

In the laboratory, social influences on food intake are often studied using a live model, who is an associate of the experimenter, acting as a participant. A snack or meal is consumed in the presence of the model and the amount of food consumed by the model is varied according to experimental condition (see Herman et al., 2003 for a description of such studies). The participants are unaware they are eating with a confederate. A well replicated finding using this paradigm is that if the live model eats very little then the participants eat less than when they eat alone (Feeney, Polivy, Pliner, & Sullivan, 2011; Goldman, Herman, & Polivy, 1991).

A different approach to using live models is to use remote models. In this type of study, participants are exposed to fictional accounts of the amount of food consumed by previous participants in that study (Feeney et al., 2011; Pliner & Mann, 2004; Roth, Herman, Polivy, & Pliner, 2001). This is known as a remote confederate paradigm. The amount that other participants have been eating can be conceptualised as a type of food intake norm. If the remote confederate eats a lot, this signals a high intake norm, whereas if they eat a little this signals a low intake norm. Two studies using the remote confederate paradigm have shown that a high intake norm increases food intake relative to a no norm control (Pliner & Mann, 2004; Roth et al., 2001). A third study also showed that a low intake norm can decrease food intake relative to a no norm control (Feeney et al., 2011, but see also Leone, Pliner, & Herman, 2007 for a study that examined modal distributions of participant food intake, rather than total amount consumed by condition). Pliner and Mann (2004) and Roth et al. (2001) also included low intake norm conditions in their studies, but found no significant decrease in food intake. Roth et al. (2001) found a trend for intake to be decreased, but this was not statistically significant. One explanation provided in both studies was that the low intake norm was too similar to the amount of food being eaten by the no norm control participants to produce any effect. Feeney et al. (2011) only included a low intake norm condition, so were unable to simultaneously examine the influence of high and low intake norms on consumption behaviour.
Thus, there has been no report to date that both high and low intake norms influence intake using this paradigm.

Some studies have examined the moderating effect of individual differences on social eating (Bruner, 2011; Herman, Koenig-Nobert, Peterson, & Polivy, 2005; Hermans et al., in press). Exline, Zell, Bratslavsky, Hamilton, and Swenson (2012) reported that the extent to which individuals want to be liked by other people may underlie food intake matching. Trait empathy has been shown to predict the extent to which individuals adjust their food intake to match the intake of an eating partner. Only individuals with high trait empathy showed evidence of intake matching (Robinson, Tobias, Shaw, Freeman, & Higgs, 2011). This may be because empathic individuals possess a natural tendency to imagine how others interpret their behaviour, and so eat a similar amount to their eating partner to present themselves favourably (Chartrand & Bargh, 1999; Robinson et al., 2011).

The role of individual differences in moderating the effects of a remote confederate on food intake has received less attention. There are some similarities between the live model and remote model designs and so one might expect similar moderating influences. However, there are also differences between the two paradigms. The use of a live model can produce more than one type of social influence on food intake. Live models could provide information about how to behave in that context, which is known as informational social influence (Herman et al., 2003). In addition, the influence of live models may stem from participants adapting their eating to ingratiate themselves with the model (Hermans, Engels, Larsen, & Herman, 2009; Robinson et al., 2011) and make a good impression (Caudill & Kong, 2001; Pliner & Chaiken, 1980). One might assume that the latter types of social influence (we refer to these as self-presentation concerns) would be much reduced in the remote confederate design since there is no live model to impress. Hence, it is of interest to examine whether factors that have been shown to moderate the effect of a live model on intake similarly moderate the effect of a remote model.

Our overall aim was test whether both increases and decreases in intake are elicited by a remote model and whether individual differences in empathy play a moderating role. We led participants to believe that they would be taking part in a food tasting task involving eating cookies. Depending on condition, participants were led to believe that previous participants had consumed either a small amount of cookies (low intake norm) or a large amount (high intake norm) or they received no information (no norm). To increase the likelihood that participants in the no norm condition would eat an intermediate amount between the portrayed high and low intake norms we based intake norms on the results of a pilot study. It was hypothesised that relative to the no norm control condition, exposure to the high intake norm would result in an increase in food intake and exposure to the low intake norm would result in a decrease in food intake. We also tested whether a measure of trait empathy predicted norm effects on intake. We have previously found that trait empathy scores moderate the effect of a live model on eating in dyads (Robinson et al., 2011) and so we were interested in whether this would also be true for eating in the remote confederate design, as it might tell us something about the similarity between the two study types.

Method

Participants

Sixty six female undergraduate psychology students participated. Mean age = 19.2 years (SD = 0.9). BMI was within healthy range; mean = 23.3 (SD = 3.8). To disguise the aims of the study it was advertised as research examining hunger and taste perception. Participation was in return for course credit. Advertisement was through an online portal in which participants signed up to time slots in advance of study participation. Participants were instructed to abstain from eating 2 h prior to the study to ensure they were not satiated on arrival. Participants gave informed signed consent. The study protocol was approved by the University of Birmingham Research Ethics Committee and was conducted according to the ethical standards laid down in the Declaration of Helsinki 1964.

Design and food intake norm information

A between-subjects design was used with three conditions: control (no norm); high intake norm; low intake norm. Participants were randomly assigned to one of the three conditions. In the two experimental conditions participants were exposed to a fictitious previous participant information sheet. In both conditions the sheet contained information about 4 participants. All were female psychology students aged 18–20 yrs old. A pilot study indicated that in the absence of norm information, female psychology undergraduates would consume approximately 4 cookies. We selected high and low norm values that we reasoned would be believable and that would differ substantially from the expected intake in the no norm condition. In the high intake norm condition, the 4 previous participants had eaten 8, 9, 9 and 10 cookies. In the low intake norm condition, the 4 previous participants had eaten 1, 1, 2 and 2. In the control condition there was no information sheet presented.

Measures

Empathy

The interpersonal reactivity index (IRI, Davis, 1983) was used to measure trait empathy. The scale has good internal reliability and consists of 4 subscales: ‘perspective taking’ (α = 0.71–0.75), ‘emotional distress’ (α = 0.75–0.77), ‘empathic concern’ (Cronbach’s α = 0.68–0.73) and ‘fantasy’ (Cronbach’s α = 0.78–0.79), which tap into the global concept of empathy (Davis, 1983). The IRI has previously been shown to be strongly correlated with other measures of trait empathy (Davis, 1983). Each subscale consists of 7 questions and uses a five-point Likert scale response format (‘describes me well’ to ‘does not describe me well’). A high score denotes high levels of empathy and a low score indicates low levels of empathy.

Personality measure

To disguise the aims of the study participants completed a personality questionnaire. The questionnaire consisted of 21 characteristics (e.g. I am sociable) and participants used a five-point Likert scale (‘strongly disagree’ to ‘strongly agree’) to record how well the characteristic described them.

Appetite ratings

Participants completed appetite ratings to corroborate the cover story. Three questions were included; ‘how hungry do you feel right now?’, ‘how full do you feel right now?’ and ‘what is your current desire to eat?’. Participants made responses on 100 mm line scales by placing an x on the line. Anchors were ‘not at all hungry’ & ‘extremely hungry’, ‘not at all full’ & ‘extremely full’ & ‘no desire’ & ‘extremely strong desire’. We used responses to ‘how hungry do you feel right now?’ to compare conditions for baseline hunger. We also compared conditions on the other two measures separately.

Cookie rating measures

Participants rated how sweet, crunchy and nutty the cookie was (separate 100 mm line scale, anchors: ‘not at all’ and ‘extremely’).
Participants also rated how much they liked the taste of the cookie (‘I like the cookie’) using a five-point Likert scale.

Cookies
Maryland chocolate chip cookies were used (approximate weight per cookie 11 g, 57 kcals per cookie). Cookies were served in a well-stocked bowl that contained 14 cookies.

Procedure
Participants were tested individually between 10 am–12 pm and 2 pm–6 pm on weekdays. Participants were informed they would be sampling cookies and making taste ratings about them. Participants first signed for consent and completed the appetite measures. Participants in the two experimental conditions were provided with the fictitious previous participant information sheet. The amount eaten by the four previous participants varied dependent on assignment to the low or high intake norm condition. Participants in the control condition were not provided with the fictitious participant sheet. Participants in the conditions receiving the fictitious information sheet were asked to fill out their age, gender and course on the sheet. Participants were told they would not have to complete the last column (number of cookies consumed), as this information was only needed from the first few participants for ordering purposes.

The researcher then returned, removed the fictitious information sheet and provided participants with the cookies and the cookie rating measures. Participants were told they could eat as much as they liked as the food would be thrown away afterwards, before being left alone for 15 min. Next, participants completed the personality measure and the IRI empathy measure (Davis, 1983). The participant’s weight and height were recorded using digital scales and a stadiometer. Participants were then asked what they thought the aims of the study were. As a manipulation check, in the experimental conditions participants wrote down if they had noticed the intake of the previous participants and were asked to state how many cookies the previous participants had eaten. Participants were fully debriefed and thanked for their time. To calculate total number of cookies consumed, the experimenter counted the number of remaining cookies in the bowl.

Analysis
We planned one way ANOVA to examine whether the groups differed on baseline hunger, baseline fullness and desire to eat, as well as BMI and age. To examine the effect of condition and empathy on food intake, we planned a 2 × 3 ANOVA, with number of cookies consumed serving as the dependent variable. Using a similar approach as in Robinson et al. (2011), we used a median split to characterise participants into low and high scorers on overall empathy (overall empathy was determined by total score on the questionnaire). This approach allowed us to determine the effect of condition and whether empathy status would moderate the extent to which participants adjusted their intake as a function of condition. As we were interested to examine whether high and low intake norms increased and decreased food intake (from control), if a significant effect of condition was observed we planned follow up pairwise comparisons using a Dunnett’s correction.

We also planned to examine whether empathy moderated the degree of ‘matching’ to the presented norms, as in Robinson et al. (2011). For participants in the two experimental conditions, we calculated the absolute difference between their cookie intake and the average number of cookies that the fictitious previous participants had consumed. A score of 0 = exact matching. We then correlated the overall empathy score and matching scores using Pearson’s correlation to examine whether empathy was associated with the degree of matching. PASW 18© (SPSS inc. Chicago) was used for data analysis.

Results
One participant guessed the aims of the study and one participant did not notice the previous participant consumption information, so both were removed prior to data analysis. ANOVA indicated no effects of condition on baseline hunger \( F(2, 61) = 0.16, p = 0.85 \), age \( F(2, 61) = 0.15, p = 0.86 \) or BMI \( F(2, 61) = 2.1, p = 0.13 \). See Table 1. We also found no baseline differences between conditions for fullness \( F(2, 61) = 0.18, p = 0.84 \) or desire to eat \( F(2, 61) = 0.01, p = 0.99 \).

Cookie intake
A median split resulted in 30 participants classified as being high in overall empathy (mean score = 81/112, SD = 5.2) and 34 participants as being classified as being low in overall empathy (mean score = 61/112, SD = 10.9). ANOVA indicated a significant main effect of condition \( F(2, 58) = 9.2, p < 0.001 \), partial \( \eta^2 = 0.24 \), but no significant main effect of empathy \( F(1, 58) = 1.6, p = 0.21 \), partial \( \eta^2 = 0.03 \). The interaction between the two variables was also non-significant \( F(2, 58) = 0.42, p = 0.66 \), partial \( \eta^2 = 0.01 \). Following up the main effect of condition, pairwise comparisons indicated that participants in the low intake norm condition consumed significantly fewer cookies than participants in the control condition (mean difference = 1.30, \( p = 0.048 \)) and that participants in the high intake norm condition consumed significantly more cookies than participants in the control condition (mean difference = 1.46 \( p = 0.027 \)) See Table 1.

We also examined whether empathy entered as a continuous variable predicted the influence of high and low intake norms on food intake. We conducted linear regression. Using dummy coding, we examined whether the amount of cookies eaten was predicted by the condition participants were assigned to. We also included centered empathy scores and centered empathy score + condition interactions in the regression model. In line with the ANOVA results, condition predicted the number of cookies consumed: high intake norm condition (standardised \( \beta = 0.30, p = 0.023 \)), low intake norm condition (standardised \( \beta = -0.28, p = 0.031 \)). Empathy scores did not significantly predict intake (standardised \( \beta = 0.16, p = 0.027 \)).

Table 1

<table>
<thead>
<tr>
<th></th>
<th>Low intake norm, N = 23</th>
<th>No norm control, N = 20</th>
<th>High intake norm, n = 21</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cookies eaten (total number)</td>
<td>2.0 (0.8)</td>
<td>3.3 (1.6)</td>
<td>4.7 (2.7)</td>
</tr>
<tr>
<td>Age (yrs)</td>
<td>19.3 (0.9)</td>
<td>21.9 (2.7)</td>
<td>19.2 (1.0)</td>
</tr>
<tr>
<td>Baseline hunger (100 mm)</td>
<td>54.5 (2.1)</td>
<td>51.1 (2.2)</td>
<td>52.4 (1.8)</td>
</tr>
<tr>
<td>BMI (kg/m²)</td>
<td>23.9 (4.0)</td>
<td>22.0 (2.7)</td>
<td>24.0 (4.2)</td>
</tr>
</tbody>
</table>

Standard deviations in brackets. Indicative significant difference at \( p < 0.05 \) to control condition.
The condition × empathy interactions were also non-significant: high intake norm condition × empathy (standardised β = −0.05, p = 0.72), low intake norm condition × empathy (standardised β = −0.09, p = 0.58).

**Empathy and matching scores**

Matching scores were significantly lower (t(42) = 9.1, p < 0.05) in the low intake norm condition (0.8 mean matching score, SD = 0.8) than in the high intake norm condition (4.6 mean matching score, SD = 1.9), suggesting that participants in the low intake norm condition were more likely to closely match the presented food intake norm, than participants in the high intake norm condition.

Correlating matching and overall empathy score (in the experimental conditions) produced no significant associations between overall empathy score and matching. In the low intake norm condition there was no significant association between matching and overall empathy score (r(23) = 0.01, p = 0.94), nor was there a significant association in the high intake norm condition (r(21) = 0.06, p = 0.78).

Although Robinson et al. (2011) reported findings that overall empathy scores from the IRI moderated intake matching during a social interaction, the IRI (Davis, 1983) can also be broken down into 4 sub category scores; fantasy proneness, perspective taking, empathic concern, personal distress. We conducted further analyses re-running all of the earlier reported analyses, but instead using each of these sub category scores rather than overall empathy scores. None of the sub categories of the IRI predicted norm effects on intake and the same pattern of non significant results was observed (all p values >0.19).

**Discussion**

Participants who were led to believe that previous study participants had eaten a lot of cookies (a high intake norm) ate significantly more cookies than participants given no information about previous participants’ intake. Similarly, after being led to believe that the food intake norm was to eat few cookies, participants ate fewer cookies than a no-norm control condition. An increase and decrease in food intake of approximately 40% (76 kcal) was observed, suggesting the food intake norm information exerted a substantial influence on food intake in this study. There was no evidence that trait empathy influenced the effect of food intake norms on cookie intake.

As far as we are aware this is the first report that food intake norm information decreases and increases food intake in a remote confederate study. In part, this may have been because we were able to set intake norms based on the results of a pilot study. The intake of the remote confederates in the low intake norm condition and in the high intake norm condition were lower and higher than the amount of food eaten by the actual participants in the no norm control condition. That being said, pilot testing was used by Roth et al. (2001) who only observed a trend for the low intake norm condition to eat less than the no norm condition. However, food intake tended to be more variable across participants in the Roth et al. study (2001), and so this may explain why we observed a significant difference, but they did not.

As has been reported previously (Pliner & Mann, 2004; Roth et al., 2001), we found strong evidence for close matching to the low intake norm but weaker matching to the high intake norm. It should be noted that the presented high intake norm was approximately 6 cookies greater than intake in the no-norm control condition and the presented low intake norm was only approximately 2 cookies less than intake in the control condition. Thus, the stronger matching observed to the low intake norm may be because participants would have had to eat upwards of 500 kcal of cookies to match high the intake norm. Alternatively, it may be that high intake norms simply communicate to participants not to worry about watching their calorie intake which allows them to eat as much as they want (regardless of whether this is similar to the presented norm). More direct testing of how closely individuals follow low and high intake norms would be of interest.

Previously, trait empathy has been shown to predict matching of food intake between eating companions and one explanation of these findings is that empathic individuals possess a natural tendency to imagine how others interpret their behaviour, so they are more likely to eat in a way to present themselves favourably (Robinson et al., 2011). In the present study, trait empathy did not influence results. These findings provide preliminary support to the proposition that there are important differences between the live model and remote confederate designs. Self-presentation concerns may be less influential in the remote confederate paradigm than the live model paradigm. A weakness is that we make this argument based on the lack of an interaction between norm condition and empathy. In a future study, a state measurement of self presentation concern administered during this paradigm would be useful. This would allow assessment of whether such concerns are present and if they moderate the influence that food intake norms have on the amount of food consumed. It should also be noted that although the cover story we used led participants to believe the experimenter would not monitor how much food they had eaten, there is still some possibility that participants were wary of whether the experimenter might judge them on their food intake. Thus, participants may have followed the presented intake norms to please the experimenter. Completely removing possible self presentation or experimenter effects is challenging, but future work should consider this.

The results of the present study suggest that a belief that other people have eaten a large amount of food may promote overconsumption, regardless of whether eating companions are present. This is in keeping with recent suggestions that social norms may be contributing to the spread of dietary behaviours through social networks (Christakis & Fowler, 2007; Pachucki, Jacques, & Christakis, 2011). The findings of the present study are also in line with recent suggestions that perceived social norms may influence habitual dietary behaviours (Lally, Bartle, & Wardle, 2011) and that messages emphasising social norms to eat healthily could promote healthier eating choices (Robinson, Fleming, & Higgs, 2012).

The present study sampled only young females. Although there is some evidence that males too can be prone to social eating influence of an eating companion, the evidence is sparse (Hermans, Herman, Larsen, & Engels, 2010). Elsewhere, research suggests that males may be less likely to conform to social influence than females (Bond & Smith, 1996). We also tested food intake norms in a specific context and setting (‘what participants normally do in this experiment’). Future research should test whether food intake norms about high or low snack food intake would transfer to a different context, as there is some evidence this might occur (see Robinson et al., 2012).

In conclusion, the present study shows that intake of snack food can be increased or decreased as a function of perceived food intake norms. These findings provide further support to the proposition that beliefs about the eating habits of those around us can exert powerful effects on behaviour, even when eating alone.

References


