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Self-reported overeating and attributions for food intake

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Objective: We examined whether people's attributions for their eating behaviour differ according to whether they believe they have eaten more, less or about the same as they normally would.

Design: Participants were served a small or large portion of pasta for lunch. Afterwards, they were asked to compare how much they ate in the study to how much they normally eat for lunch, resulting in three intake-evaluation categories: 'ate less', 'ate about the same' or 'ate more'.

Main outcome measures: How much participants ate; the extent to which they attributed their food intake to an internal cue (i.e. hunger) and an external cue (i.e. the amount of food served).

Results: Participants served a large portion ate more than those served a small portion, but the magnitude of the portion-size effect did not vary across intake-evaluation categories. Furthermore, although participants in all groups indicated that their hunger influenced how much they ate, only those in the 'ate more' group indicated that the amount of food available influenced how much they ate.

Conclusion: People appear to be willing to explain their food intake in terms of an external cue only when they believe that they have eaten more than they normally would.

Keywords: overeating; portion size; attributions; external influences; hunger

External cues in the eating environment play an important role in dictating how much food people eat. These external cues can include the amount of food available (Benton, 2015; Herman, Polivy, Pliner, & Vartanian, 2015), the variety of food available (Remick, Polivy, & Pliner, 2009; Sørensen, Møller, Flint, Martens, & Raben, 2003) and how much other people eat (Herman, Roth, & Polivy, 2003; Vartanian, Spanos, Herman, & Polivy, 2015). Portion size, in particular, has received a great deal of attention as one of the main contributors to excess energy intake. A large body of empirical evidence indicates that people eat more food when they are served larger portions than when they are served smaller portions (for a meta-analysis, see Zlatevska, Dubelaar, & Holden, 2014). This portion-size effect occurs in both men and women (e.g. Rolls, Roe, & Meengs, 2007), in individuals who are overweight or not (e.g. Fisher, Arreola, Birch, & Rolls, 2007; Rolls, Morris, & Roe, 2002), and in restrained and unrestrained eaters

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(e.g. Kral, Roe, & Rolls, 2004) and is also observed across a range of different types of foods (Steenhuis & Vermeer, 2009).

Although there is clear and consistent evidence that external eating cues such as portion size influence people's food intake, people often fail to acknowledge the influence of those external cues on their behaviour. Instead, factors such as hunger, satiety and the taste of the food are typically cited when people are asked why they ate as much (or as little) as they did (Cavanagh, Vartanian, Herman, & Polivy, 2014; Vartanian, Herman, & Wansink, 2008; Vartanian, Sokol, Herman, & Polivy, 2013). One explanation for this discrepancy is that people are unaware of or insensitive to the influence of the external cues. For example, in portion size studies, participants' ratings of satiety are not affected by the size of the portion that they are served, despite the fact that participants served the larger portion consume significantly more food than do participants served the smaller portion (e.g. Levitsky & Youn, 2004; Rolls et al., 2002). However, recent research suggests that failure to acknowledge the influence of external factors might be indicative of motivated denial rather than a lack of awareness. For example, Spanos, Vartanian, Herman, and Polivy (2014) found that participants were able to recognise the influence of external eating cues (social modelling) on other people's eating behaviour, but many participants refused to acknowledge the impact of external cues on their own behaviour. Specifically, whereas some people were reasonably accurate in judging the extent to which their food intake was influenced by their eating companion, others appeared to actively deny being influenced by their eating companion; indeed, the more that this subset of participants mimicked the intake of their eating companion, the less likely they were to acknowledge being influenced by their companion.

Whether or not people are willing to acknowledge external influences on their behaviour might also depend on the nature of that behaviour and, in particular, how the behaviour or outcomes are evaluated. According to attribution theory, people tend to explain their behaviour in a manner that reflects positively on themselves (Bradley, 1978; Zuckerman, 1979), such that positive behaviours or successes are attributed to internal factors and negative behaviours or failures are attributed to external factors. Similar processes might be involved in people's attributions for their food intake. In a recent study, Vartanian, Spanos, Herman and Polivy (*in press*) examined attributions for food intake when participants were either food-deprived for 18 h or were given a meal-replacement drink prior to taking part in a taste test. Half the participants in each of the deprived and preloaded conditions were exposed to a social norm cue that conflicted with their hunger level (i.e. a low-intake norm for deprived participants and a high-intake norm for preloaded participants), and the other half were not exposed to a social norm cue. Deprived participants who were exposed to a low-intake norm ate minimally but denied being influenced by the social cue. In contrast, preloaded participants who were exposed to a high-intake norm reported that the amount of food that others had eaten made them eat more than they normally would, even though their intake did not differ significantly from that of the preloaded participants not exposed to social norm information. Vartanian et al. suggested that people may selectively use external cues to explain (or justify) their eating behaviour in situations where they believe they have eaten more than they should have, even though people generally avoid explaining their intake by reference to external cues. However, because that study did not directly assess

the extent to which people believed that they had overeaten, Vartanian et al.'s interpretation was speculative.

The purpose of the present study was to assess whether people's attributions for their eating behaviour differ according to the extent to which they believe they have overeaten relative to the amount that they typically eat. Participants were served a small or large portion of pasta for lunch. After they finished eating, they were asked to compare how much they ate in the study to how much they normally eat for lunch, and they were also asked to indicate the extent to which a variety of factors (including the amount of food that they were served and how hungry they were) influenced them to eat as much or as little as they did. We hypothesised that participants who reported eating more than they normally do would rate the amount of food that they were served as having had a greater influence on their food intake than would participants who reported having eaten less than they normally do.

Method

Participants

Participants were young women ($n = 164$) who were either first-year psychology students or community members recruited through advertising. Seven participants were excluded because they guessed that we were interested in how much food they ate. This resulted in a final sample of 157 participants (107 students and 50 community members) with a mean age of 19.88 years ($SD = 2.83$)¹ and mean body mass index (BMI; kg/m^2) of 22.05 ($SD = 3.54$). Regarding ethnicity, 53.5% were Asian, 34.4% were Caucasian, 0.6% were of Aboriginal or Pacific Islander origin and 11.5% identified as 'other'. The study was approved by the university's ethics advisory panel.

Materials and procedure

Participants signed up for a study on 'hunger and taste perception'. When they signed up, they were told that they would be served lunch, and they were asked to abstain from eating for 3 h prior to their session (91% of participants adhered to this request). Sessions were held between 11 am and 3.30 pm.

Upon arrival, participants provided informed consent and recorded the time of their last meal, which was used to calculate the number of hours since they last ate ($M = 7.13$ h, $SD = 5.22$). They also rated their current hunger level on a 10-cm visual analogue scale anchored at *not at all* and *extremely*. Participants were then served either a small (300 g; 748 kcal) or large (600 g; 1496 kcal) portion of pasta with tomato sauce and were asked to make taste ratings based on the first mouthful of pasta that they ate and then again for the last mouthful of pasta that they ate (once they had eaten as much as they wanted for lunch). They rated the pasta on a number of specific taste properties (e.g. salty, how chewy, etc.), and also indicated how much they liked the pasta and how good-tasting the pasta was on 10-cm visual analogue scales with *not at all* and *extremely* as the anchors. Participants were left alone for 12 min² to complete the taste ratings and have lunch.

After the taste test, participants re-rated their hunger level. They were then asked to evaluate their own intake by comparing how much they ate in the experiment to the

amount they would normally eat for lunch on a scale from 1 (*much less than I normally eat*) to 5 (*much more than I normally eat*), with 3 (*similar to the amount I normally eat*) as the mid-point. These ratings were used to form three 'intake evaluation' categories (ate less = 1 or 2, ate about the same = 3, or ate more than normal = 4 or 5) for each portion size (see Table 1).³

Participants were then asked to rate the extent to which 18 different factors influenced how much they ate in the study on a 9-point scale from -4 (*made me eat less than I normally would*) to +4 (*made me eat more than I normally would*) with 0 (*did not influence me*) as the mid-point. The main item of interest was 'the amount of food I was served' (i.e. the external cue that was manipulated in this study). As a point of comparison, we also examined ratings for the item 'how hungry I was' (i.e. the most prototypical internal eating cue). The remaining 16 factors were filler items, which served to mask our interest in the two main factors. These filler items were potential influences which people might invoke to explain their food intake (e.g. 'Whether or not I was in the mood for the food provided', 'What was expected of me', 'Pre-existing medical conditions', 'How difficult it was to make the taste ratings'). Finally, participants were probed for suspicion using a funnel debriefing procedure in which they were asked what they thought the study was about, what they thought the hypothesis was, and whether they thought any of the tasks were odd, unusual or out of place.

Results

Preliminary analyses

A χ^2 test of independence revealed that participants' intake-evaluation category (i.e. whether they thought they had eaten more, less, or about the same as usual) did not depend on the portion size that they received, $\chi^2(2, N = 157) = 0.86, p = 0.65$ (see Table 1). We next examined whether there were any group differences in ratings of initial hunger, liking for the food, or how good tasting the food was. A 2 (portion size) \times 3 (intake evaluation) MANOVA showed no significant main effects or interactions on those variables, $F_s < 1.32, p_s > .25$.

Food intake

A 2 (portion size) \times 3 (intake evaluation) ANOVA on food intake showed a main effect of portion size, $F(1, 151) = 25.44, p < 0.001, \eta_p^2 = 0.14$, with participants in the large-portion condition consuming more pasta than did participants in the small-portion

Table 1. Number and percentage of participants in each intake evaluation category, separately for each portion size condition.

Portion size	Intake evaluation category		
	Less than normal <i>n</i> (%)	About the same <i>n</i> (%)	More than normal <i>n</i> (%)
Small	34 (43.0)	24 (30.4)	21 (26.6)
Large	35 (44.9)	27 (34.6)	16 (20.5)
Total	69 (43.9)	51 (32.5)	37 (23.6)

condition. There was also a main effect of intake evaluation, $F(2, 151) = 20.66$, $p < 0.001$, $\eta_p^2 = 0.22$. Planned contrasts indicated that ‘ate less’ participants ate significantly less than did ‘ate the same’ or ‘ate more’ participants ($ps < 0.001$); the latter two groups did not differ from one another ($p = 0.19$). Importantly, there was no significant portion size \times intake–evaluation interaction, $F(2, 151) = 0.66$, $p = 0.52$, $\eta_p^2 = 0.01$, indicating that the magnitude of the portion size effect on food intake did not depend on participants’ intake evaluations of whether they ate more, less, or about the same than they normally would (see Figure 1). Note that participants’ initial hunger ratings, their ratings of how much they liked the pasta, and their ratings of how good-tasting the pasta was, all had small to medium positive correlations with food intake ($rs = 0.18$ – 0.27 , $ps < 0.03$). However, controlling for these variables did not change the pattern of results.

Attributions for food intake

Amount of food available

A 2 (portion size) \times 3 (intake evaluation) ANOVA on amount of food available as an explanation for food intake showed no main effect of portion size, $F(1, 151) = 1.28$, $p = 0.26$, $\eta_p^2 = 0.01$, but there was a significant main effect of intake evaluation, $F(2, 151) = 24.64$, $p < 0.001$, $\eta_p^2 = 0.25$. Planned contrasts indicated that ‘ate less’ participants provided the lowest ratings of the influence of the amount of food available, followed by ‘ate the same’ participants, with ‘ate more’ participants providing the highest ratings for the influence of the amount of food available (all $ps < 0.04$). There was also a significant portion size \times intake–evaluation interaction, $F(2, 151) = 4.78$, $p = 0.01$, $\eta_p^2 = 0.06$. Simple effects analyses indicated that ‘ate more’ participants who were also in the large-portion condition rated the amount of food available as more influential than did participants in any other group (all $ps < 0.005$; see top panel of Figure 2).

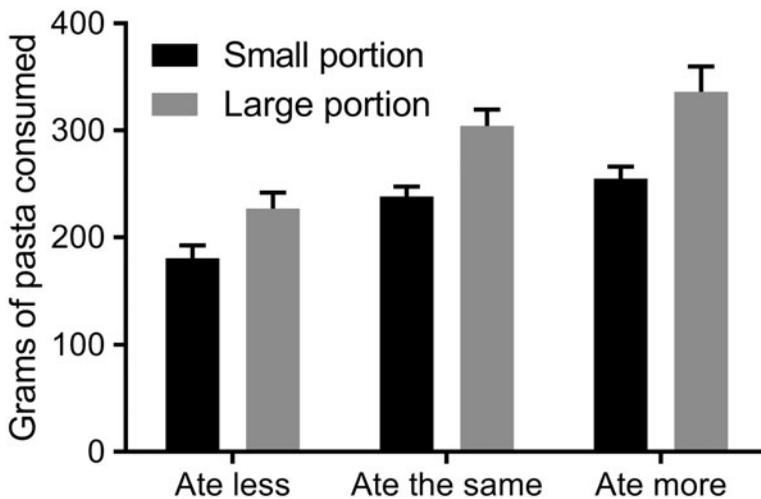


Figure 1. Mean food intake by portion size and intake-evaluation category. Error bars represent standard errors.

Follow-up single-sample *t*-tests were conducted to determine whether, for each group, there was significant endorsement of the influence of the amount of food available (rather than just comparing the relative level of reported influence across groups). Ratings of the influence of the amount of food available were significantly above the mid-point of the scale (0 = 'no influence') for the 'ate more' small portion group

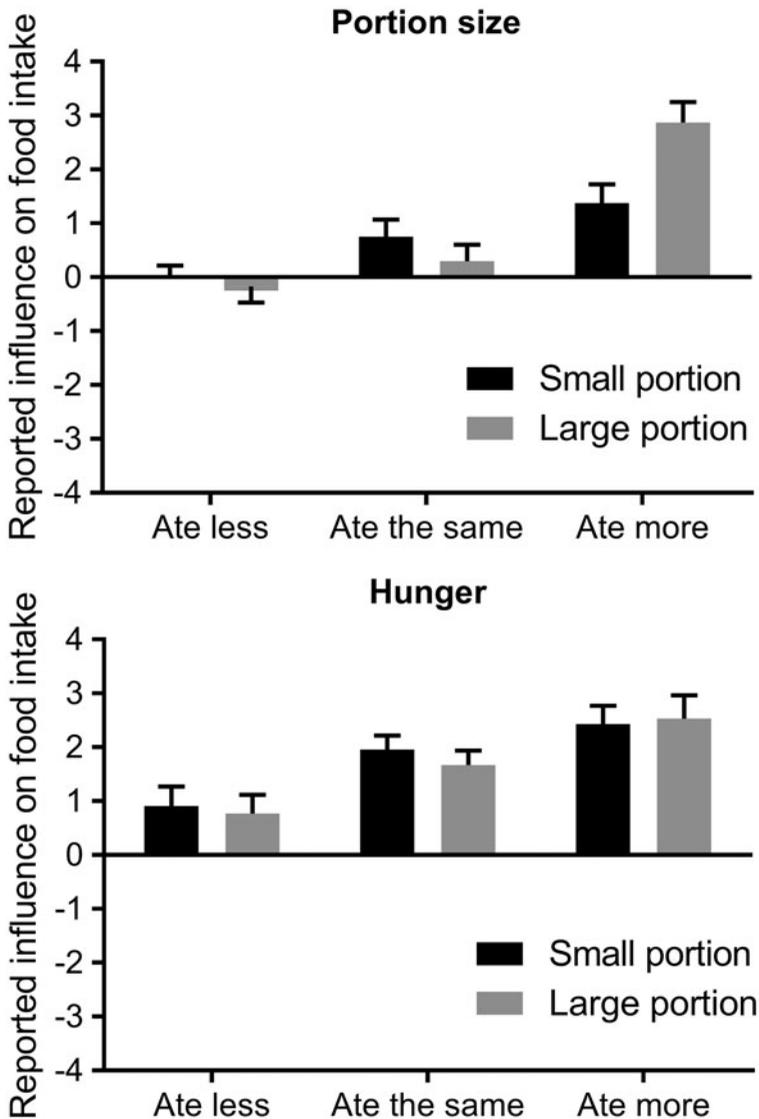


Figure 2. Mean ratings of the influence of portion size (top panel) and hunger (bottom panel) on food intake. The scale ranged from -4 (*made me eat less than I normally would*) to +4 (*made me eat more than I normally would*), with 0 (*did not influence me*) as the mid-point of the scale. Error bars represent standard errors.

($t = 4.05$, $p = 0.001$), for the 'ate more' large portion group ($t = 8.17$, $p < 0.001$) and for 'ate the same' small portion group ($t = 2.34$, $p = 0.03$); in other words, these three groups reported that the amount of food available augmented their food intake. For all other groups, ratings for the influence of the amount of food available were not significantly different from 0 (i.e. 'no influence'), $t_s < 1.00$, $p_s > 0.33$.

Hunger

A 2 (portion size) \times 3 (intake evaluation) ANOVA on hunger as an explanation for food intake showed a main effect of intake evaluation, $F(2, 151) = 12.37$, $p < 0.001$, $\eta_p^2 = 0.14$. Planned contrasts indicated that 'ate less' participants provided the lowest ratings for the influence of hunger on their food intake, followed by 'ate the same' participants and 'ate more' participants ($p_s < 0.003$); the latter two groups did not differ from one another ($p = 0.07$). There was no significant main effect of portion size, $F(1, 151) = 0.03$, $p = 0.87$, $\eta_p^2 < 0.001$, and no significant portion size \times intake-evaluation interaction, $F(2, 151) = 0.20$, $p = 0.82$, $\eta_p^2 = 0.003$. See bottom panel of Figure 2.

Follow-up single-sample t -tests indicated that ratings of the influence of hunger were significantly above the mid-point of the scale (0 = 'no influence') for all groups ($t_s > 2.20$, $p_s < 0.04$), indicating that on average all groups reported that hunger had an augmenting influence on their food intake. Furthermore, as a *post hoc* analysis, we conducted paired samples t -tests for each group comparing ratings of the amount of food available to ratings of hunger as explanations for their food intake. Hunger was rated as a more powerful influence than was the amount of food available in all groups ($t_s > 2.35$, $p_s < 0.04$), with one exception: 'ate more' participants in the large-portion condition rated the two factors as equally influential ($t = 0.62$, $p = 0.54$).

Discussion

This study examined people's explanations for their food intake when they thought that they had eaten more than they normally would versus when they did not think that they had eaten more than they normally would. The first point to note is that, although participants who reported eating more than they normally do did in fact eat significantly more than did participants who reported eating less than they normally do, the portion-size effect was observed indiscriminately across all intake-evaluation groups. That is, participants in the large-portion condition ate more than did participants in the small-portion condition, but the magnitude of this difference did not vary as a function of participants' intake evaluation.

With respect to explanations for food intake, past research indicates that people typically explain their food intake in terms of internal factors such as how hungry they are (Cavanagh et al., 2014; Vartanian et al., 2008). In line with those past studies, participants in the present study reported that their hunger level influenced how much they ate. The extent to which participants indicated that hunger influenced their food intake did vary according to their intake evaluations. Specifically, participants who reported eating the same amount or more than they normally do rated hunger as a stronger influence on their food intake than did those who reported eating less than they normally do. (Note, however, that there were no differences across conditions in initial hunger ratings.) Importantly, there was no interaction with portion size. That is, even though

participants in the large-portion condition ate an average of 25% more than did those in the small-portion condition, participants in the small-portion condition were no less likely to cite hunger as an influence on their food intake. Thus, ‘hunger’ appears to be a stock explanation that is applicable in most circumstances, regardless of how much one has eaten. This finding is also consistent with evidence that people consider hunger to be an appropriate or acceptable reason for eating as much as one does (Spanos et al., 2015).

The main question of interest in the present study was whether attributions to the external eating cue (in this case, the amount of food available) would vary according to whether or not participants felt that they had eaten more than they would normally eat. There were a number of notable findings in this respect. First, despite the lack of difference in the magnitude of the portion-size effect across groups, participants who felt that they had eaten more than normal indicated that they did so partly because of the amount of food available, whereas those who reported that they ate less than or the same as they normally do indicated that the amount of food available did not influence their food intake. These findings are consistent with those of Vartanian et al. (*in press*) and support the notion that people may be willing to explain their food intake in terms of external eating cues when they are motivated to do so – that is, when they judge that they have overeaten and may be looking for an excuse. Second, there was no significant difference in actual food intake between the ‘ate the same’ and ‘ate more’ groups, yet those in the ‘ate more’ group indicated that the amount of food available had a greater influence on their food intake than did those in the ‘ate the same’ group. These findings are also consistent with those of Vartanian et al. (*in press*), who found that participants attributed their ‘overeating’ to a social model when in fact the social model had little effect on their food intake. Together, these findings suggest that, although people are more likely to blame external cues when they believe that they have overeaten, they are not particularly accurate when they invoke external cues to exculpate themselves. Third, we found that it was those participants who both felt that they had eaten more than they normally would and who had been served a large portion who were most likely to explain their intake in terms of the amount of food available. This finding suggests that the salience of the external cue can in part determine whether or not that cue is acknowledged. Finally, for participants in the ate more than normal/large portion group, there was no difference in the extent to which they believe that hunger and the external cue influenced their food intake.

The present study provides further support for the suggestion that people might be willing to use external cues to explain the extent of their food intake under some circumstances: that is, people might use external cues to excuse what they perceive to be excessive food intake. There are, however, some limitations to this study that should be noted. First, we measured – but did not manipulate – the extent to which participants believed that they had eaten more than normal, and thus, we cannot be certain that their beliefs about their food intake had a causal impact on their attributions. Second, we defined overeating as eating more than one normally does, but there are other ways of conceptualising overeating (e.g. in terms of eating more than one wanted to, feeling uncomfortably full, eating more than others do, etc.). It is possible that the different forms of overeating would be associated with different types of attributions. Third, the basic premise of attribution theory is that the attributions that people make for their behaviour serve to improve their self-evaluations (Bradley, 1978). Because we did not

measure the overall positivity of people's self-evaluations, we cannot speak to what impact different attributions have on those self-evaluations. Fourth, our sample consisted of young women who had BMIs predominately within the normal range, and we did not screen for pathological eating behaviour. Although previous research has shown that external eating cues influence peoples' food intake regardless of factors such as sex, age, BMI, and dietary restraint (e.g. Zlatevska et al., 2014), it would be important to determine whether any of these demographic factors or individual difference variables might influence people's *attributions* for their food intake. These are some of the questions that should be addressed in future research.

External eating cues have been demonstrated in numerous studies to have a powerful impact on how much food people eat (e.g. Vartanian et al., 2015; Zlatevska et al., 2014). The question of whether or not people will acknowledge the influence of those external cues turns out to not have a straightforward answer. Previous research has shown that people are aware of the effects of external cues but that some people are motivated to deny those influences (Spanos et al., 2014). There is now some preliminary evidence (from the present study and from the study by Vartanian et al., *in press*) indicating that there are situational factors that can also influence whether or not people will explain their food intake in terms of external cues (even if that explanation is not accurate). Further research is needed to better understand the conditions under which people will and will not acknowledge the influence of external cues and, importantly, what consequences people's attributions or misattributions have for their self-evaluations and for their self-regulation.

Disclosure statement

No potential conflict of interest was reported by the authors.

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Notes

1. To ensure that participants from the student pool and the community would be of a similar age, we recruited participants from the community who were aged between 18–30 years. The student sample had a mean age of 19.63 years (SD = 3.13, range = 17–38) and the community sample had a mean age of 20.42 years (SD = 1.94, range = 18–26). There was no significant difference in age between the two samples, $t = 1.65$, $p = .10$.
2. Previous research has shown that 12 min is sufficient time for female participants to eat lunch in a laboratory context (Rolls et al., 2002; Spanos, Kenda, & Vartanian, 2015). In the present study, only five participants (3%) had not finished their lunch after the 12 min. When the experimenter returned to the room, those participants were asked to quickly finalise their taste ratings so that they could move on to the next part of the study. The results are virtually identical if those five participants are excluded from the analyses.
3. The pattern of results was the same when this relative intake item was treated as a continuous predictor in a regression model.

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