Appetite 116 (2017) 511–517

Contents lists available at ScienceDirect

Appetite

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

Hunger, taste, and normative cues in predictions about food intake

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ARTICLE INFO

Article history:
Received 30 December 2016
Received in revised form
24 May 2017
Accepted 25 May 2017
Available online 28 May 2017

Keywords:
Hunger
Taste
Normative influences
Predicted food intake

ABSTRACT

Normative eating cues (portion size, social factors) have a powerful impact on people's food intake, but people often fail to acknowledge the influence of these cues, instead explaining their food intake in terms of internal (hunger) or sensory (taste) cues. This study examined whether the same biases apply when making predictions about how much food a person would eat. Participants (n = 364) read a series of vignettes describing an eating scenario and predicted how much food the target person would eat in each situation. Some scenarios consisted of a single eating cue (hunger, taste, or a normative cue) that would be expected to increase intake (e.g., high hunger) or decrease intake (e.g., a companion who eats very little). Other scenarios combined two cues that were in conflict with one another (e.g., high hunger + a companion who eats very little). In the cue-conflict scenarios involving an inhibitory internal/sensory cue (e.g., low hunger) with an augmenting normative cue (e.g., a companion who eats a lot), participants predicted a low level of food intake, suggesting a bias toward the internal/sensory cue. For scenarios involving an augmenting internal/sensory cue (e.g., high hunger) and an inhibitory normative cue (e.g., a companion who eats very little), participants predicted an intermediate level of food intake, suggesting that they were influenced by both the internal/sensory and normative cue. Overall, predictions about food intake tend to reflect a general bias toward internal/sensory cues, but also include normative cues when those cues are inhibitory. If people are systematically biased toward internal, sensory, and inhibitory cues, then they may underestimate how much food they or other people will eat in many situations, particularly when normative cues promoting eating are present.

1. Introduction

Food intake is influenced by many factors, including internal cues (hunger/satiety), sensory cues (taste), and normative cues (e.g., social and situational cues indicating appropriate intake; Herman & Polivy, 2008). Although internal and sensory eating cues are important determinants of how much food people will eat, with people typically eating more food when they are hungry (e.g., Drapeau et al., 2007; Parker et al., 2004) and when the food is palatable (Sørensen, Møller, Flint, Martens, & Raben, 2003), normative eating cues can also have a powerful impact on people's food intake. Perhaps the most commonly discussed normative cue is portion size. When people are served larger portions of food, they consume significantly more than they do when they are served smaller portions of food (for a review see Zlatevska, Dubelaar, & Holden, 2014). Another potent normative influence on people's food intake is the amount of food that their eating companions consume. For example, research consistently shows that people model the food intake of others with whom they are eating: They consume more food when they are eating with a companion who eats a relatively large amount, and consume less food when they are eating with a companion who eats a relatively small amount (for reviews see Herman, Roth, & Polivy, 2003; Vartanian, Spanos, Herman, & Polivy, 2015). This modeling effect is evident even when there is no "companion" present and participants are simply informed about the behavior of previous participants in the study (the so-called remote-confederate design; e.g., Feeney, Polivy, Pliner, & Sullivan, 2011).

Most of the research that has examined the influence of normative cues on eating behavior has considered the influence of the normative cue in isolation (i.e., only the normative cue is manipulated). However, a few studies have shown that these

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http://dx.doi.org/10.1016/j.appet.2017.05.044
0195-6663/

normative eating cues can influence peoples' food intake independent of other internal or sensory cues that might be expected to be primary determinants of food intake. For example, Wansink and Kim (2005) served participants either a medium (120 g) or large (240 g) container of popcorn, and the popcorn was either fresh or two weeks old. Not surprisingly, participants ate more when the popcorn was fresh than when it was stale. Remarkably, however, the portion-size effect was still evident even when the popcorn was stale and unpalatable, with participants given a large container of stale popcorn consuming 34% more than those given a medium-sized container of stale popcorn. The power of the normative cue has also been shown in the social modeling literature. Goldman, Herman, and Polivy (1991) examined the influence of a social model on food intake when participants had either just eaten or had been food deprived for up to 24 h prior to the experiment. In two studies, they found that participants ate less when eating with a companion who ate minimally than with a companion who ate a lot, and that this was true even of participants who had been food-deprived for 24 h. These studies suggest that normative eating cues can have a powerful influence on people's food intake even in the face of conflicting internal or sensory eating cues.

Although normative eating cues have a potent influence on food intake, people often fail to acknowledge the influence of those normative cues on their own behavior. Instead, people typically explain their own food intake in terms of internal cues (i.e., hunger) and sensory cues (i.e., taste; Vartanian, Herman, & Wansink, 2008; Vartanian, Sokol, Herman, & Polivy, 2013). Furthermore, portion size studies typically find that average post-intake satiety ratings do not differ between portion-size conditions, despite the fact that participants in the large-portion condition consume significantly more food than do those in the small-portion condition (e.g., Levitsky & Youn, 2004; Reily & Vartanian, 2016; Rolls, Morris, & Roe, 2002). Together, these findings suggest that people may be unaware of or insensitive to the effect of some factors that have a profound influence on their food intake. An alternative possibility is that people may be aware of the impact of normative cues but are unwilling to acknowledge them. For example, there is evidence that people can recognize the impact of social influences on other people's food intake (Spanos, Vartanian, Herman, & Polivy, 2014), and that they will even acknowledge normative influences on their own food intake under certain circumstances. Specifically, a recent study found that people are more willing to acknowledge portion size as an influence on their food intake when they believe that they have overeaten compared to when they believe that they have eaten an appropriate amount (Vartanian, Reily, Spanos, Herman, & Polivy, 2017).

Vartanian, Spanos, Herman, and Polivy (2017) further examined the conditions under which people will and will not acknowledge normative eating cues by introducing a conflicting internal eating cue. Previous research has demonstrated that normative cues may have a more potent influence on people's behavior than either internal or sensory cues (Goldman, Herman, & Polivy, 1991; Wansink & Kim, 2005), but how are people's explanations for their food intake affected by those conflicting food cues? Participants in theVartanian, Spanos, et al. (2017) study took part in an ostensible taste test immediately after consuming a filling meal-replacement shake or after abstaining from eating for 18 h. Half of the participants were exposed to social-norm information that was in conflict with their hunger state (i.e., a low-intake norm for the food-deprived participants, and a high-intake norm for the preloaded participants). The remaining participants were not exposed to social-norm information. Although participants in the food-deprived condition ate less on average if they had been exposed to the conflicting low-intake-norm information than if they had not, they denied being influenced by the normative cue and instead explained their food intake in terms of their hunger. In contrast, participants in the preload condition who had been exposed to the conflicting high-intake norm did not eat more than those who had not been exposed to the norm, but were more likely to attribute their food intake to the social norm. Thus, although deprived participants were inaccurately biased toward explaining their food intake in terms of hunger, preloaded participants were inaccurately biased toward the normative cue. These findings suggest that situational factors contribute to determining the extent to which internal/sensory or normative cues will be utilized to explain one's intake (whether this explanation is accurate or not).

Most studies on reasons for eating have asked participants who had already eaten to explain why they ate the particular amount that they did, and those studies have shown a general bias toward internal- and sensory-cue explanations (e.g., Vartanian et al., 2008; Vartanian et al., 2013), although normative cues might be acknowledged under some circumstances (e.g., Robinson & Field, 2015; Spanos et al., 2014). Another way to assess biases in judgments about the factors that influence food intake would be to consider people's predictions about how much food will be eaten, by themselves or by others, when different cues are made salient. Predictions about food intake do seem to play a role in people's actual food intake. For example, Fay et al. (2011) conducted a questionnaire study on pre-meal planning in a large cohort and found that food intake was planned in most cases, and that from the outset most participants expected to consume their entire portion. Furthermore, experimental studies have shown that the amount of food that people intend to consume closely matched their subsequent food consumption (Wilkinson et al., 2012), and that these intake predictions were influenced by their expectations of how filling the food will be (e.g., Brunstrom & Rogers, 2009; Brunstrom, Shakeshaft, & Scott-Samuel, 2008). In this study, we examined whether predictions about food intake are influenced by internal, sensory, and/or normative cues, in particular when those cues are in conflict with one another.

1.1. The present study

Previous research has shown that, in most circumstances, people tend to overemphasize the influence of internal (hunger) and sensory (taste) factors when explaining their prior food intake, and underemphasize the influence of normative factors (e.g., the behavior of others, portion size). The purpose of the present study was to determine whether the same biases apply when making predictions about how much food a person would eat under various conditions. On the basis of previous research (e.g., Vartanian et al., 2008, 2013), we hypothesized that participants would overemphasize internal and sensory factors[1] and underemphasize normative factors when predicting the target person's food intake. Although there is some evidence that people will acknowledge normative influences under some circumstances (e.g., when they feel that they have overeaten), those circumstances should not apply when making predictions about food intake.

We also explored two potential moderators of the bias toward the internal and sensory cues: First, on the basis of research

[1] Although some people may consider both hunger and taste to be internal cues, we believe it is more accurate to conceptualize taste as a sensory cue (see Herman & Polivy, 2008). Taste includes both an internal component (i.e., individual food preferences and palate) and an external component (i.e., properties of the food itself, such as freshness), making it distinctly different from hunger. What hunger and taste share is that they are both seen as appropriate reasons for eating as much as one does (Spanos et al., 2015), and are commonly cited reasons for eating. This is why we had similar predictions for hunger and taste but kept them separate in the analyses.