



Short communication

The shaping role of hunger on self-reported external eating status

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ABSTRACT

As people are relatively incompetent in assessing the impact of visceral states on their behavior, two studies tested the hypothesis that hunger affects the extent to which people assess themselves as external eaters. In Study 1 participants' current self-reported hunger states were linked to their scores on an external eating scale. Hungrier participants perceived themselves more strongly as external eaters. In Study 2 hunger was experimentally manipulated, after which self-reported external eating was assessed. Hunger was found to affect people's self-reported external eating status, such that hungry participants scored higher and above the average norm score on external eating compared to satiated participants, who scored below this average norm score. The key implications of these findings are discussed.

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In Western societies excessive food intake has become a more serious threat for human health than hunger and shortage of food (Pinel, Assanand, & Lehman, 2000). An important factor that has been linked to overeating is our 'obesogenic' food environment with an enduring availability of high caloric foods (French, Story, & Jeffery, 2001). People who typically face problems in dealing with this environment are so called 'external eaters'. They can be defined as those individuals with the tendency to overeat in response to external food-related cues like the sight, smell, and taste of palatable food, regardless of their physical need for food (Rodin, 1980; Van Strien, Schippers, & Cox, 1995).

External eating is considered a highly problematic eating style due to its association with higher body weights (Elfhag & Linné, 2005), more unhealthy food intake (Van Strien, 2000), and increased risk of relapse in eating disorders and obesity (e.g., Jansen et al., 2003; Nederkoorn, Smulders, Havermans, & Jansen, 2004). It has even been suggested that classification of overeaters as external eaters should guide treatment selection, in such a way that overweight people scoring high on the external eater scale need behavior therapy (Van Strien, 2006; Jansen et al., 2011). Therefore, it is highly important to know who can be classified as an external eater.

The Dutch Eating Behavior Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986) includes an External Eating (EE) subscale that aims to identify this type of eater. Apart from the EE-

subscale, the DEBQ also contains the Restraint Eating subscale to classify the restrained eater and an Emotional Eating subscale to identify the emotional eater. Research on this latter scale has revealed that the induction of negative affect increased the level of the self-reported tendency to eat when emotional (Bekker, Meerendonk, & Mollerus, 2004). Just like the self-assessment of emotional eating thus seems to be affected by an individual's emotional state, we assume that the way in which individuals report on their external eating behavior also varies according to their visceral state.

Visceral states are internal bodily states that guide behavior in the direction of satisfying bodily needs. When hungry, for example, the body creates a desire for food consumption, particularly for high-caloric foods. Research has convincingly shown that people often underestimate the influence of visceral drives on their subsequent behavior, specifically when they do not experience that particular drive at the moment of assessment. When people are in *hot* states (such as being sexually aroused, hungry, or emotional), they appreciate the influence of past or future hot states, whereas people in neutral or *cold* states chronically underestimate the impact of these hot states (Van Boven & Loewenstein, 2003). This so called 'empathy gap' has important implications. Hungry shoppers, for example, often purchase more food than they had anticipated; more so than satiated shoppers (Nisbett & Kanouse, 1969). Moreover, dieters craving food assess the difficulty of losing weight rather realistically, whereas satiated dieters optimistically underestimate how difficult this will be (Nordgren, Pligt, & Harreveld, 2008). Likewise, satiated people overestimate their capacity to control their hunger cravings compared to hungry people and, consequently, expose themselves to more food temptations (Nordgren, Pligt, & Harreveld, 2009).

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External eating seems to be a type of behavior that is typically vulnerable to the visceral drive of hunger. That is, people in a hungry state are more tempted by external food cues, like the sight of food, than those in a satiated state (Seibt, Häfner, & Deutsch, 2007). Indeed, research has shown that food stimuli capture attention sooner and longer in hungry participants than in satiated participants, thus indicating that hunger selectively biases attention toward food cues (Piech, Pastorino, & Zald, 2010). Importantly, just like people are not competent in assessing the impact of visceral states on their behavior, they may also not be competent in assessing themselves as an external eater – precisely because they mispredict how a visceral state like hunger drives their eating behavior. Thus, in our view, people's tendency to assess themselves as an external eater is fundamentally linked with the hunger state that drives eating behavior. Accordingly, we assume that hunger affects the extent to which people assess themselves as external eaters, such that people in a hungry state more strongly report that they are external eaters than people in a satiated state. The present studies

In two studies we tested the hypothesis that hunger enhances the level of self-perceived external eating. In Study 1 this was tested by linking participants' current hunger states to their scores on the EE-subscale. In Study 2 hunger was experimentally manipulated by bringing participants into a hungry or satiated state, after which they filled out the EE-subscale. Study 1

Hunger and external eating were assessed by self-reports in order to test the hypothesis that the level of hunger predicts the level of external eating. Method Participants & procedure

As part of a larger study, visitors of several health-related websites and an internet site of a national newspaper were presented with a link inviting all female visitors to participate in a study on eating behavior. This link was placed on the website together with a general article on eating behavior.

In this study 382 women participated. Average age was 29.79 ($SD = 10.81$) and mean BMI was 23.79 ($SD = 4.59$). Nearly 30% of the sample was student; over 60% was working; 10% indicated that they were neither studying nor working. Across all participants, 78% had followed higher education. Questionnaire

Participants completed the DEBQ (Van Strien et al., 1986) in order to assess the extent of external eating (EE-subscale: 10 items: $\alpha = .82$ on 5-point scales ranging from 'never' to 'very often') an example being: "If food smells and looks good, do you eat more than usual?" Next, besides some demographical variables, participants had to indicate the extent to which they felt hungry, ranging from 1 (*not hungry at all*) to 4 (*very hungry*). Results & discussion

Mean scores, standard deviations, and intercorrelations are presented in Table 1. Hunger was associated with external eating status, with hungrier participants scoring significantly higher on the EE-subscale, $r = .17$, $p = .001$. This is a first indication that hunger is related to the extent to which people see themselves as external eaters. A limitation of this study was that hunger was assessed with only one item and that it was assessed after filling in the EE-subscale; individuals high in external eating may have experienced hunger in response to reading and responding to the EE-subscale items to a higher degree than individuals low in external eating. Moreover, as this study entailed only correlational evidence, it remains unclear to what extent hunger is truly responsible for participants' scores on the EE-subscale. Study 2

In order to address the limitations mentioned above, hunger was manipulated in Study 2. The EE-subscale was assessed either before participants had breakfast (hungry condition) or after they had breakfast (satiated condition). Moreover, in order to assess whether the effect of this hunger state is specific for the assessment of one's external eating status or also generalizes to the other eating styles, also the Restraint Eating (Rs) and Emotional

Table 1
Means, standard deviations, and correlations (Study 1).

	1	2	3
1. BMI	–		
2. Hunger	–.04	–	
3. EE-subscale	.13	.17**	–
<i>M</i>	23.79	1.58	3.33
<i>SD</i>	4.59	.74	.68

** $p < .01$.

Eating (EmE) subscales of the DEBQ were taken into account. Method Participants & procedure

Female university students ($n = 74$) participated in this study for course credit. Average age was 22.08 ($SD = 2.41$) and mean BMI was 21.06 ($SD = 1.75$).

The study was presented as a study on students' eating habits. Participants were informed upon scheduling an appointment that they were not allowed to eat from 11 pm the evening before participation; they were only permitted to drink water. At the day of participation, subjects arrived at the university canteen between 9.00 and 9.30 am and were seated individually in a quiet corner. After signing informed consents, participants were randomly assigned to one of two conditions. In the *hungry condition* ($n = 36$) participants completed a questionnaire including the DEBQ. When finished, they received breakfast. In the *satiated condition* ($n = 38$) participants first received breakfast and then completed the same questionnaire. Along with providing the breakfast, participants were told that it did not matter how much or what they consumed, but that it was important to eat such an amount that they would feel satiated. After completion, participants were debriefed and provided with course credit. Questionnaire

In order to check whether participants in the hungry condition were more hungry than those in the satiated condition, they had to indicate the extent to which they were hungry, felt like eating something, and felt like having a bite on 7-point scales ranging from 1 (*not at all*) to 7 (*very much*). These three items were combined into a hunger scale ($\alpha = .95$). Next, besides some demographical variables, the DEBQ was assessed, including the EE-subscale ($\alpha = .78$), the Rs-subscale ($\alpha = .92$), and the EmE-subscale ($\alpha = .90$). Results & discussion Randomization and manipulation check

Two separate ANOVAs with age and BMI as dependent variables showed that there were no significant condition effects, $F_s < 1$, indicating successful randomization. An ANOVA with the hunger scale as dependent variable revealed that participants in the hungry condition ($M = 5.44$, $SD = 1.09$) were more hungry than participants in the satiated condition ($M = 2.54$, $SD = 1.24$), $F(1,72) = 113.48$, $p < .001$. The manipulation of hunger was thus successful. Main analysis

An ANOVA with the EE-subscale as dependent variable revealed a significant condition effect, $F(1,73) = 4.51$, $p = .037$. In the hungry condition participants assessed themselves as external eaters more strongly ($M = 3.23$, $SD = .49$) than in the satiated condition ($M = 2.98$, $SD = .51$). Importantly, this means that the average score within the hungry participants resulted in a score *above* the average norm score as determined for female students (3.10–3.14: Van Strien et al., 1986), while the average score within the satiated participants resulted in a score *below* this established average norm.

To assess whether this effect generalized to self-reported restrained and emotional eating, univariate effects of condition regarding the Rs and EmE-subscales were also assessed. Hunger affected the self-assessment of neither restrained ($p = .139$) nor emotional eating ($p = .625$), indicating that the hunger state is specific for the assessment of external eating. General discussion

The visceral state of hunger was found to affect people's scores on the EE-subscale, such that hungry participants scored higher and, in fact, as a group exceeded the average norm score on external eating compared to satiated participants, who scored on average below this norm score. The finding that hunger affects self-perceived external eating has several important implications.

First, as people's external eating score seems to be moderated by their hunger state, future research should identify the key visceral state in which the EE-subscale identifies the 'true external eater': when participants fill out this scale in a relatively hungry state, or in a rather satiated state. This is particularly important since Study 2 revealed that one's visceral state can potentially determine whether one is classified, by the existing norm scores, as being an external eater or not. In view of the suggestion that classification as a high external eater indicates a need for therapy (Van Strien, 2006), it seems of vital importance that future studies establish the key visceral state that is the best predictor of the 'true external eater'. Drawing upon earlier research findings (Nordgren et al., 2009) which suggest that people are able to assess their eating-related behaviors more accurately when in a hot state, it seems that hunger, rather than satiety, would be the more likely candidate for this key visceral state. Moreover, this key visceral state should be established not only in a sample of normal-weight women (like in the present studies), but also in samples of obese and overweight individuals.

Second, people's self-reported external eating score is typically considered to be a trait measure. However, if this score is dependent on one's level of hunger at the time of filling out the EE-subscale, this would mean that it is a state rather than a trait measure. Given that the accuracy of people's perception changes according to their current visceral state, this may have important consequences for the predictive validity of the EE-subscale. That is, for a good predictive validity a match may be needed between the state of filling in the EE-subscale and the state when exposed to food cues. It seems likely that the EE-subscale assessed when hungry is predictive for external eating behavior in a corresponding hungry state and that one's external eating score assessed in a satiated state is predictive for one's external eating behavior in a satiated state. Recent findings indeed indicate that the EE-subscale in its current form may lack predictive validity (Jansen et al., 2011). However, if hunger can moderate people's score on the EE-subscale as the current results suggest, this cries for additional validation research assessing if the predictive validity of this subscale improves when people's visceral state is accounted for.

Further, the results showed that hunger status only affected the self-assessment of external eating, as opposed to other important eating styles like restrained and emotional eating. This specificity is important as it helps to establish the boundaries of this effect: Simply feeling hungry does not change the self-assessment of all eating-related behaviors. This finding is in line with research showing that inducing negative affect in participants elevated their scores on emotional eating, the subscale that measures behavior corresponding to this visceral state (Bekker et al., 2004).

Besides these implications, some limitations need to be addressed as well. First, our sample included only normal-weight, young, and highly educated women; the generalizability of the present findings to other samples needs to be assessed. However, in contrast to many other studies in the eating domain, the sample of Study 1 was a community sample. Furthermore, Study 1 provides only correlational evidence with the limitation that hunger was assessed after external eating. However, Study 2

tackled these limitations and entailed further evidence that hunger may have small, but highly relevant effects on an individual's external eater status. A further potential limitation is that only the EE-subscale was investigated, which could be expanded to include other measures in future research (the disinhibition subscale of the Three-Factor Eating Questionnaire, Stunkard & Messick, 1985; and the Power of Food Scale, Lowe & Butryn, 2007). However, the generally high correlations between these various measures (Hyland, Irvine, Thacker, Dann, & Dennis, 1989) suggest that substantial differences with regard to the influence of hunger need not be anticipated.

The current studies suggest that hunger, which is a highly *state-dependent* visceral drive, affects individuals' self-perceived external eating status, which is typically considered to be a stable *trait*. Though further research is certainly warranted, this has important implications for the administration of the EE-subscale as well as for the interpretation of its resulting scores.

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