



Research report

Do hunger and exposure to food affect scores on a measure of hedonic hunger? An experimental study

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ABSTRACT

Research suggests that visceral bodily states, such as hunger, can affect participants' responses on self-report measures of eating behavior. The present study evaluated the influence of hunger and exposure to palatable food on self-reported hedonic appetite, measured using the Power of Food Scale (PFS). A secondary aim was to evaluate the effects of these manipulations on self-reported external eating and disinhibition. Participants ($N = 67$) ate a standardized meal followed by a 4-h fast. Participants were randomized to one of four groups (Fasted/Food Absence, Fasted/Food Exposure, Fed/Food Absence, or Fed/Food Exposure). In Phase I of the experiment (Hunger Manipulation), participants randomized to the "Fed" group drank a protein shake, while those in the "Fasted" group did not receive a shake. In Phase II (Palatable Food Exposure), participants in the "Food Exposure" group were visually exposed to palatable food items, while "Food Absence" participants were not. All participants completed the PFS, Dutch Eating Behavior Questionnaire External Eating subscale, and the Disinhibition subscale from the Eating Inventory during Phase II. Results showed no significant main or interactive effects of Hunger condition or Food Exposure condition on PFS, External Eating, or Disinhibition scores (all p 's $< .33$). All effect sizes were small (partial η^2 s squared $\leq .015$). Manipulation checks confirmed that the intended hunger and exposure interventions were successful. Results suggest that relatively short fasting periods (e.g., 4 h) analogous to typical breaks between meals are not associated with changes in scores on the PFS, External Eating, or Disinhibition scales. Hedonic hunger, at least as measured by the PFS, may represent a relatively stable construct that is not substantially affected by daily variations in hunger. In addition, individual differences in exposure to food in the immediate environment are unlikely to confound research using these measures.

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Introduction

Self-report measures are commonly used in research on eating behaviors. However, research suggests that some such measures may be influenced by an individual's hunger status at the time of questionnaire completion (e.g., Evers et al., 2011). This finding comes from a line of research suggesting that visceral bodily states that motivate the individual to satisfy physiological needs (for instance, hunger or drug cravings) can affect the individual's self-report, particularly when the visceral state relates to the construct being measured (e.g., Nordgren, van Harreveld, & van der Pligt, 2009). The experience of a visceral impulse has been referred to as a "hot state" (Nordgren et al., 2009). People may more accu-

rately appraise the effects and behavioral correlates of a particular hot state when they are in that state (Nordgren et al., 2009). For instance, a participant who is not hungry might overestimate his or her ability to resist unhealthy foods, while a participant who is hungry while filling out a self-report measure may report more accurately because the hunger state facilitates recall of past hunger states.

A recent experimental study found that self-reports of external eating, or the tendency to eat in response to external cues such as the sight or smell of food, are affected by current hunger status (Evers et al., 2011). After an overnight fast, college students who were hungry at the time they completed questionnaire measures scored significantly higher on the External Eating Scale of the Dutch Eating Behavior Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986) compared to participants who were randomly assigned to eat breakfast prior to completing the questionnaire. This finding suggests that measures of similar constructs

Abbreviations: DEBQ, Dutch Eating Behavior Questionnaire; EI, Eating Inventory; PFS, Power of Food Scale.

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should also be investigated to assess the possibility of systematic differences associated with visceral states; such research would allow investigators to account for potential confounding effects of visceral states in their research designs.

Hedonic hunger, the drive to eat for pleasure in the absence of a physiological energy deficit, is a construct that has received increased attention in research on eating behaviors (e.g., [Lowe & Butryn, 2007](#)). A frequently used measure of hedonic hunger is the Power of Food Scale (PFS; [Lowe et al., 2009](#)), a self-report questionnaire that assesses sensitivity to the availability of palatable food and includes items assessing frequency of thoughts about food in the absence of physical hunger, degree of pleasure associated with eating, and urges to eat when exposed to palatable food. While the PFS and the DEBQ External Eating Scale tend to be significantly correlated (e.g., $r = .66$; [Lowe et al., 2009](#)), the PFS differs from the DEBQ External Eating Scale in that the PFS does not assess actual food consumption; rather, the PFS measures hedonically driven motivation to eat. The importance of the construct of hedonic hunger in understanding eating behavior is suggested by a number of studies that have demonstrated associations between PFS scores and overeating (e.g., [Appelhans et al., 2011](#); [Lowe et al., 2009](#)) as well as the experience of loss of control over eating (i.e., binge eating; [Davis et al., 2009](#); [Witt & Lowe, in press](#)).

Given the apparent effects of concurrent physiological state on individuals' self-report ratings of similar constructs, we sought to determine whether self-reported hedonic hunger, as measured by the PFS, is similarly affected by hunger status. In addition, because theories of hedonic hunger suggest that hedonic hunger may be externally stimulated by exposure to abundant palatable food ([Lowe & Butryn, 2007](#)), we speculated that exposure to palatable food might also produce a "hot state" that might be relevant to scores on self-report measures of hedonic hunger. More specifically, because the PFS asks individuals to report on their appetitive responsiveness to the availability of palatable food, the presence of food in the immediate environment may cue participants to report more accurately on their responsiveness to the availability of food, just as hunger is theorized to facilitate recall of past hunger states. This may be especially the case for participants who are highly prone to cravings and thoughts about food when exposed to food stimuli: it is possible that such individuals might underestimate their appetitive responsiveness to the presence of food when they complete a measure such as the PFS in the absence of food in their environment. Accordingly, we sought to extend previous research by investigating the effects of exposure to palatable food, in addition to hunger, on PFS scores. These questions were investigated by manipulating participants' hunger levels and the presence of palatable food in the immediate environment prior to administering the PFS. For convergent validity purposes, the External Eating Scale from the DEBQ and the Disinhibition subscale from the Eating Inventory (EI; [Stunkard & Messick, 1985](#)) were also administered in order to assess the effects of the experimental manipulations on self-reports of constructs related to hedonic hunger.

The present study employed a shorter fasting period (4 h) prior to the experiment than was used in the prior study on the DEBQ ([Evers et al., 2011](#)) to determine whether a fasting period that better represents daily intervals between meals and snacks is likely to affect PFS scores. This shorter fasting period was used to improve generalizability: it was considered important to determine whether effects previously found for the DEBQ after a longer (overnight) fast are likely to represent confounds in studies using similar measures as part of assessment batteries that may take place at a variety of times of day. While prior research suggests that studies administering such measures after very lengthy or overnight fasting periods may obtain different results relative to what would be obtained during a participant's more typical day, it is unclear whether scores on the PFS and similar measures are likely to

fluctuate throughout the day based on hunger status, or if these measures tap more stable, trait-like constructs. If scores were found to be significantly influenced by a four-hour fast, this would suggest a need for studies using these measures to rigorously control the timing of eating in relation to measure administration.

Based on prior research on the effects of hot states on self-report measures, it was hypothesized that self-reported hedonic appetite, as measured by the PFS, would be higher among hungry participants than among satiated participants. In addition, it was hypothesized that PFS scores would be higher for participants exposed to palatable food at the time of questionnaire completion compared to participants who complete the PFS without concurrent exposure to food. A similar pattern was expected for scores on External Eating and Disinhibition. We also sought to assess any interactive effects of hunger and exposure to food on these self-report measures, although no specific hypotheses were made.

Methods

Participants

Participants ($N = 71$) were undergraduate students age 18–25 enrolled at a Philadelphia area university. Recruitment was conducted through a university-based electronic system, and interested students were screened for eligibility by telephone. Potential participants were deemed ineligible upon meeting any of the following exclusion criteria: (1) current or previously diagnosed eating disorder, (2) inability or refusal to eat any of the foods in the experiment. Eligible participants were instructed to eat a standardized meal (1 bagel, 1 pat of butter, 8 oz of apple juice) 4 h before the scheduled visit and to otherwise refrain from eating or drinking beverages other than water during that period, and an email reminder with these instructions was sent 24 h prior to the scheduled visit.

Experimental procedure

All procedures were approved by the Institutional Review Board at Drexel University. Informed consent was obtained upon arrival at the laboratory. Adherence to the standardized breakfast and four hour fast was assessed via open-ended questioning about the timing and content of the participant's breakfast as well as other food or beverage consumption, and two participants who had deviated from the instructions were not permitted to proceed with the experiment. Participants were randomized to one of four groups: (1) Fasted/Food Absence ($N = 19$), (2) Fasted/Food Exposure ($N = 15$), (3) Fed/Food Absence ($N = 15$), or (4) Fed/Food Exposure ($N = 18$). The Fasted vs. Fed groupings correspond to the hunger manipulation detailed in Phase I, and the Food Absence vs. Food Exposure groupings correspond to the Palatable Food Exposure manipulation detailed in Phase II. All participants completed experimental Phases I and II.

As an additional check for adherence to the standardized breakfast, participants received a short debriefing questionnaire about their experience participating in the study following completion of the experiment, which included questions about adherence to the standardized breakfast as well as an explicit statement that compensation would not be affected by the answers. The aim of this procedure was to increase the likelihood that participants would report any non-adherence by removing concerns about compensation and minimizing potential embarrassment about verbally reporting non-adherence directly to the experimenter. Data from two participants who had completed the study but later reported non-adherence to the breakfast were not used in the

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