



Acute hunger modifies responses on the Three Factor Eating Questionnaire hunger and disinhibition, but not restraint, scales



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ABSTRACT

It is widely assumed that responses on the Three Factor Eating Questionnaire (TFEQ) represent long-term (trait) attitudes to eating behaviour. However, the questionnaire requires agreement with a number of food related statements, and it is possible that some are easier to agree with when assessed hungry than sated. To test this potential state-dependency, participants completed a 100 mm visual analogue scale rating of their current hunger at the time they completed the TFEQ. Data were collected from two cohorts: Cohort 1 (507 women and 119 men) completed both measures on paper, while the hunger rating was computerised in Cohort 2 (179 women). Regression analysis revealed significant effects of rated hunger on scores on the hunger (TFEQ-H) and disinhibition (TFEQ-D) but not restraint (TFEQ-R) subscales, with higher TFEQ-H and TFEQ-D scores when participants were more hungry. In addition, 61 women and two men from Cohort 1 completed the measures on two separate occasions. Here, scores on TFEQ-H were higher on days when these participants were hungrier, but no differences in TFEQ-D or TFEQ-R were found. Overall these data suggest TFEQ-H could be interpreted as an indirect measure of current hunger, that scores on TFEQ-D are partly moderated by hunger but TFEQ-R is a more trait-like measure of restraint.

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1. Introduction

Since its publication, the Three Factor Eating Questionnaire (Stunkard & Messick, 1985) has become one of the most widely used psychometric tools identifying individual differences in eating attitudes in studies of human ingestive behaviour. As its name indicates, the questionnaire was devised to measure three aspects of human eating, defined by the authors as restraint (TFEQ-R), disinhibition (TFEQ-D) and hunger (TFEQ-H). Originally, these scales were designed to measure long-term attitudes to eating and consequently scores are often considered as long-term or trait measures (Barkeling, King, Näslund, & Blundell, 2007; Bryant, King, & Blundell, 2008; Finlayson, Cecil, Higgs, Hill, & Hetherington, 2012; Gallant et al., 2013; Gallant et al., 2010; Lattimore, Fisher, & Malinowski, 2011). However, this implies that answers to items

on the TFEQ reflect long-term influences on each individual's eating and are thus insensitive to the acute appetitive state of the participant. To our knowledge this assumption has never been formally tested.

At present there are three widely used measures of restrained eating: TFEQ-R, the restraint scale from the Dutch Eating Behaviour Questionnaire (DEBQ; Van Strien, Frijters, Bergers, & Defares, 1986) and the Revised Restraint Scale (RRS; Polivy, Herman, & Howard, 1988), which itself was developed from the original attempt to measure habitual restrained eating (Herman & Mack, 1975). Restraint is often initiated as a response to weight gain and all three measures are based on responses to items that measure the tendency to cognitively control eating behaviours and restrict intake due to concerns with current body weight. The external focus restrained eaters makes it less likely that scores on restraint scales will vary with acute hunger state.

However, both TFEQ-D and TFEQ-H measure attitudes and responses to food. The TFEQ-D scale has been described variously as a measure of trait disinhibition (Lattimore et al., 2011; Neale, Mazzeo,

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& Bulik, 2003), uncontrolled eating (Keskitalo et al., 2008; Yeomans, Leitch, & Mobini, 2008) or opportunistic eating (Bryant et al., 2008; Finlayson et al., 2012), reflecting a recognition that the name disinhibition is confounded with the disinhibition effect arising from the breakdown of dietary restraint. Indeed, a shortened version of the TFEQ combined items from the original TFEQ-D and TFEQ-H scales into measure of uncontrolled and emotional eating (Karlsson, Persson, Sjöström, & Sullivan, 2000). High scores on TFEQ-D have been associated with higher body-weight both on its own (French, Mitchell, Finlayson, Blundell, & Jeffery, 2014; Hays & Roberts, 2008; Lawson et al., 1995; Tepper & Ullrich, 2002), and in combination with scores on TFEQ-R (Williamson et al., 1995). In all cases, TFEQ-D is interpreted as a longer term dispositional measure of self-reported tendency to struggle to control eating. However, the statements underlying TFEQ-D typically relate to situations that challenge the ability to resist eating, either by the presence of desirable food or by emotional states that may promote eating. Thus it is plausible that some participants might be more likely to respond positively to these questions when more hungry than when satiated.

The least researched of the three TFEQ subscales is TFEQ-H, originally seen as a measure of susceptibility to hunger cues: i.e. a reflection of long-term individual differences in responses to hunger rather than a state measure of hunger per se. High scores on TFEQ-H have again been associated with higher body-weight (Dykes, Brunner, Martikainen, & Wardle, 2004; French et al., 2014), which runs counter to the original idea that high scores on TFEQ-H might relate to greater interoceptive awareness and consequently lower susceptibility to overeating. However, as with TFEQ-D responses on hunger items could again be enhanced by actual state hunger: for example, it seemed plausible that hungry individuals might more readily agree with the statement “When I see a real delicacy, I often get so hungry that I have to eat right away”. Indeed, some papers interpret TFEQ-H as a measure of perceived or state hunger (de Castro & Lilienfeld, 2005; Rutters, Nieuwenhuizen, Lemmens, Born, & Westerterp-Plantenga, 2009; Williamson et al., 1995), implying this is more an acute than trait measure, although others describe TFEQ-H in trait terms (Barkeling et al., 2007; Bond, McDowell, & Wilkinson, 2001; e.g.; Gendall, Joyce, Sullivan, & Bulik, 1998; Provencher et al., 2005). This uncertainty in the nature of the TFEQ-H measure can be clarified by examining the acute sensitivity of TFEQ-H to actual hunger when the TFEQ was completed.

The key question in the present paper thus relates to the sensitivity of responses to the TFEQ to acute appetitive state. The majority of the scores on the original 51-item TFEQ derive from simple “True/False” statements which describe various eating situations. Although the intention was to use this simple questionnaire format to promote long-term responses, it is possible that the degree to which someone agreed with these statements depended on their acute hunger. The present study tested this idea by assessing how within and between-person responses on all three TFEQ sub-scales varied as a function of hunger at the time of completion to explicitly test the extent to which TFEQ scores were sensitive to the self-reported hunger state at the time of testing.

2. Methods

2.1. Design

The study examined how scores on the three subscales of the TFEQ varied depending on the rated hunger of the participant at the time when the TFEQ was completed.

2.2. Participants

Participants were 805 male and female volunteers who completed the TFEQ and at the same time rated their hunger. Most data were obtained as part of a standardised recruitment process between 2006 and 2008: additional data came from a subset of specific studies conducted between 2012 and 2014, where participants again completed the TFEQ alongside a rating of current hunger. All data collection was approved by the University of Sussex Science and Technology Cross-Schools Research Ethics Committee (C-REC) and was conducted in line with the British Psychological Society code of conduct, ethical principles and guidelines. As this was an analysis of data originally collected for other purposes, we confirm all participants consented to the use of their responses in future research.

2.3. Procedure

Data were collected from two cohorts of participants. Cohort 1 was collected between 2006 and 2008 and comprised of staff and students at the University of Sussex who had completed a standardised recruitment questionnaire as part of their voluntary admission to the Sussex Ingestive Behaviour Unit (SIBU) participant pool. This combined the standard 51-item TFEQ, a series of questions about drinking habits, food aversions and allergies, and finally a single rating of hunger presented as a 100 mm visual analogue scale (VAS) below the instruction “Please put a mark on the line to show how hungry you are right now, paying attention to the descriptions at the end of the line”, with the end-anchors “Not at all Hungry”, coded as zero, and “Extremely hungry”, coded as 100. The VAS rating was on a separate page from all TFEQ measures. In total 626 completed questionnaires were available for analysis in Cohort 1 (507 women and 119 men). Each person's age at the time of completion was recorded (mean age: males = 23.4 ± 5.9 , range 18–62 years; females = 21.6 ± 4.4 , range 18–61 years).

Of the participants in Cohort 1, 63 (59 women and 4 men) completed the questionnaire more than once (separated by between 1 and 15 months). This provided the opportunity to test how within-participant differences in rated hunger altered the way they completed the TFEQ.

Data for Cohort 2 was collected later (2012–2014) from a further 179 female participants who consented to be part of research studies in the SIBU. On this occasion participants made computerised ratings of hunger alongside fullness, thirst and desire to eat. Participants were asked “How Hungry do you feel right now?” and responded on a similar 100 mm VAS as in Cohort 1, with the end-anchors “Not at all hungry” (0) and “Extremely hungry” (100). This time, however, the rating was completed on a computer. All participants completed the TFEQ (on paper) straight after rating their appetite. Finally, Body Mass Index (BMI: calculated from height and body weight measurements) and age at the time of testing was recorded (mean age = 20.6 ± 3.0 , range 18–38 years; mean BMI $\text{kg/m}^2 = 23.2 \pm 3.6$, range = 17–37).

2.4. Data analysis

The key question for this study was the extent to which ratings on the three sub-scales of the TFEQ depended on a person's reported hunger at the time when the TFEQ was completed. Principle analyses regressed Rated Hunger against each TFEQ factor in separate regression models. Cohort (1 vs 2), Gender (male vs. female), Age (years) were entered as control variables in the first step of each model and their interaction with Hunger ratings were tested in a second step. BMI was not included as these data were only available for the smaller Cohort 2. Since 29 participants did not

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