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Research report

Characterization of the Three-Factor Eating Questionnaire scores of a young French cohort ☆

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ABSTRACT

The aims of our study were to characterize the psychological dimensions of eating behaviour of young French adults as measured by the Three Factor Eating Questionnaire (TFEQ) and to analyze the association between the 3 TFEQ mean scores (main scales and subscales) and gender, Body Mass Index (BMI) and socio-demographic data in this population. An online TFEQ questionnaire was used with a nationally representative sample of 1000 young French people (aged 20–39 yrs). The average scores were 6.3 ± 0.1 (sem) for dietary restraint, 6.0 ± 0.1 for disinhibition and 5.0 ± 0.1 for hunger. Compared to the limit commonly used in human food studies, young French adults were characterized by low restraint and low disinhibition levels. There was a significant gender effect on both restraint and disinhibition scores, with women showing significantly higher scores than men. Concerning the link between TFEQ scores and BMI, there was a significant effect of the BMI category on cognitive restraint, disinhibition and hunger. Disinhibition was the factor most strongly associated to BMI, independently of gender. Our results highlight both the importance of taking into account not only disinhibition but also cognitive restraint and the usefulness of subscales when studying eating behaviour and its link to body weight. We characterize the eating behaviour of a French cohort with criteria often chosen for healthy volunteers in human food studies. Consequently, we suggest new TFEQ limits (6 for cognitive restraint and disinhibition, 5 for hunger) lower than those traditionally used for this category of the population in clinical food studies.

Introduction

Psychometric traits play an important role in human food studies and are widely used both to characterize a specific population's eating behaviour (Boschi, Iorio, Margiotta, D'Orsi, & Falconi, 2001; Gallant et al., 2010; Yeomans & Coughlan, 2009) and to avoid recruiting participants with a tendency to control food intake cognitively (Blundell et al., 2010). Indeed, cognitive control of food intake can bias results, especially in studies of satiety induced by food (Bertenshaw, Lluch, & Yeomans, 2008; Blundell & King, 1996; Lluch, King, & Blundell, 1998; Marmonier, Chapelot, Fantino, & Louis-Sylvestre, 2002). The two most commonly used questionnaires to evaluate volunteers' eating behaviours and potentially correlated factors (Blundell et al., 2010) are the Three-Factor Eating Questionnaire (TFEQ) (Stunkard & Messick, 1985), and the Dutch Eating Behaviour Questionnaire (DEBQ) (Van Strien, Frijters, Bergers, & Defares, 1986). Both questionnaires show that measurement of dietary restraint may be a good indicator of the intent to diet in cross-sectional research (Williamson et al., 2007). In addition, they are sensitive to measuring changes in dietary restraint regardless of the strategy that was employed, i.e. caloric restriction alone, a combination of caloric restriction and increased exercise, or following a low-calorie diet followed by self-management of food intake. The factor structure of TFEQ, widely validated in several languages (Bellisle, 2009; Williamson et al., 2007) and more frequently used in French studies (Bellisle, 2003; Bellisle et al., 2004; Capuron et al., 2011; Chapelot, Pasquet, Apfelbaum, & Fricker, 1995; Lemoine et al., 2007; Lluch, 1995; Lluch et al., 1996), has been more extensively evaluated than has the DEBQ. TFEQ evaluates 3 factors: cognitive restraint (factor I or TFEQ-R), disinhibition (factor II or TFEQ-D) and susceptibility to hunger (factor III or TFEQ-H) (Stunkard & Messick, 1985). It has been proposed (Westenhoefer, 1991; Westenhoefer, Stunkard, & Pudel, 1999) that TFEQ-R be separated into two dimensions defined as rigid control (RC) and flexible control (FC), i.e. having an all-or-nothing

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behaviour or a more balanced approach towards eating, respectively. The disinhibition factor has also been split into 3 subscales defined as habitual (recurring overconsumption even when eating alone associated with weight change), emotional (when it is associated with negative affective states, i.e. 'I feel anxious', 'I feel blue', 'I feel lonely') and situational susceptibility to disinhibition (a feeling initiated by specific environmental cues: social occasions, eating especially tasty foods, etc.) (Bond, McDowell, & Wilkinson, 2001; Ganley, 1988). Finally, hunger is characterized by its internal (regular feeling of hunger interpreted & regulated internally) and external traits (feeling of hunger triggered by external cues (social occasions, for instance) (Bond et al., 2001).

Considering the increasing prevalence of epidemic obesity (Charles, Eschwege, & Basdevant, 2008), several authors have focused on the link between TFEQ scores, Body Mass Index (BMI) (Bellisle et al., 2004; Hays & Roberts, 2008; Provencher, Drapeau, Tremblay, Despres, & Lemieux, 2003) and other variables such as age (Harden, Corfe, Richardson, Dettmar, & Paxman, 2009) and gender (Provencher et al., 2003). Many studies evaluating cognitive restraint and disinhibition have shown that these factors can be associated to actual or future overweight or obesity (Bellisle, 2009), with a recent focus on the link between higher disinhibition and increased BMI (Bryant, King, & Blundell, 2008). Moreover, because of contradictory results in the correlation of the main TFEQ factors with BMI (Bellisle et al., 2004; de Lauzon-Guillain et al., 2006; Vogels, Diepvens, & Westerterp-Plantenga, 2005; Westenhoefer et al., 1999), subscales frequently have been used to better understand the relationships between psychometric factors, appetite control and body weight variation (Gallant et al., 2010; Provencher et al., 2007).

To our knowledge few studies (Hainer et al., 2006) have evaluated the scores distribution of the three factors in a homogenous nationally representative sample. In this context, the novelty and first aim of the present work was to study TFEQ scores distribution of a young French adult population corresponding to an age range often chosen when recruiting volunteers for satiety studies (Bond et al., 2001; Veldhorst et al., 2009). This work could help clarify whether the limits commonly used are applicable to a specific sample of French adults aged from 20 to 39 yrs, and to propose new limits if the common ones are not suitable. The second aim of this study was to analyze whether the responders' BMI differ in relationship to such variables as TFEQ scores, gender, age, and educational levels. Hence, changes in TFEQ scores according to the BMI category were also studied for the whole French cohort (hereinafter referred to simply as cohort).

Methods and procedure

Subjects

An online TFEQ questionnaire was used with a nationally representative sample of 1000 French adults aged 20–39 yrs. The internet address for the online poll was mailed to participants by the Global Market Insite (GMI) polling institute. These notifications were sent progressively over a 1 week period in order to have around 150 answers per day and to avoid receiving too many answers at one time, which could have reduced the representativeness of our sample. The panellists were part of a permanent sample constituted on a voluntary basis to regularly answer various questions. They received financial reward points as compensation for their participation. Participants were selected by quotas in order to assure representativity of the French population. The determination of quotas was based on the distribution of the closest National Institute of Statistics and Economics (INSEE) references for crossed quotas: gender × region × age. The quotas were 50.2% of women and 49.8% of men for gender with 50.5% of the participants aged 20–29 yrs and 49.5% aged 30–39 yrs. In accordance with the regional distribution of the French Advertisers' Union (UDA 5), France was divided into 5 main segments commonly used in French surveys (Sofres/Voyages-sncf.com/Routard.com, 2009). Panellists also answered questions about their jobs to facilitate analysis of the data according to socio-professional status. Three categories were defined: "Upper socio-professional status," "Lower socio-professional status" and "Unemployed and others."

Questionnaire and measurement

Participants answered the questionnaire online. This questionnaire was created using Sphinx Software and the link to this questionnaire was sent by GMI to their pool of panellists. Data were registered on a database in order to collect all the answers when all the quotas had been filled. In the first part of the questionnaire, subjects were asked standard socio-demographic questions about: (i) their identity (gender, age, weight, height, marital status, average number of inhabitants per household); (ii) their housing (postal code, city, urban or rural area, agglomeration size, housing size); (iii) their job and socio-professional status; (iv) their income and level of education. The second part of the questionnaire was composed of the standard 51 questions of the TFEQ: 21 of the questions are used to calculate cognitive restraint, 16 for disinhibition and 14 for the susceptibility to hunger score. Among the 21 "cognitive restraint" questions, 7 items were used to evaluate flexible control and 7 others for rigid control (Westenhoefer, 1991; Westenhoefer et al., 1999). Among the 16 "disinhibition" questions, habitual and situational susceptibility to disinhibition both included 5 different items each, while emotional susceptibility to disinhibition comprised 3 items (Bond et al., 2001; Ganley, 1988). Internal and external loci for hunger each contained 6 different items from TFEQ-H (Bond et al., 2001). For both main and subscale scores, higher scores denote higher levels of restrained eating, disinhibited eating and predisposition to hunger. In order to examine the relationship between eating behaviour and BMI, the declared weights and heights of the panellists were used to calculate their BMI.

Statistical analyses

Statistical analyses were performed using SAS for Windows (version 9.1; SAS Institute, INC., Cary, NC, USA). Descriptive data are expressed as means with their standard errors (SEM). ANOVA was performed to analyze the effects of gender, age and BMI categories on TFEQ variables. For these analyses, the BMI variable was divided into 4 subcategories (Charles et al., 2008): underweight (<18.5 kg/m^2), normal-weight (18.5–24.9 kg/m^2), overweight (25–29.9 kg/m^2) and obese (>30 kg/m^2) subjects. Main cognitive restraint, disinhibition and hunger effects were considered.

A logistic regression analysis was performed to analyze the link between BMI (divided into four categories as previously described) and the three TFEQ scores. Covariates of gender, current age (years) and educational level were included to adjust the possible influence of these variables in the model as it is an effect found in the literature (Blundell et al., 2010; Lingsma, Roozenbeek, & Steyerberg, 2010; Overall & Ashby, 1991; Van Breukelen, 2006; Wagenknecht et al., 2007). A backward approach was used to eliminate the variable(s) showing a non-significant contribution to the model. The educational level was divided into 5 categories: (1) No post-secondary education and no high school levels; (2) Vocational school level; (3) High school degree; (4) Two years of college; (5) Four years of college, graduate school or professional school.

The Calmar procedure was used to calculate a "weight variable" in order to adjust the model and correct for the minor differences