Body mass index and age affect Three-Factor Eating Questionnaire scores in male subjects

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Not for publication

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Abbreviations

BMI; body mass index

TFEQ; Three Factor Eating Questionnaire

Abstract

This cross-sectional analysis evaluated the effect of age and body mass index (BMI) on Three Factor Eating Questionnaire (TFEQ) scores in males. Subjects (*n* = 60) were recruited according to BMI status. Each completed the 51-item TFEQ. The group was split at the median age to produce a 'younger' and 'older' group for statistical analysis. A two-way between groups ANOVA revealed a significant main effect of BMI on disinhibition (*p* = .003) and hunger (*p* = .041) with higher levels found in overweight males compared to healthy weight counterparts. A significant main effect of age on hunger (*p* = .046) demonstrated 'older' males were less susceptible to hunger than 'younger' males. These insights provide a better understanding of eating behavior across the male lifecycle and may assist health professionals to better guide men in weight management in the light of rising overweight/obesity.

Keywords; Three Factor Eating Questionnaire; body mass index; age groups; males; eating behavior

1. Introduction

Globally, the number of overweight individuals is increasing exponentially with significant public health and economic implications. Obesity is a dysfunction of hunger and satiety, which are controlled by numerous integrated physiological mechanisms. Other influences affect energy intake: the contribution of socio-cultural, environmental and psychological influences render appetite a powerful and poorly controlled stimulus to eat [1].

In order to categorize different psychological patterns of eating, the 51-item Three-Factor Eating Questionnaire (TFEQ) was constructed by Stunkard and Messick [2]. This self-administered questionnaire is designed to assess three dimensions of human eating behavior: restraint (cognitive control over food intake to influence body weight), disinhibition (loss of control over eating) and hunger (susceptibility to hunger and food cravings) [3]. As these factors are associated with eating disorders and disease severity, the TFEQ is frequently used for examining eating behavior [4]. It has been validated and shown good test-retest reliability [5]. It is commonly applied in appetitive research to homogenize or describe study populations.

Several studies have investigated the relationship between TFEQ response and subject characteristics in females. Extensive research suggests women with high

restraint scores are similar to those with low restraint scores in terms of age and body mass index (BMI) [6] whilst those with low restraint and high disinhibition scores tend to have the highest BMIs [7, 8]. These data imply TFEQ scores are not a psychological fixture throughout life and may vary with BMI. However, information pertaining to the three factors and male eating behavior is scarce despite its value in the light of rising overweight and obesity incidence in men [9]. Likewise, studies investigating the relationship between restraint, disinhibition and hunger and age are also limited.

TFEQ scores are labile but how they relate to BMI and age in male subjects is not clear. It is hypothesized that cognitive restraint, disinhibition and susceptibility to hunger scores for a sample of self-reported healthy males will be affected by both age and BMI grouping. This study aims to investigate how BMI and age affect such eating behaviors measured using the 51-item TFEQ [2].

2. Methods and Materials

51-item, Three Factor Eating Questionnaire (TFEQ) data were obtained from 60, self-reported healthy adult males (18-62yrs) who were volunteers in a feeding trial. Questionnaires were all analyzed by the same researcher. This study was approved by the Faculty of Organization and Management Ethics Committee (Ref: FIRC/2006/RE21). All subjects gave informed consent to participate. Volunteers were recruited according to BMI via the University email messaging service and notice boards. Height and weight was measured (SECA 709 mechanical column scales with SECA 220 telescopic measuring rod; SECA United Kingdom, Birmingham) and BMI was calculated by the researchers upon commencement of the study. Subject characteristics from this nested analysis are presented in table 1.

TFEQ scores were categorized according to Stunkard and Messick's suggested ranges [2]. For restraint, scores of 0–10 were classed as low restraint, 11–13 high restraint and 14-21 clinical range of restraint. For disinhibition, scores of 0–8 were classed as low disinhibition, 9–11 high disinhibition and 12-16 clinical range of disinhibition. For hunger, scores of 0–7 were classed as low susceptibility to hunger, 8–10 high susceptibility to hunger and 11-14 clinical range of susceptibility to hunger.

Statistical Analyses

SPSS (version 15.0 for Windows, 2007, SPSS Inc., Chicago, Illinois) was used to conduct two-way between-groups analyses of variance to explore the main effects of BMI grouping and age grouping on restraint, disinhibition and hunger. 'Healthy weight' subjects had BMIs of >18.5kg/m^2 and <25.00kg/m^2, and 'overweight' subjects had BMIs of ≥ 25.00kg/m^2. Age groups were formed by splitting the group at the median age (25.5y) to create two equal groups described as 'younger' and 'older'. A *p*-value of <0.05 was considered as significant. Data are presented as mean scores ± standard deviations.

3. Results & Discussion

Mean values for all three factors; restraint, disinhibition and hunger, were in the 'low' score range (Table 1) [2].

There were no significant main effects of BMI or age grouping on restraint. The 'older' overweight group appeared more restrained compared to the other groups, who all displayed similar levels of restraint (Figure 1). There was no significant interaction effect between BMI and age grouping for restraint.

Similar levels of restraint were reported in all except the 'older' overweight group, where comparatively elevated levels of restrained eating behavior were evident. The apparent tendency for men to increase restraint behavior (measured over a 6 year period) has been previously observed in the Québec Family Study [10]. The labile nature of TFEQ scores has also been exposed in research examining individuals undergoing weight altering regimes [11].

For disinhibition, there was a significant main effect of BMI classification (p = .003) where overweight subjects were found to be more disinhibited than their healthy weight counterparts in both age groupings (Figure 1). In contrast, there was no

significant main effect for age grouping and no significant interaction effect between BMI and age grouping.

For hunger, there was also a significant main effect of BMI grouping (p = .041) with overweight subjects reporting greater susceptibility to hunger than healthy weights in both age groupings. Additionally, the main effect of age grouping significantly affected hunger (p = .046) with younger people being more susceptible to hunger than older people (Figure 1). There was no significant interaction effect between BMI and age grouping for hunger.

Overweight subjects had significantly higher disinhibition and hunger scores than their healthy weight counterparts in both age groupings. In our study sample, 9 volunteers were classified obese (BMI ≥30kg/m^2) which represented 30% of the total overweight group. The rest (n = 21) were classified as overweight (BMI 25<30kg/m^2). Provencher *et al.* [12] reported significant positive correlations between disinhibition and BMI and susceptibility to hunger and BMI in both males and females. The trend for susceptibility to hunger and BMI was evident in both overweight and obese males but not in "non-obese" males (classified by the authors as <25kg/m^2).

Our findings demonstrate that hunger was significantly comparatively lower in the older age group irrespective of BMI classification. These findings have not, to our

knowledge, been previously reported. Documented physiological changes associated with aging include changes in taste and smell, diminished sensory-specific satiety and delayed gastric emptying [14]. These factors may explain why reduced physiological hunger sensations were reported in the 'older' groups. Eating behavior as assessed by TFEQs has been observed to fluctuate in males and females involved in weight management programmes [11, 13] until now however, age has not been seriously considered as a potential influencing factor.

Bond *et al.* [15] conducted a TFEQ factor analysis which led to the suggestion that the three factors could be broken down into 3 subscales for restraint and disinhibition and two for hunger. Whilst initial evidence of the validity of these constructs has been provided, relatively few authors have yet to use them and this study was not sufficiently powered to make use of subscales. Future longitudinal research of this kind is clearly warranted.

This study reports novel findings about the relationships between descriptors of eating behavior, measured using TFEQ responses, and the age and BMI of self-reported healthy male subjects. The TFEQ may be used as a predictive tool for identifying male subjects at risk of obesity [11, 13]. This study supports the emerging paradigm shift that TFEQ are labile and a feature of both physiology and psychology, highlighting the effect in males and the effect of age.

Acknowledgment

This work was supported by Technostics Ltd., UK.

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