

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

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Published version

HARDEN, Charlotte, CORFE, B. A., RICHARDSON, J. C., DETTMAR, P. W. and PAXMAN, J. R. (2009). Body mass index and age affect Three-Factor Eating Questionnaire scores in male subjects. *Nutrition Research*, 29 (6), 379-382.

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1 BMI and age affect Three Factor Eating Questionnaire scores in male subjects

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21

22 **Abbreviations**

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25 BMI; body mass index

26 TFEQ; Three Factor Eating Questionnaire

27 **Abstract**

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

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

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47 **1. Introduction**

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

55

56

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

66

67

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

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

78

79

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

85

86 **2. Methods and Materials**

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88

89 51-item, Three Factor Eating Questionnaire (TFEQ) data were obtained from 60,
90 self-reported healthy adult males (18-62yrs) who were volunteers in a feeding trial.
91 Questionnaires were all analyzed by the same researcher. This study was approved
92 by the Faculty of Organization and Management Ethics Committee (Ref:
93 FIRC/2006/RE21). All subjects gave informed consent to participate. Volunteers
94 were recruited according to BMI via the University email messaging service and
95 notice boards. Height and weight was measured (SECA 709 mechanical column
96 scales with SECA 220 telescopic measuring rod; SECA United Kingdom,
97 Birmingham) and BMI was calculated by the researchers upon commencement of
98 the study. Subject characteristics from this nested analysis are presented in table 1.

99

100

101 TFEQ scores were categorized according to Stunkard and Messick's suggested
102 ranges [2]. For restraint, scores of 0–10 were classed as low restraint, 11–13 high
103 restraint and 14-21 clinical range of restraint. For disinhibition, scores of 0–8 were
104 classed as low disinhibition, 9–11 high disinhibition and 12-16 clinical range of
105 disinhibition. For hunger, scores of 0–7 were classed as low susceptibility to hunger,
106 8–10 high susceptibility to hunger and 11-14 clinical range of susceptibility to hunger.

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110 **Statistical Analyses**

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

121

122 3. Results & Discussion

123

124

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

127

128

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

133

134

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

141

142

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

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

148

149

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

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

166

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

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

177

178

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

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186

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

193

194 **Acknowledgment**

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197 This work was supported by Technostics Ltd., UK.

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