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## **Feeding feelings: Is there a relationship between emotional eating and body mass index in adults?**

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### **Abstract**

The present study aimed to investigate the relationship between emotional eating and body mass index (BMI) in an international sample of healthy weight, overweight, and obese adults ( $N = 226$ ). It was hypothesised emotional eating scores would differ significantly between the BMI classification groups. Consistent with expectations, ANCOVA results revealed significant differences in emotional eating scores across weight groups, after controlling for gender. Post-hoc analyses revealed participants who were overweight or obese reported higher emotional eating levels than participants who were normal weight. An analysis of variance indicated that being over the age of 50 was the strongest predictor of BMI, however emotional eating scores were identified as the second strongest predictor. Contributions and limitations of the present study, as well as recommendations for future research are also discussed.

Keywords: body mass index, BMI, emotional eating, obesity

### **Feeding feelings: Is there a relationship between emotional eating and body mass index in adults?**

In 2008, the World Health Organisation (WHO) estimated 46 percent of the world's adult population over the age of 20 were obese or overweight (WHO, 2013), with this figure expected to increase to 57.8 percent by 2030 (Kelly, Yang, Chen, Reynolds, & He, 2008). As the number of individuals classified as "overweight" rises, an increasing proportion of the population are at risk of developing some of the most prevalent and costly non-communicable diseases, including heart disease, diabetes, and some types of cancer (Mitchell, Catenecci, Wyatt, & Hill, 2011; WHO, 2013). In today's "obesogenic" environment, where access to energy-dense food is high and opportunities to expend energy are low (Ard, 2007), obesity is largely attributed to eating and exercise behaviours, leading to positive energy imbalances (Mitchell et al., 2011). Although efforts to revise environmental factors promoting and facilitating these behaviours are underway (Mitchell et al., 2011), research has highlighted the importance of addressing the internal determinants of dysfunctional eating behaviours in the prevention and treatment of obesity (Buckroyd & Rother, 2008; Wardle, 2007). The addressing of environmental factors has been largely relegated to governmental authorities, which has produced

only limited successes. By addressing personal determinants, individuals are able to deal with their own issues contributing to dysfunctional eating.

An eating behaviour that has received particular attention as a risk factor for overeating and, therefore, obesity, is emotional eating. Within literature the definition of emotional eating appears relatively consistent, commonly referred to as the tendency to consume food in response to negative or diffuse emotional states (van Strein, Engels, van Leeuwe, & Snoeck, 2005). Over the years, studies have consistently demonstrated biological, as well as psychological factors, contribute to an individual's motivation to consume foods; however, in some cases, the latter can override the former (Dallman, 2010). It has also been established food choices are influenced by psychological processes, with researchers emphasising the importance of reinforcing biochemical reactions (e.g., activation of dopamine receptors) in response to the consumption of certain foods, such as chocolate (Bruinsma & Taren, 1999).

Despite the support for biological food-mood effect, recent research (e.g., Macht & Mueller, 2007) found improvements in experimentally induced negative mood states occurred only two minutes after consuming particular foods (e.g., chocolate), suggesting it was unlikely biological reactions alone were responsible for the effect of food on mood. Accordingly, some researchers have suggested the hedonic effects of certain foods may result, not only from nutritional or psychopharmacological properties, but also the association with socially and emotionally significant memories (Buckroyd & Rother, 2008; Goodspeed Grant, 2008). Thus, researchers have commonly characterised emotional eating as a complex, psychologically driven, and dysfunctional coping mechanism, whereby eating can provide temporary comfort and relief from a preceding aversive experience (D'Arrigo, 2007).

Research has also found emotional eaters tend to display preferences for foods high in sugar and fat (Elfhag, Tynelius, & Rusmussen, 2007; Oliver, Wardle, & Gibson, 2000). Consequently, it appears emotionally motivated overconsumption of food can lead to weight gain, which is consistent with research demonstrating emotional eating can predict weight gain (Koenders & van Strien, 2011). However, research has also reported emotional eating tendencies do not lead to positive energy imbalances, as indicated by statistically non-significant associations between emotional eating and weight in numerous studies (Nguyen-Rodriguez, Chou, Unger, & Spruijt-Metz, 2008; Snoeck, Engles, van Strien, & Otten, 2013; Wardle, Marsland, Sheikh, Quinn, Fedoroff, & Ogden, 1992). Similarly, Caccialanza et al. (2004) reported non-significant differences in emotional eating between normal weight, overweight, and obese participants. However, these studies were conducted amongst samples of adolescents and the importance of emotional eating for adulthood body mass index (BMI) remains unclear.

As emotional eating has been reported amongst healthy-weight samples, it seems this behaviour is not confined to the overweight or obese. Thus, it appears emotional eating is best viewed on a severity continuum. Supporting this notion, studies have indicated prevalence rates of emotional eating are highest amongst obese individuals and individuals presenting for weight loss surgery (Fischer et al, 2007; Ganley, 1989). Furthermore, Geliebter and Aversa (2003) found overweight individuals reported eating larger quantities of food than healthy weight individuals when experiencing aversive emotions. Collectively, these results indicate the frequency and severity of emotional eating amongst overweight populations may be particularly problematic, however supporting research is required to confirm these findings across the spectrum of BMI and associated categories.

Typically, psychological interventions for emotional eating in overweight/obese adults are considered beneficial (Shaw, O'Rourke, Del Mar, & Kenardy, 2005). A Cochrane review (Shaw, et al., 2005) highlighted that Cognitive Behavior Therapy (CBT) and Behavior Therapy (BT) significantly improved the success of weight loss for overweight and obese people. Cognitive therapy alone was not found to be effective as a weight loss treatment. The evidence available for other strategies, such as relaxation

therapy and hypnotherapy, also indicated that these may be beneficial in improving weight loss (Shaw, et al., 2005). Goodspeed-Grant, Buckroyd, and Rother's (2008) research recognised and highlighted the complex psychological factors involved in losing weight and overcoming emotional eating. The authors found that eating for comfort for the morbidly obese is rooted in using food to manage experiences of emotional pain and difficult family and social relationships. Participants reported that what had been missing from all treatment programs they had tried was the opportunity to work on the psychological issues concurrently with weight loss.

## **Hypotheses**

Based on previous research and theory, it was hypothesised that people who were normal weight, overweight, and obese, would have significantly different emotional eating scores. Specifically, it was expected individuals who were overweight or obese would report significantly higher levels of emotional eating than healthy weight individuals. Similarly, it was also anticipated individuals who were obese would report significantly higher levels of emotional eating than overweight individuals.

## **Method**

### ***Participants***

Healthy weight, overweight, and obese adults were recruited through notices posted on national and international weight-related (e.g., ObesityHelp) or general community noticeboards. Eligible participants were males and females over the age of 18, currently not in a romantic relationship, volunteering without incentive for participation. Choosing relationship status as an exclusion criterion enabled measurement of state attachment levels. Although 328 participants were initially recruited, the final sample consisted of 226 cases, after the exclusion of criteria and statistical violations.

Of the included participants, 197 were female (87.2%) and 29 were male (12.8%). Participants' BMI ranged between 18.52 and 73.03, with a mean of 27.44 ( $SD = 8.00$ ). Of the participants, 49.6 percent had BMIs between 18.5 and 24.9 (classified as healthy), 22.1 percent had BMIs between 25 and 29.9 (classified as overweight), and 28.3 percent had BMIs greater than 30 (classified as obese). Additionally, 78 people were between 18 and 24 years old (34.5%), 30 people were between 25 and 29 years old (13.3%), 27 people were between 30 and 35 years old (11.9%), 15 people were between 36 and 39 years old (6.6%), 17 people were between 40 and 45 years old (7.5%), 11 people were between 46 and 49 years old (4.9%), and 48 people were over 50 years old (21.2%). Ninety-two participants identified themselves as married (40.7%), 77 identified themselves as living with another person in a relationship (34.1%), whilst 57 identified themselves as in a relationship and living together (25.2%). Adults born in Australia comprised 156 participants (69%), 22 participants were born in the USA (9.7%), 20 participants were born in England (8.8%), whilst the remaining 28 participants (12.5%) were born in other countries (e.g., New Zealand, Scotland, and India). Almost half the sample (40.3%) had completed a Bachelor's degree, while 19.9 percent had only completed high school or equivalent, 9.3 percent had completed vocational or technical training, 17.7 percent had completed a Master's degree, whilst 4 percent had completed a Doctoral degree. The remaining 20 participants identified their highest level of education completed "other" (8.8%).

### ***Materials***

#### ***Demographic Questions***

For the purpose of describing the sample, participants were asked to provide information regarding age, gender, marital status, number of people in their household, country of birth, and highest level of completed education.

### **Anthropometric Measures**

Participants were asked to provide their current height and weight measurements for the purpose of estimating BMI, calculated as weight in kilograms divided by height in meters squared ( $\text{kg}/\text{m}^2$ ). Recent research suggests self-reported anthropometric measurements accurately quantify the body size of most middle-aged, elderly, and young individuals' (Bowring et al., 2012; Ng et al., 2011). Thus, each participant's BMI was utilized in the present study to classify participants as underweight ( $< 18.5$ ), healthy weight (18.5 to 24.9), overweight (25.0 to 29.9), or obese ( $\geq 30.0$ ).

### **Emotional Eating**

In order to assess emotional eating, participants were asked to complete the Three Factor Eating Questionnaire (TFEQ; Stunkard & Messick, 1985). In its original form, the TFEQ is a 51-item self-report instrument designed to examine three cognitive and behavioural aspects of eating behaviour: cognitive restraint, disinhibition of eating, and perceived hunger. Although traditionally analysed at a full-scale level, research (e.g., Karlsson, Persson, Sjöström, & Sullivan, 2000) has suggested an alternate scoring scheme can be utilised, whereby three of the original items can reliably measure emotional eating. As this study formed part of a broader research project, the TFEQ was administered in its entirety; however, only items addressing emotional eating were relevant to the present analysis. The emotional eating subscale was comprised of three true/false items to assess respondents' tendency to eat in response to negative emotional experiences (e.g. *when I feel blue, I often overeat; when I feel lonely, I console myself by eating; when I feel anxious, I find myself eating*). A response of "true" equalled a score of one, and a response of "false" equalled a score of zero. Item values were summed to yield an emotional eating score, with higher scores reflective of greater levels emotional eating.

Previous research has found TFEQ to be a valid and psychometrically sound instrument, with the emotional eating scale demonstrating a good internal consistency of .85 (Karlsson et al., 2000), with the current study revealing a similar internal consistency of .82. Research has also revealed the emotional eating subscale is positively associated with the consumption of energy-dense snack foods (de Lauzon et al., 2004), in addition to poor mood and depressive symptoms (Karlsson et al., 2000).

### **Procedure**

Prior to commencing the research, ethical approval was obtained from the University Human Research Ethics Committee. Participants were recruited from national and international weight-related (e.g., ObesityHelp) or general community noticeboards (e.g., Nnub). Potential participants were provided with an online link directing them to an explanatory statement and consent form on a secure web-based system (PsychData). After consent was given, participants were asked to complete a series of demographic questions items from various psychometric instruments. Each instrument was presented on a separate page and all items were forced-response questions (i.e., participants could not skip items). Contact details for various counselling and support services were provided at the completion of the survey in the event any distress was elicited. The questionnaire took approximately 15 to 20 minutes to complete.

### **Results**

The data were analyzed using SPSS version 22. An alpha level of .05 was utilized to determine the statistical significance of all results.

### **Preliminary Analysis**

Chi-square analyses revealed significant differences between the three weight category groups (e.g., normal weight vs overweight vs obese) on gender  $\chi^2(2) = 8.35, p = .015$ , age  $\chi^2(12) = 52.70, p = < .001$ , and education  $\chi^2(10) = 28.45, p = .002$ . To determine whether BMI significantly covaried with emotional eating, bivariate correlations were performed. This analysis revealed BMI was significantly positively associated with emotional eating ( $r = .37$ ).

### **Main Analyses**

**To determine the association between Emotional Eating and BMI**, a one-way analysis of covariance (ANCOVA) was conducted, comparing differences in emotional eating across three weight classes (healthy weight vs overweight vs obese). As preliminary analyses indicated gender significantly impacted emotional eating scores, gender was included as a covariate to partial out its effects.

To explore how much of the variance in BMI could be explained by emotional eating, a hierarchical multiple regression (HMR) was conducted. Gender and age were controlled for by entering at step one of the HMR, before entering emotional eating scores at step two. As can be seen in Table 1, on step one of the analysis, gender and age accounted for a significant 17 percent of variance in BMI, adjusted  $R^2 = .17, F(7, 218) = 7.49, p < .001$ . As seen in Table 1, the coefficients suggest all of the age categories were significant predictors of BMI, indicating that people 25 years and older had significantly higher BMIs than those who were between the ages of 18 and 24. Gender also predicted BMI, where a positive coefficient indicated women had significantly higher BMIs than men.

On step two of the HMR, emotional eating scores were added to the regression equation, and accounted for an additional 9.4 percent of variance in emotional eating scores,  $R^2_{change} = .09, F_{change}(1, 217) = 28.66, p < .001$ . Collectively, the predictor variables at step two explained 26.2 percent of variance in BMI, adjusted  $R^2 = .26, F(8, 217) = 10.97, p < .001$ . By Cohen's (1988) standards, a combined effect of this magnitude can be considered "large" ( $f^2 = .355$ ). Further analysis of the standardised coefficient betas indicated age and gender remained significant positive predictors of emotional eating at step two. Whilst being over the age of 50 was the strongest predictor of BMI, emotional eating scores were identified as the second strongest predictor. Specifically, beta values indicated higher emotional eating significantly predicted higher BMI.

**Table 1. Hierarchical Multiple Regression Analysis Predicting BMI Scores from TFEQ Emotional Eating Scores, After Controlling for Gender and Age (N = 226)**

<i>Predictor</i>	<i>R</i>	<i>R</i> <sup>2</sup>	<i>B</i>	<i>SE B</i>	$\beta$	95% CI for <i>B</i>
Step 1	.44***	.19				
Constant			21.83	1.52		[18.83, 24.83]
Gender			1.40	1.47	.06	[-1.50, 4.29]
25 to 29 years old			4.21**	1.57	.18	[1.12, 7.30]
30 to 25 years old			5.70**	1.64	.23	[2.48, 8.93]
36 to 39 years old			6.09**	2.06	.19	[2.03, 10.15]
40 to 45 years old			9.74***	1.95	.32	[5.89, 13.59]
46 to 49 years old			7.20**	2.36	.19	[2.54, 11.85]
Over 50 years old			7.87***	1.34	.40	[5.23, 10.51]
Step 2	.54***	.29				
Constant			21.06	1.44		[18.21, 23.90]
Emotional Eating			2.04***	.38	.33	[1.29, 2.79]

Note. TFEQ = Three Factor Eating Questionnaire; BMI = Body Mass Index.

CI = confidence interval. \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

## Discussion

In recent years, research has revealed the number of individuals classified as “overweight” has increased exponentially, thereby intensifying population risks for developing prevalent and costly non-communicable diseases (Mitchell et al., 2011; WHO, 2013). Within the “obesogenic” environment of current society, obesity has largely been attributed to unhealthy eating and exercise behaviours, leading to positive energy imbalances (Mitchell et al., 2011). Whilst efforts to improve environmental factors facilitating weight gain are underway, research has highlighted the importance of addressing the internal determinants of dysfunctional eating behaviours in the prevention and treatment of obesity (Buckroyd & Rother, 2008; Wardle, 2007).

As detailed above, an eating behaviour that has received particular attention as a risk factor for overeating, and obesity, is emotional eating. Whilst studies have consistently demonstrated biological factors contribute to an individual’s motivation to consume food, some researchers have suggested the hedonic effects of certain foods may result not only from nutritional or psychopharmacological properties but also the association with socially and emotionally significant memories. Evidence has also suggested individuals who engage in emotional eating behaviours typically display a preference for foods high in sugar and fat (Elfhag, Tynelius, & Rasmussen, 2007; Oliver, Wardle, & Gibson, 2000). Thus it would appear emotionally motivated overconsumption of food could lead to weight gain, consistent with research suggesting emotional eating can predict weight gain (Koenders & van Strien, 2011).

However, research has also reported emotional eating tendencies do not lead to positive energy imbalances, as indicated by statistically non-significant associations between emotional eating and weight in numerous studies. Emotional eating has also been reported amongst healthy weight samples. Thus, it would appear the behaviour of emotional eating is not confined to individuals who are classified as overweight or obese. However, these studies were conducted amongst samples of adolescents and the importance of emotional eating for adulthood BMI was unclear.

Based on previous research, it was hypothesised that emotional eating scores would differ significantly between the BMI classification groups. Consistent with expectations, results of the current study revealed significant differences in emotional eating scores across weight groups, after controlling for gender. Specifically, consistent with first extension of the hypothesis, participants who were obese or overweight had significantly higher emotional eating scores than participants whose weight fell within a healthy range. Although research has indicated emotional eating is prevalent amongst healthy weight samples, recent research has demonstrated eating in response to negative affect occurs at less frequent and severe levels than in obese and overweight samples (Macht, 2008). Results of the present study are consistent with this trend. Alarming, results of the present study also indicate emotional eating is a relatively important predictor of BMI. This finding is consistent with longitudinal studies demonstrating stress-related eating increases the likelihood of weight gain in all individuals, particularly those who are already overweight (Blair et al., 1990).

Despite the significant difference between overweight and obese groups and healthy weight counterparts, results of the current study indicated that those participants who were classified as overweight and those who were obese did not differ significantly in emotional eating scores. Therefore, the second extension of the hypothesis was not supported. Whilst there is less literature regarding differences in obese and overweight samples, these results are inconsistent with the findings of Navanpera et al. (2012), where obese individuals had significantly higher emotional eating scores than overweight participants. Several explanations are proposed for this non-significant finding. Firstly, perhaps the failure to discriminate between the two groups (overweight and obese) reflects homogeneous attitudes between groups. Therefore possibly participants’ classified as

overweight will progress to the obese range, should emotional eating persist. Overall, the results indicate emotional eating may not only be a concern for the obese but also overweight individuals.

### **Limitations and Recommendations for Future Research**

The present study had several limitations which should be recognized when interpreting the results and considering their potential contribution to the literature. First, research has indicated overweight and obese individuals seeking treatment report significantly greater levels of psychopathology than normal-weight controls, and those who are not seeking treatment (Fitzgibbon, Stolley, & Kirschenbaum, 1993). Participants in the present study were recruited from online weight forums and, hence, may not be representative of the broader population in terms of their psychological characteristics. Future research should seek to increase the heterogeneity of the sample by employing randomized sampling as this may enhance the representativeness of the sample and, therefore, generalizability of the results.

Due to time constraints, the present study could not recruit an adequate sample size to conduct separate HMR analyses on grouped data. However, research has indicated there are significant gender differences in terms of eating behavior and associated psychological constructs. Additionally, Wadden et al. (2012) found evidence to indicate those in different weight categories also differ with regard to their psychological characteristics (Wadden et al., 2012). These results indicate it may be important to assess the relationship with emotional eating when data is grouped according to BMI class and gender. Additionally, it is recommended further research uses stratified random samples, ensuring an equal number of people from each BMI class and gender are represented.

The operationalization of emotional eating should also be addressed as a potential limitation of the present study. Research (e.g., Evers et al., 2011) has noted self-report emotional eating scales should be conceptualized as measuring an individual's attitude toward emotions and eating, rather than an indicator of actual food intake. Hence, an experimental replication of this study, with an objective measure of food consumption in response to negative affect, would confirm whether the present results can be considered valid in terms of predicting actual eating behavior. Additionally, BMI has not always been shown to be an accurate indicator of adiposity, therefore, future research may benefit from using direct measurements of weight, or body fat composition, to ensure accuracy of the results.

### **Concluding Remarks**

It has been suggested standard behavioral weight-loss programs generally fail to achieve long-lasting (Wadden, Steen, Wingate, & Foster, 1996), and poor long-term maintenance (Turk, Yang, Hravnak, Sereika, Swing, & Burke, 2009). This has largely been attributed to the failure of interventions to address the psychological determinants of overeating behaviors (Blundell et al., 2005). The present study provides further support for the proposition emotional overeating may be an important behavioral risk factor for overweight and obesity, and treatments need to identify and implement strategies that assist people with managing their psychological motivations to eat.



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