



A weighty issue: Explaining the association between body mass index and appearance-based social anxiety



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ABSTRACT

Research has indicated that individuals who are overweight or obese are more likely to experience mental health difficulties. One line of research has indicated that body mass index (BMI) is positively associated with appearance-based social anxiety, rather than social anxiety more generally. However, there is a lack of research that has attempted to explain this association. Thus, the current study recruited an undergraduate sample ($N = 90$) and aimed (a) to replicate previous research by examining the associations between BMI, social anxiety, and appearance-based social anxiety and (b) to extend previous research by examining two potential mediators in the relationship between BMI and appearance-based social anxiety suggested in the literature (i.e., body image dissatisfaction and emotional eating). Analyses indicated that BMI was not associated with social anxiety but positively associated with appearance-based social anxiety. The association between BMI and appearance-based social anxiety was only mediated by body image dissatisfaction, and the model of these relationships emerged as the best fitting model relative to a plausible alternative model. The findings replicate and extend previous research on weight status and psychological factors and highlight the need for future longitudinal research on BMI, appearance-based social anxiety, and body image dissatisfaction so that interventions for obesity and weight loss maintenance programs can be ultimately enhanced.

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1. Introduction

Overweightness and obesity are world-wide physical health concerns that are associated with mental health difficulties (Petry, Barry, Pietrzak, & Wagner, 2008; Scott, Bruffaerts, Simon, Alonso, Angermeyer, de Girolamo, et al., 2008; World Health Organisation, 2000, 2013). Social anxiety disorder (SAD), a mental health concern characterised by an intense fear of social situations in which evaluation from others may occur (American Psychiatric Association, 2013), has been shown to be positively associated with obesity, particularly in females (see Gariepy, Nitka, & Schmitz, 2010, for a review). This finding suggests that females with a higher body mass index (BMI) have a greater likelihood of experiencing social-evaluative anxiety. This may be the case given one's weight is a characteristic observable by others, societal pressures to be thin (Stice, 2002), and weight-related prejudice and discrimination (Carr & Friedman, 2005; Puhl & Heuer, 2009).

When obesity and SAD have been analysed in terms of their continuous variable equivalents (i.e., BMI and social anxiety levels), studies have shown that BMI is not associated with social anxiety level in female-only samples or predominantly female samples (e.g., Levinson et al., 2013; Mayer, Muris, Meesters, & Zimmermann-van Beuningen,

2009; Ostrovsky, Swencionis, Wylie-Rosett, & Isasi, 2013). Studies have instead shown a positive association between BMI and appearance-based social anxiety in female-only or predominantly female samples (e.g., Crocker, Sabiston, Kowalski, McDonough, & Kowalski, 2006; Diehl, Johnson, Rogers, & Petrie, 1998; Levinson et al., 2013). Some studies have failed to find the BMI and appearance-based social anxiety association (e.g., Levinson & Rodebaugh, 2011), although arguably these studies examined samples with a more even gender distribution. Overall, BMI appears most likely to be positively related to appearance-based social anxiety rather than general social anxiety in females. Appearance-based social anxiety may also play a role in the association between obesity and SAD given the lack of association between BMI and general social anxiety.

To our knowledge, there are currently no studies that have explained the association between weight status and appearance-based social anxiety (see also Pagoto, Schneider, Appelhans, Curtin, & Hajduk, 2011). Body image dissatisfaction (BID) and emotional eating (EE) are two variables proposed in the literature that might explain this association (Barry, Pietrzak, & Petry, 2008; Friedman & Brownell, 1995; Gatineau & Dent, 2011; Scott, McGee, Wells, & Oakley Browne, 2008). The proposed mediating roles of BID and EE have not been explicitly tested in the literature, although BMI has been shown to be positively related to both BID (e.g., Jones, Vigfusdottir, & Lee, 2004; Paxton, Eisenberg, & Neumark-Sztainer, 2006) and EE (e.g., Clum, Rice, Broussard, Johnson, & Webber, 2014; Koenders & Van Strien, 2011),

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and appearance-based social anxiety has also been shown to be positively related to both BID (e.g., Hart et al., 2008; Levinson & Rodebaugh, 2012) and EE (e.g., Ostrovsky et al., 2013).

The current study aimed (a) to replicate previous findings on the relationships between BMI, social anxiety, and appearance-based social anxiety and (b) to extend current research by examining the role of BID and EE in these relationships. We predicted that after controlling for potential confounding variables (see Method), BMI would be positively associated with appearance-based social anxiety but not general social anxiety. We further predicted that after controlling for potential confounders that (a) BMI would be positively associated with BID which would in turn be positively associated with appearance-based social anxiety and (b) appearance-based social anxiety would be positively associated with EE which would in turn be positively associated with BMI. We expected that in each of these cases the relationship between BMI and appearance-based social anxiety would disappear once BID or EE was taken into account.

2. Methods

2.1. Participants

Ninety female undergraduates from six Australian universities participated in the study (mean age = 20.71, $SD = 4.23$; 67% normal weight [BMI 18.50–24.99], 25% overweight [BMI 25.00–29.99], 8% obese [BMI ≥ 30]) for course credit or as volunteers.

2.2. Measures

The Demographic, Health, and Lifestyle Questionnaire (DHLQ) was developed for the current study to measure potential confounding variables: age, ethnicity, medical conditions, medications, exercise, smoking, and alcohol consumption (see Gariepy et al., 2010). Mood level, another potential confounder, was measured using the Depression Subscale of the Depression Anxiety Stress Scales (DASS-D; Lovibond & Lovibond, 1995).

BMI was calculated from the weight (kg) and height (m) of participants measured with weight scales and a tape measure. Social anxiety was measured with the Social Phobia Scale (SPS; Mattick & Clarke, 1998), and the straightforwardly worded items of the Social Interactional Anxiety Scale (S-SIAS; Rodebaugh, Woods, & Heimberg, 2007). Appearance-based social anxiety was measured with the Social Appearance Anxiety Scale (SAAS; Hart et al., 2008) and the Physical Appearance Subscale of the Negative Self-Portrayal Scale (NSPS-PA; Moscovitch & Huyder, 2011). BID was assessed with the Body Dissatisfaction Subscale of the Eating Disorder Inventory (EDI-BD; Garner, Olmstead, & Polivy, 1983), and EE was measured using the Anxiety Subscale of the Emotional Eating Scale (EES-A; Arnow, Kenardy, & Agras, 1995).

2.3. Procedure

Participants provided informed consent and completed the DHLQ and then the remaining questionnaires in a randomised order. Participants were subsequently asked to remove their shoes and their height and weight were recorded by a female experimenter.

2.4. Analyses

A social anxiety composite measure was formed by converting SPS and S-SIAS raw scores (which correlated .71) to z scores and averaging the z scores (see Wong & Moulds, 2010). An appearance-based social anxiety composite measure was similarly formed using SAAS and NSPS-PA scores (which correlated .68).

Given certain variables had non-normal distributions, bootstrapping analyses (Efron & Tibshirani, 1993; Preacher & Hayes, 2004) were conducted and used to test: (a) associations between potential confounders

and the main variables and (b) hypothesised associations and mediational (indirect) effects. We utilised a bootstrapping method with 1000 bootstrapped samples and bias-corrected confidence intervals (BCCI).

The fit of mediational models tested was evaluated using several fit indices (Brown, 2006): the comparative fit index (CFI; values $\geq .90$ suggest acceptable fit with higher values indicating better fit), the non-normed fit index (NNFI; values $\geq .90$ suggest acceptable fit with higher values indicating better fit), the root mean square error of approximation (RMSEA; values $\leq .08$ suggest acceptable fit with lower values indicating better fit), the standard root mean square residual (SRMR; values $\leq .08$ suggest acceptable fit with lower values indicating better fit), and the Akaike information criterion (AIC; smaller values indicate better fit).

3. Results

Table 1 shows descriptive statistics, correlations for the main variables, and results from the analysis of potential confounding variables. The significant relationships between potential confounders and the main variables were accounted for in subsequent analyses.

3.1. BMI, social anxiety, and appearance-based social anxiety

Accounting for DASS-D, BMI was not significantly associated with the social anxiety composite, $r = .11$, 95% BCCI [−.12, .35], $p = .36$. Accounting for DASS-D and smoking frequency, BMI had a significant positive association with the appearance-based social anxiety composite, $r = .21$, 95% BCCI [.02, .40], $p = .04$.

3.2. The mediating role of BID and EE in the BMI and appearance-based social anxiety association

The test of the mediating role of the EDI-BD (accounting for relevant potential confounders) indicated expected significant paths (see Panel A, Fig. 1). Importantly, the significant direct path from BMI to the appearance-based social anxiety composite became non-significant after the EDI-BD was accounted for. There was also a significant indirect effect from BMI to the appearance-based social anxiety composite via the EDI-BD, standardised indirect effect = .23, 95% BCCI [.11, .39], $p < .01$. The hypothesised mediational model demonstrated adequate to good fit with the data (CFI = .95, NNFI = .91, RMSEA = .08, SRMR = .08, AIC = 38.43).

The test of the mediating role of the EES-A (accounting for relevant potential confounders) indicated a significant path from the appearance-based social anxiety composite to the EES-A, $\beta = .26$, 95% BCCI [.07, .46], $p < .01$, but the path from the EES-A to BMI was non-significant, $\beta = -.17$, 95% BCCI [−.33, .01], $p = .07$. Thus, it was not possible to further test the mediating role of the EES-A in the BMI and appearance-based social anxiety association.

3.3. Post hoc analysis: considering plausible alternative models

Given the mediating role of the EDI-BD in the BMI and appearance-based social anxiety association, we subsequently considered an alternative model that appeared most likely based on previous research (Gatineau & Dent, 2011): BMI has psychological consequences such that increased BMI leads to both BID and appearance-based social anxiety with the latter two constructs mutually influencing each other. A test of this model (accounting for relevant potential confounders) indicated expected significant paths (see Panel B, Fig. 1). However, this alternative model did not demonstrate acceptable fit (CFI = .91, NNFI = .85, RMSEA = .10, SRMR = .11, AIC = 41.35) and is less preferred when compared to the original hypothesised model (i.e., Panel A, Fig. 1).

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