



Fear of Negative Evaluation and Weight/Shape Concerns among Adolescents: The Moderating Effects of Gender and Weight Status

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Received: 18 March 2018 / Accepted: 16 May 2018 / Published online: 29 May 2018
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Abstract

Fear of negative evaluation has been linked with weight/shape concerns among adults, however, similar research among adolescents is lacking. We investigated the relationship between fear of negative evaluation and weight/shape concerns, including the moderating roles of gender and body mass index (BMI) in adolescents. Participants were 4045 Australian adolescents (53.7% girls) aged 11–19 years ($M_{age} = 14$ years 11 months), who completed a self-report questionnaire about weight/shape concerns, fear of negative evaluation, and weight and height. Results showed a positive association between fear of negative evaluation and weight/shape concerns, with the association being stronger among girls. Furthermore, the association between fear of negative evaluation and weight/shape concerns was stronger among adolescents with higher BMIs, especially so for boys. These results highlight the role of fear of negative evaluation in weight/shape concerns and suggest potential avenues for prevention programs.

Keywords Fear of negative evaluation · Weight and shape concerns · Body image · Adolescence · Eating disorders

Introduction

Comorbidity among eating disorders and social anxiety has been well established in previous research, with around 25–40% of adults diagnosed with an eating disorder also meeting criteria for social anxiety disorder (Hudson et al. 2007). Furthermore, findings from twin studies showing shared genetic transmission between eating disorders (Keel

et al. 2004) and anxiety disorders have been used to argue that the two disorders share mechanistic vulnerabilities (Strober 2004). Embedded within the core psychopathology of social anxiety disorder, a robust maintaining factor relates to fear of negative evaluation. Fear of negative evaluation is defined as anxiety surrounding others' evaluations of oneself, and gives rise to distress regarding others' negative evaluations, avoidance of situations in which evaluation could occur, and the expectation to be negatively evaluated (Heimberg et al. 2014). While fear of negative evaluation has been identified as a key feature of social anxiety among adolescents, research investigating its role within eating disorders has been limited. Emerging evidence, particularly among adults, however, points towards fear of negative evaluation as potentially being a shared feature of both eating disorder symptoms and social anxiety (Levinson and Rodenbaugh 2012).

Fear of negative evaluation may indeed be expected to play a role in eating disorder pathology, as anticipating negative evaluations of oneself by others may often extend to one's weight and shape. In line with socio-cultural theory, adolescents who experience greater fear of negative evaluation may experience more weight/shape concerns as they might be more susceptible to influences from peers, parents and the media (Dunkley et al. 2001). More specifically, sociocultural theory predicts that

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increased exposure to media sources containing idealized bodies may lead to an internalization of these idealizations, and that these internalizations may manifest as a fear of being negatively evaluated relative to these idealizations. Accordingly, research suggests that social physique anxiety, a type of social anxiety that is concerned with one's appearance (Hausenblas et al. 2004), is linked to eating disorder symptoms in adolescents (Gomes et al. 2015). More broadly, studies have shown a significant association between fear of negative evaluation and a range of eating disorder symptoms such as body dissatisfaction (DeBoer et al. 2013), drive for thinness (Maraldo et al. 2016), and disordered eating (Menattia et al. 2015), among adults. Furthermore, fear of negative evaluation has been included in a revised model of the dual-pathway model of bulimia nervosa, underscoring its perceived importance in the development of eating disorders (Utschig et al. 2010).

However, most research examining the effect of fear of negative evaluation on eating disorder symptoms, such as weight/shape concerns, has thus far focused on young adult women and few studies have explored the relationship within adolescent samples. This is a crucial gap in the current evidence base for multiple reasons. First, adolescence is the most common period of onset for eating disorders and disordered eating behaviors (Hudson et al. 2007), and approximately 20% of adolescents report distress regarding their weight and shape (Bartholdy et al. 2017). Second, because these weight/shape concerns typically escalate as adolescents transition into adulthood (Calzo et al. 2012), adolescence represents a critical time for possible prevention and early intervention efforts.

Another notable limitation of the literature on fear of negative evaluation and weight/shape concerns is that it has focused primarily on females and mostly neglected males. Research consistently shows that more girls than boys report concerns regarding their weight and shape and experience body dissatisfaction (Bartholdy et al. 2017; Calzo et al. 2012). However, despite gender differences in prevalence, research has indicated that there are no gender differences in the strength of the adverse relationships of body dissatisfaction with quality of life (Bentley et al. 2016), underscoring the need to include both genders in research examining the predictors and correlates of body dissatisfaction (Griffiths et al. 2017).

Some studies examining the relationship between fear of negative evaluation and weight/shape concerns among children and adolescents of both genders have provided preliminary support that fear of negative evaluation might be a significant risk factor for weight/shape concerns in adolescents. Females have been shown to experience higher levels of fear of negative evaluation compared to males (Duke et al. 2006) and previous research has suggested that

there might be a moderating effect of gender on the relationship between fear of negative evaluation and weight/shape concerns. In a study with pre-adolescents in grade 5, Michael et al. (2014) found that fear of negative evaluation predicted body image discrepancy directly in girls and indirectly through physical self-worth in both girls and boys. However, since this study was confined to a measure of body image discrepancy, which assessed the difference between participants' own body and their idea of a typical body for someone their age, it remains unclear whether this relationship exists for weight/shape concerns more generally. Recently, Cook-Cottone et al. (2016) have demonstrated that social anxiety mediates the relationship between peer victimization and eating disorder symptoms in adolescents. While this relationship was found among both boys and girls, the effects were significantly greater for girls. However, again, the study used a composite measure of eating disorder risk combining drive for thinness, body dissatisfaction, and bulimic symptoms rather than measuring weight/shape concerns directly. Furthermore, the study investigated social anxiety as a whole, rather than focusing directly on fear of negative evaluation. This is in contrast with adult research examining fear of negative evaluation, which found that gender did not moderate the relationship between fear of negative evaluation and eating disorder symptoms (Levinson and Rodebaugh 2012). Thus, no study to our knowledge has investigated the association between fear of negative evaluation and weight/shape concerns specifically in adolescents. The current study therefore aimed to further investigate whether the relationship between fear of negative evaluation and weight/shape concerns is significant for adolescents and whether this relationship differed by gender.

Previous research has also suggested that the relationship between fear of negative evaluation and weight/shape concerns might be moderated by body mass index (BMI). Menattia et al. (2015) propose that individuals with higher BMIs experience dissatisfaction with their weight/shape regardless of social context, whereas individuals with lower BMIs only occasionally experience significant concern about their shape and weight, such as when they fear negative evaluation. They provided support for this notion, as they found that the relationship between fear of negative evaluation and body dissatisfaction was moderated by BMI, whereby the effect was stronger among young adult women with a lower BMI. In contrast, DeBoer et al. (2013) found that fear of negative evaluation predicted body dissatisfaction irrespective of BMI among young adult women. However, no study to date has investigated if BMI influences the relationship between FNE and weight/shape concerns among adolescents. Investigating the influence of weight status in contributing to the risk of developing an weight/shape concerns is an important endeavor, however.

Around 20% of adolescents are obese (Hales et al. 2018) and it is now well-documented that both adults and adolescents at the higher end of the weight spectrum are at greatest risk for experiencing weight/shape concerns and other eating disorder symptoms relative to healthy weight individuals (da Luz et al. 2017; Gall et al. 2016). Furthermore, to date no study has investigated the role of BMI on the relationship between fear of negative evaluation and weight/shape concerns in males. Given differences in body ideals between males and females (Murray et al. 2017), with males typically preferring a more muscular and females preferring a thinner body, it might also be expected that the moderating role of BMI on the relationship between fear of negative evaluation and weight/shape concerns differs according to gender.

Current Study

The current study aimed to investigate the relationship of between fear of negative evaluation and weight/shape concerns among adolescents, including the potential moderating roles of gender and BMI. Specifically, it was hypothesized that fear of negative evaluation would be positively associated with weight/shape concerns, based on previous research that has investigated body dissatisfaction (Cook-Cottone et al. 2016). It was further expected that this relationship would be significantly moderated by gender, with girls showing a stronger association than boys. Lastly, it was hypothesized that the relationship between fear of negative evaluation and weight/shape concerns would be moderated by BMI, with the relationship being stronger in adolescents with a lower BMI for girls, in line with research with adult women (Menattia et al. 2015). As no study has been conducted with males, no a priori hypothesis was made regarding this effect in males. Based on previous research, age differences were expected for weight/shape concerns, BMI, and fear of negative evaluation (Calzo et al. 2012; Westenberg et al. 2007). Age was thus controlled for in all analyses.

Methods

Participants and Procedure

Data were used from the first wave of the EveryBODY study, a longitudinal investigation of eating disorders and body image concerns among Australian adolescents. The current sample included all students who completed the measures utilized in this study at the first wave, producing a final data set of 4002 adolescents aged between 11 and 19 years ($M = 14$ years, 11 months).

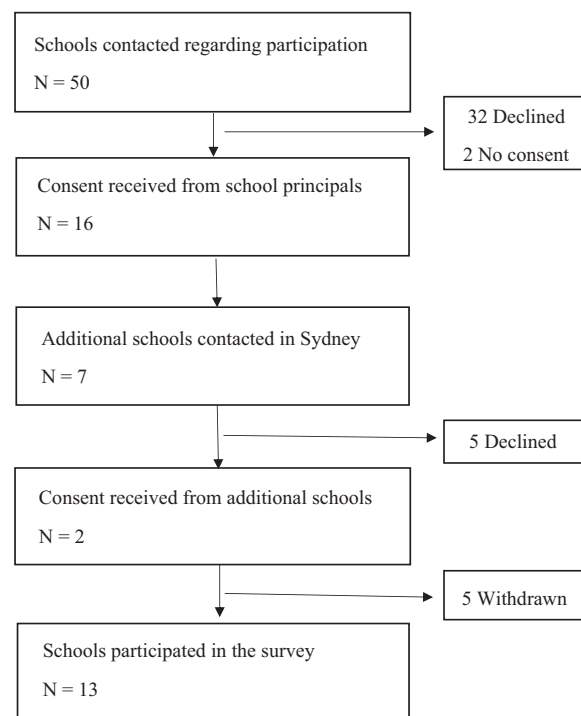


Fig. 1 Flow-chart of how total sample for the “Everybody” study was obtained

EveryBODY study researchers contacted the principals and welfare staff of 50 high schools in the Newcastle and Hunter region of New South Wales, Australia (see Fig. 1). Eighteen schools (36% of approached schools) agreed to participate. However, six schools withdrew their participation prior to testing, due to conflicting time commitments ($n = 5$), and concerns regarding some topics such as gender identity and dating ($n = 1$). Among non-participating schools, reasons for not participating included conflicting commitments, participation in other research projects, lack of time, and lack of a staff member to coordinate the project. In addition, seven schools in the Sydney area were invited to participate in order to increase the ethnic diversity of the sample. Two of these schools agreed to participate in the study, with one withdrawing prior to testing due to conflicting commitments, leaving a total of 13 schools. No Catholic schools chose to participate in the study, while independent schools were slightly over-represented compared to the Australian population (Government: 66.7% vs. 65.25%; Independent: 33.3% vs. 14.46%, respectively). Across schools, total enrollments ranged from 514 to 1305, with 70% of students participating in the study. Schools also varied in socio-economic status (SES). The Index of Community Socio-Educational Advantage (ICSEA) is a standardized ($M = 1000$, $SD = 100$) measure of educational advantage provided to each school and based on parental occupation and education, geographic location and proportion of Indigenous enrollments. ICSEA scores of schools

in the overall sample of the EveryBODY study ranged from 909 to 1129 ($M = 1035$, $SD = 60.91$). This mean is within 1 SD of the standardized mean, indicating that the SES of the schools in the EveryBODY study were similar to the average Australian school. However, the SD of ICSEA scores for schools in the EveryBODY study was lower than the standardized SD, indicating that schools in the current sample varied less in terms of SES compared to Australian schools in general. Ethics approval was sought and received from the University ethics committee, the Catholic Education Office, and the New South Wales Department of Education.

All students at the participating schools were invited to take part in the study, unless schools had previously restricted participation to selected year groups. Prior to the survey date, schools distributed information letters to parents and students, as well as newsletter inserts informing parents and students about the study. A passive parental consent procedure was used, whereby consent was assumed unless parents actively opted their child out of the study. On the day of testing, students were invited to complete an online questionnaire under the supervision of their teachers. Only students who agreed (i.e., provided assent) were provided with the survey to complete. The survey consisted of questions regarding demographics, eating behaviors, weight/shape concerns, general mental health (e.g., psychological distress, quality of life), social media use, bullying, gender typicality, and relationships. Schools were allocated to three different groups based on size, ethnic diversity, ICSEA scores and age range to ensure equivalence. Each group received the same survey, with the exception of one measure which differed for each group. This allowed for the addition of extra measures without extending the time required to complete the study. Each student was provided a handout for themselves and for their parents, which contained eating disorder specific and general mental health referral resources and hotlines. Pilot testing was conducted prior to the study to ensure questions were understandable and that the survey could be completed within a typical 50-min class, while minimizing fatigue.

Of the 5191 students who participated in the first wave of the EveryBODY study, 119 were excluded due to unacceptable rates of missing data—less than 10% of the questionnaire completed ($n = 39$), non-serious responses—as indicated by bogus or inappropriate responses to open-ended question ($n = 79$), and withdrawn consent ($n = 1$), leaving a total sample of 5072 students aged between 11–19 years ($M_{\text{age}} = 14$ year and 11 months). Furthermore, for the current study, participants who indicated their gender to be non-binary ($n = 29$), were excluded as this group was too small for comparisons with participants who indicated their gender to be male or female. The current study used data from students, who completed all measures used for analyses in the current

study (BFNE, EDEQ, postcode, weight and height), leaving a total sample of 4002 adolescents. The sample included 2150 girls and 1852 boys. In terms of ethnicity, 89.8% of students reported being born in Australia, 5.6% in Asia, 2.0% in Europe, 1.1% in Oceania/Pacific (other than Australia), 0.8% in Africa, 0.5% in North America, 0.1% in South America, and 0.1% did not specify their country of birth.

Measures

Fear of negative evaluation (BFNE)

Participants' fear of negative evaluation was measured using the positively-worded items from the Brief Fear of Negative Evaluation (BFNE) scale (Leary 1983). These items were selected based on previous research suggesting that the positively-worded items are more reliable, discriminate more effectively, and are more closely related to social anxiety measures compared to using the full scale with both negatively-worded items and positively-worded items (Carleton et al. 2011; Rodebaugh et al. 2004). In line with the original measure, the BFNE assessed participants' worry regarding others' evaluations, distress concerning such negative evaluations, and the anticipation of other's negative evaluations (Watson and Friend 1969). Participants were asked to rate each item (e.g., *I am afraid others will not approve of me*) on a 5-point Likert scale (1 = *Not at all* to 5 = *Extremely*). Scores on all eight items were summed to calculate a total score with higher scores indicating greater fear of negative evaluation. The scale has been shown to have good reliability with adolescents (White et al. 2015). Excellent internal consistency was shown in the current study with a Cronbach's α of 0.97 for both boys and girls.

Weight/shape concerns

Participants' weight/shape concerns were assessed using the combined weight and shape concerns subscale of the EDE-Q (Fairburn et al. 2008). The measure assesses eating disorder pathology over the past month and asks participants to rate the frequency/severity of their weight and shape concerns in the past 28 days (e.g., *How dissatisfied have you been with your shape*) on a 7-point Likert scale (0 = *No days/Not at all* to 6 = *Everyday/Markedly*). The subscale has demonstrated good reliability among Australian adolescent boys and girls (Mond et al. 2014). The current study found the measure to have excellent internal reliability with Cronbach's α of 0.94 for boys and 0.96 for girls.

Body mass index (BMI)

Participants were asked to provide their subjective height and weight measurements, which were used to determine

BMI (weight (kg)/height (m)²). To account for age and gender, BMI percentiles were calculated in line with the CDC guidelines (Centers for Disease Control and Prevention 2017). Self-reported height and weight measurements have been found to be strongly correlated with anthropometric measurements in adolescents (Goodman et al. 2000) and young adults (Pursey et al. 2014).

Control variables

Given the large sample of the current study, we controlled for basic demographics that could influence results. These included age, measured in months, socio-economic status as measured by postal area index (POA), an index of relative socio-economic advantage and disadvantage (Australian Bureau of Statistics 2016), and migrant status as measured by ‘‘born in Australia’’ compared to ‘‘born overseas’’. Postal area index scores are given to each postcode (similar to a ZIP code) by the Australian Bureau of Statistics and standardized to have a mean of 1000 and a standard deviation of 100. Higher scores indicate residence in a more socio-economically advantaged area, thus providing an indirect measure of participants’ socio-economic status.

Results

Data Analytic Plan

The results are presented in three sections. First, sample characteristics are outlined to provide descriptive statistics of the current sample. Secondly, correlations among all variables are reported to examine bivariate relationships. Lastly, a hierarchical regression analysis was conducted to assess the relationship between fear of negative evaluation and weight/shape concern, controlling for age, SES and migrant status, as well as to address the moderating effect of

gender and BMI on the relationship between fear of negative evaluation and weight/shape concerns.

Both fear of negative evaluation scores and BMI percentile scores were centered prior to analyses (Shieh 2011), and interaction terms for moderation analyses were computed using the centered variables. The tested regression model showed no evidence of multicollinearity (Tabachnick and Fidell 2001), however the assumption of normality was violated. Therefore, bootstrapping analyses were conducted to provide bias-corrected *p*-values and confidence intervals. It has been argued that this method provides robust results when the assumption of normality is violated and it is considered as preferable to other methods such as transformations or relying on robustness of *F*-test and *t*-tests (Field and Wilcox 2017). Due to the large sample size an adjusted alpha of 0.01 was used for all analyses. Prior to examining the correlations among variables, the potential clustering effect of schools was assessed using mixed model analysis with school as a random factor. The random factor was not significant, thus it was not controlled for in any subsequent analyses.

Sample Characteristics

At the time of the survey, 19.2% of students were in seventh grade, 20.4% were in eighth grade, 19.4% of students were in ninth grade, 22.6% of students were in tenth grade, 12.1% of students were in eleventh grade, and 6.2% of students were in twelfth grade. As can be seen in Table 1, there were slightly more girls than boys and the genders differed significantly on most variables. Most notably, girls had significantly higher fear of negative evaluation levels and more weight/shape concerns than boys. As expected, there were significant age differences for fear of negative evaluation, weight/shape concerns and BMI, with younger students reporting lower fear of negative evaluation levels, fewer weight/shape concerns and higher BMI scores.

Table 1 Estimated marginal means and standards errors of all variables

Variables	Boys (<i>n</i> = 1852)	Girls (<i>n</i> = 2150)	<i>F</i> - value	Grades 7/8/9 (<i>n</i> = 2362)	Grades 10/11/12 (<i>n</i> = 1640)	<i>F</i> - value	Total (<i>n</i> = 4002)
Age in months	180.69 (0.43)	179.02 (0.40)	8.19*	167.09 (0.21)	198.09 (0.26)	8711.05*	179.80 (18.42)
SES	984.01 (0.98)	986.68 (0.90)	4.10	985.97 (0.86)	984.70 (1.03)	0.896	985.45 (41.62)
BMI percentile	21.31 (0.10)	20.94 (0.09)	7.55*	20.09 (0.09)	22.58 (0.10)	349.75*	21.11 (4.32)
FNE	14.43 (0.22)	20.80 (0.20)	459.20**	16.57 (0.20)	19.70 (0.24)	99.03*	17.85 (9.91)
Weight and shape concerns	0.87 (0.04)	2.33 (0.04)	771.30**	1.50 (0.04)	1.88 (0.05)	44.16*	1.66 (1.81)

Standard errors are in brackets

SES socio-economic status, as measured by postal area index scores. BMI body mass index, FNE fear of negative evaluation

p* < 0.01, *p* < 0.001

Associations Between FNE, Weight/Shape Concerns, and BMI

Results for the correlations between fear of negative evaluation, weight/shape concerns, BMI percentile, and age (which was used as a control variable in subsequent analyses), are displayed in Table 2. As can be seen, there are strong associations between fear of negative evaluation and weight/shape concerns for both genders.

Relationship Between FNE and Weight/Shape Concerns

Results of the full hierarchical regression model are outlined in Table 3. Firstly, the control variables (age, SES, and migrant status) were entered in step 1 predicting weight/

shape concerns. Secondly, the moderating variables (gender and BMI) were added at step 2. Finally, fear of negative evaluation was added in step 3, followed by the two-way interactions (gender by fear of negative evaluation; BMI by fear of negative evaluation) in step 4 and the three-way interaction (gender by BMI by fear of negative evaluation) in step 5.

As can be seen in step 3, fear of negative evaluation was found to be a significant predictor of weight/shape concerns when controlling for age, SES, migrant status, gender and BMI. Higher levels of fear of negative evaluation were associated with higher levels of weight/shape concerns, uniquely accounting for 29.5% of variance.

In order to test the second hypothesis and examine whether gender moderated this relationship, the interaction term was computed for gender and fear of negative

Table 2 Correlations of all variables split by gender

	1	2	3	4	5	6
1. FNE	–	0.67**	0.17**	0.23**	0.03	–0.01
2. Weight and shape concerns	0.57**	–	0.32**	0.22*	0.07*	–0.01
3. BMI percentile	0.07*	0.22**	–	0.15*	0.04	–0.08**
4. Age in months	0.18**	0.05	0.12**	–	0.05	–0.06*
5. Migrant status	–0.03	–0.05	0.05	0.07*	–	–0.06*
6. SES	0.03	–0.01	–0.03	0.03	–0.11**	–

Pearson correlations for females are presented above the diagonal; correlations below the diagonal are for males

FNE fear of negative evaluation, BMI body mass index, SES socio-economic status, as measured by postal area index scores

* $p < 0.01$, ** $p < 0.001$

Table 3 Hierarchical regression analyses for weight/shape concerns

Variable	R ² adjusted	R ² change	F change	B	95% CI
Step 1	0.015	0.016	21.16**		
Age				0.011**	[0.009, 0.015]
SES				0.001	[–0.001, 0.002]
Migrant status				0.15	[–0.023, 0.327]
Step 2	0.236	0.221	574.53**		
Gender				–1.51**	[–1.61, –1.42]
BMI				0.014**	[0.012, 0.016]
Step 3	0.533	0.296	2521.18**		
FNE				0.108**	[0.103, 0.113]
Step 4	0.547	0.015	43.09**		
FNE x Gender				–0.035**	[–0.045, –0.025]
FNE x BMI				0.000*	[0.000, 0.001]
Gender x BMI				–0.003	[–0.006, 0.000]
Step 5	0.548	0.001	7.46*		
FNE x Gender x BMI				0.000*	[0.000, 0.001]

Unstandardized regression coefficients (B) and confidence intervals are from bootstrapped analyses

SES socio-economic status, as measured by postal area index scores, BMI body mass index, FNE fear of negative evaluation

* $p < 0.01$, ** $p < 0.001$

evaluation and entered into the regression model as a fourth step along with the two-way interaction between BMI and fear of negative evaluation. Results indicated a significant gender \times fear of negative evaluation interaction in the prediction of weight/shape concerns. To examine the interaction effect further, simple slope analysis using the PROCESS macro in SPSS was conducted (Hayes 2013). Results showed that fear of negative evaluation is a significant positive predictor for both genders (see Fig. 2), however the relationship was stronger among girls ($B = 0.12$, $p < 0.001$, 95% CI [0.115, 0.126]), compared to boys ($B = 0.086$, $p < 0.001$, 95% CI [0.079, 0.093]).

In order to test the third hypothesis and examine whether BMI moderated the relationship between fear of negative evaluation and weight/shape concerns and how this differed between genders, a three-way interaction between fear of negative evaluation, gender, and BMI was added to the regression model. The two-way interaction between fear of negative evaluation and BMI added in step 4 (see Table 3) was significant, indicating that BMI significantly moderated the relationship between fear of negative evaluation and weight/shape concerns across genders. Furthermore, step 5 showed a significant three-way interaction indicating that BMI was a significant moderator in the relationship between fear of negative evaluation and weight/shape concerns and that this effect is qualified by gender. To test this moderating effect further simple slopes analyses using the PROCESS macro (Hayes 2013) were conducted. Results indicated that higher BMI scores were associated with a stronger relationship between fear of negative evaluation and weight/shape concerns. Furthermore, this moderation effect was stronger among boys compared to girls.

Results showed that for girls (see Fig. 3), the relationship of fear of negative evaluation and weight/shape concerns remained significantly positive at all three levels of BMI (1 SD below the mean, at the mean, 1 SD above the mean), however, the moderating effect of BMI was stronger among girls with a higher BMI ($B = 0.126$, $p < 0.001$, 95% CI [0.118, 0.134]), compared to those with an average BMI ($B = 0.117$, $p < 0.001$, 95% CI [0.111, 0.122]), or a lower BMI ($B = 0.107$, $p < 0.001$, 95% CI [0.099, 0.115]). Similarly, for boys results showed that the relationship of fear of negative evaluation and weight/shape concerns also remained significantly positive at all three points (1 SD below the mean, at the mean, 1 SD above the mean), and the effect was also stronger among boys with a higher BMI ($B = 0.107$, $p < 0.001$, 95% CI [0.099, 0.114]), compared to those with an average BMI ($B = 0.086$, $p < 0.001$, 95% CI [0.080, 0.092]), or a lower BMI ($B = 0.065$, $p < 0.001$, 95% CI [0.057, 0.073]).

All results remained unchanged when conducting analyses on the whole sample, including previously excluded participants, and when removing control variables from the analysis.

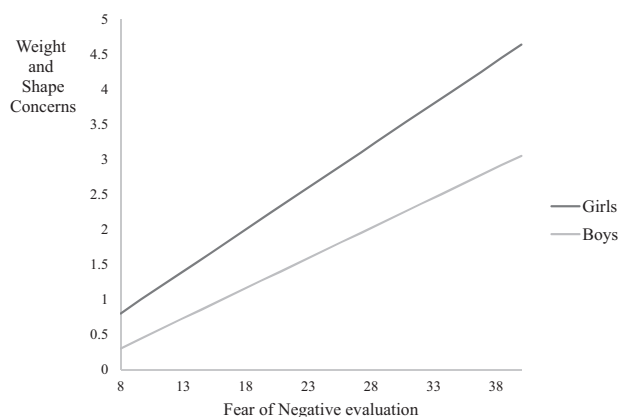


Fig. 2 Moderation of the effect of fear of negative evaluation on weight/shape concerns by gender

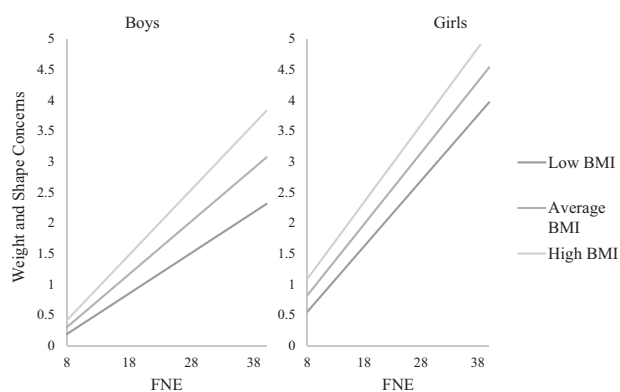


Fig. 3 Moderation of the effect of fear of negative evaluation on weight/shape concerns by BMI and gender

Discussion

Fear of negative evaluation, a key component of social anxiety, has been found to be associated with weight/shape concerns among adults (DeBoer et al. 2013); however, research among adolescents has been limited. The current study addressed this gap in the literature, by showing that fear of negative evaluation is positively associated with weight/shape concerns in adolescents and that this association is moderated by both gender and BMI. As hypothesized, results showed that adolescents with higher levels of fear of negative evaluation experience greater concerns regarding their own weight/shape. This is consistent with previous research (Cook-Cottone et al. 2016; Levinson and Rodenbaugh 2012; Menattia et al. 2015; Michael et al. 2014), and suggests that FNE might be an important risk factor for weight/shape concerns in adolescents.

The results also showed that gender significantly moderated the relationship between fear of negative evaluation and weight/shape concerns. As hypothesized, the relationship was stronger among girls compared to boys. However, while there was a difference between genders in regards to

the strength of the association, fear of negative evaluation was significantly associated with weight/shape concerns for both boys and girls. This supports previous findings with adolescents (Cook-Cottone et al. 2016), but not adults (Levinson and Rodenbaugh 2012), which may indicate that fear of negative evaluation and/or weight/shape concerns have earlier onsets in females compared to males, and that this gender effect may thus dissipate in the transition into adulthood. Further research should, therefore, examine how age impacts the moderating role of gender and investigate whether gender is a stable moderator throughout adolescence or whether this relationship declines as adolescents mature.

Lastly, the current study suggests that weight status has a significant impact on the relationship between fear of negative evaluation and weight/shape concerns. Results showed that the relationship fear of negative evaluation and weight/shape concerns was moderated by BMI, whereby the relationship between fear of negative evaluation and weight/shape concerns was stronger among adolescents with a higher BMI compared to those with a lower BMI. Furthermore, the moderation effect differed in strength between genders, as BMI was a stronger moderator among boys compared to girls. This is contrary to expectations and previous research in adult women, where research has found that BMI had either no moderating effect (DeBoer et al. 2013), or that the relationship between fear of negative evaluation and body dissatisfaction was weaker among women with higher BMI compared to those with lower BMI (Menattia et al. 2015). In support of our findings, socio-cultural theory suggests that adolescents who experience high levels of fear of negative evaluation may experience greater weight/shape concerns if their body shape is not aligned with sociocultural norms (Dunkley et al. 2001). Given that obese adolescents are at greater risk for weight/shape concerns compared to their healthy weight peers (Gall et al. 2016), the current study provides a suggested mechanism for this relationship. The results of the current study suggest that adolescents with a higher BMI and with higher fear of negative evaluation experience greater weight/shape concerns than their healthy weight peers who experience similar levels of fear of negative evaluation. However, as previous studies only included adult women, it is unclear how BMI influences the relationship between fear of negative evaluation and weight/shape concerns among adult men. This might be especially important to consider given that the current study found the moderation effect of BMI to be stronger among adolescent boys compared to girls. Overweight status, particularly obesity, has been found to be associated with a range of physical and mental health issues, including increased weight/shape concerns (Burke and Storch 2015; Calzo et al. 2012), making these adolescents particularly vulnerable. Obese children are

exposed to weight stigma, which increases their weight/shape concerns, and may give rise to other health concerns, including the development of eating disorders (Puhl and Latner 2007). Thus, targeting FNE and weight/shape concerns among obese adolescents appears to be especially important. However, given the mixed results reported in the literature, this relationship should be investigated further in order to establish more conclusive support of the moderating role of BMI in regards to fear of negative evaluation and weight/shape concerns.

Taken together, these results show that fear of negative evaluation, a core component of social anxiety (Heimberg et al. 2014), is significantly associated with weight/shape concerns, a core component of eating disorders (Fairburn et al. 2003), among adolescents. Thus, the current study provides further support for the notion that these disorders share certain vulnerability factors. This is especially important given that social anxiety disorder typically has an earlier onset compared to eating disorders (Hudson et al. 2007; Kessler et al. 2005), suggesting that treatments for social anxiety should integrate prevention methods for weight/shape concerns, as adolescents with existing social anxiety might be at a greater risk to develop body image concerns. In turn, prevention programs aimed at targeting weight/shape concerns should also target fear of negative evaluation in both boys and girls, and also potentially target overweight or obese children in selective programs. This is especially important as obese people are more likely to experience eating disorder symptoms and are thus exposed to double the stigma and double the impairment (da Luz et al. 2017; Hay et al. 2017). If fear of negative evaluation is targeted in overweight adolescents then this comorbidity may be addressed, thus reducing the eating disorder and weight disorder burden.

While the current study was able to identify the association between fear of negative evaluation and weight/shape concerns and further demonstrate how this relationship varies as a function of gender and body weight status, several limitations should be taken into account. Firstly, the study relied on cross-sectional data thus no inference about causality could be made. Future research should examine these processes using longitudinal data to establish whether fear of negative evaluation predicts weight/shape concerns over time. Secondly, the study relied on self-report data for all measures, thus increasing vulnerability to shared method variance (Podsakoff et al. 2003). Thirdly, the study relied on self-report data of height and weight to calculate participant's BMI. While previous research has shown a strong correlation between self-reported height and weight measurements and anthropometric measurements (Pursey et al. 2014), social desirability or unawareness of one's measurements could have impacted this data. Moreover, the current study did not control for pubertal status or timing,

which has been shown to be an important factor in the development of eating disorders among girls but not boys (Ullsperger and Nikolas 2017). Lastly, the current study used a community sample rather than a clinical sample, thus although representative of weight/shape concerns and social concerns in the general community, results may not be representative of adolescents with eating disorders who seek treatment. On the other hand, it is well known that treatment-seeking samples are not representative of people in general with eating disorders (Hart et al. 2011). Nonetheless, future research should investigate how fear of negative evaluation relates to weight/shape concerns within a clinical sample of treatment-seeking adolescents with eating disorders, given the centrality of weight/shape concerns to this diagnostic group and implications for treatment (Fairburn et al. 2003).

Despite the above limitations, the current study also had numerous strengths. The study included a large sample of adolescents across various age groups and from socio-economically diverse areas, allowing greater confidence in the generalizability of the results to the adolescent population. The large size of the sample further allowed for more complex analyses, such as the three-way interaction between fear of negative evaluation, gender, and BMI. While the current study did not investigate the effect of age, but rather controlled for age, future research should investigate the possibility of age as a moderating factor on the relationship between fear of negative evaluation and weight/shape concerns to establish whether the associations found in the current study differ between age groups. Furthermore, whereas previous studies on eating disorders and weight/shape concerns have frequently focused on Caucasian women, the current sample was representative of the general Australian population in terms of migration background, further strengthening the generalizability of the results.

Conclusion

The present study uniquely examined the moderating role of gender and BMI in the relationship between fear of negative evaluation and weight/shape concerns among adolescents. This extends the findings from adult research and provides a new avenue for potential intervention and prevention programs for adolescents. Specifically, the results suggest that fear of negative evaluation as well as weight/shape concerns should be targeted in adolescents to address weight/shape concerns, and that this might be especially effective among girls and overweight boys. More broadly, the results show that fear of negative evaluation is significantly associated with weight/shape concerns among both boys and girls across the range of BMI, making it a possible target for

future whole-school-based prevention programs. Furthermore, the study provides important avenues for possible clinical interventions aimed at combining treatments for social anxiety and weight/shape concerns to enhance the efficacy of treatment for eating disorders. Thus, the current study highlights that fear of negative evaluation, a core feature of social anxiety, also plays an important role in eating disorders among adolescents.

Authors' Contributions N.T. conceived of the study, participated in its design and coordination, performed the statistical analysis, and drafted the manuscript; D.M. received funding for the project, conceived of the study, participated in the design and coordination, and assisted with manuscript preparation; K.B. participated in the design and coordination of the study, participated in the interpretation of the data, and assisted with manuscript preparation; P.H., J.M., S.M., K.P. participated in the design of the study, and assisted with manuscript preparation; A.L. participated in the coordination of the study, assisted with preparing the data set for statistical analyses, and assisted with manuscript preparation; S.G. participated in the design of the study, provided advice on statistical analyses, and assisted with manuscript preparation. All authors read and approved the final manuscript.

Funding This study was funded by Macquarie University under a Research Fellowship Scheme awarded to Dr. Deborah Mitchison (grant number X 16322420).

Data Sharing Declaration Deidentified data are available upon request from the senior author (D.M.), pertaining to approval from the authors' institutional ethics committee

Compliance with Ethical Standards

Conflict of Interest Professor Hay receives/has received sessional fees and lecture fees from the Australian Medical Council, Therapeutic Guidelines publication, and New South Wales Institute of Psychiatry and royalties/honoraria from Hogrefe and Huber, McGraw Hill Education, and Blackwell Scientific Publications, Biomed Central and PlosMedicine and she has received research grants from the NHMRC and ARC. She is Deputy Chair of the National Eating Disorders Collaboration Steering Committee in Australia (2012-) and Member of the ICD-11 Working Group for Eating Disorders (2012-) and was Chair Clinical Practice Guidelines Project Working Group (Eating Disorders) of RANZCP (2012-2015). She has prepared a report under contract for Shire Pharmaceuticals in regards to Binge Eating Disorder (July 2017) and is a consultant to Shire Pharmaceuticals. All views in this paper are her own. Deborah Mitchison and Scott Griffiths are members of the executive of the Australian and New Zealand Academy of Eating Disorders. Stuart Murray receives royalties from Oxford University Press and Taylor & Francis for two academic textbooks relating to eating disorders. All other authors declare that they have no conflict of interest.

Ethical Approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Informed Consent Informed consent was obtained from all individual participants included in the study.

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