Fear of negative evaluation among eating disorders: Examining the association with weight/shape concerns in adolescence

Author Affiliations:

Nora Trompeter — Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia
4 First Walk, Macquarie university, NSW 2109, Australia
T: +61 2 9850 8711 F: +61 2 9850 6578
email: nora.trompeter@mq.edu.au

Kay Bussey — Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia

Phillipa Hay — Translational Health Research Institute, School of Medicine, Western Sydney University, Sydney, Australia

Scott Griffiths — Melbourne School of Psychological Sciences, University of Melbourne, Melbourne, Victoria, Australia

Stuart B. Murray — Department of Psychiatry, University of California San Francisco, San Francisco, CA, United States of America

Jonathan Mond — Centre for Rural Health, University of Tasmania, Launceston, Australia; School of Medicine, Western Sydney University.

This is the author manuscript accepted for publication and has undergone full peer review but has not been through the copyediting, typesetting, pagination and proofreading process, which may lead to differences between this version and the Version of Record. Please cite this article as doi: 10.1002/eat.23018

Alexandra Lonergan — Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia

Kathleen M. Pike — Department of Psychiatry, Columbia University, New York, United States of America

Deborah Mitchison — Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia; School of Medicine, Western Sydney University, Sydney, Australia

Conflicts of Interest/Disclosures:

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 consulted for, and prepared a report under contract for Shire Pharmaceuticals in regards to Binge Eating Disorder (July 2017). All views in this paper are her own.

Scott Griffiths is supported by a National Health and Medical Research Council Early Career Fellowship (grant number: 1121538).

Dr. Pike has received independent investigator research funding from Shire Pharmaceuticals; all views in this paper are her own.

Stuart Murray receives royalties from Oxford University Press and Routledge publishers.

Word count (abstract and main text, excl. tables and references): 4767

Abstract

Objective: Fear of negative evaluation has been proposed as a transdiagnostic factor associated with the development of eating disorders and has been shown to relate to disorders of body image, especially those with weight/shape concerns such as eating disorders and muscle dysmorphia. The current study aimed to investigate whether fear of negative evaluation was a transdiagnostic factor of disorders diagnostically characterized by weight/shape concerns. The study examined whether fear of negative evaluation was associated with higher odds for meeting criteria for an eating disorder and/or muscle dysmorphia, especially those disorders diagnostically characterized by weight/shape concerns. Method: Data were used from a subgroup of the first wave of the EveryBODY study, a longitudinal investigation of eating disorders and body image concerns among Australian adolescents (N = 4030). Participants completed measures on demographics, weight/shape concerns, disordered eating, psychological distress, muscularity concerns, and fear of negative evaluation. Results: Findings revealed that fear of negative evaluation was

associated with higher odds of meeting criteria for any eating disorder, but significantly more so for those characterized by weight/shape concerns diagnostically, as well as binge eating disorder. Similar results were found for muscle dysmorphia. Discussion: The findings suggest that fear of negative evaluation constitutes a transdiagnostic feature for developing and/or maintaining an eating disorder.

Keywords: Fear of negative evaluation, Weight and shape concerns, Adolescence, Eating disorders, Muscle dysmorphia

Introduction

Eating disorders constitute a group of disorders that are defined by varying degrees of disturbance in body image and disordered eating behaviors (American Psychiatric Association, 2013). These disorders often run a long and protracted course (Fichter & Quadflieg, 2016), are linked to high levels of psychological distress, reduced quality of life and can entail severe health risks (Fisher et al., 1995; Mitchison, Morin, Mond, Slewa-Younan, & Hay, 2015). Most eating disorders have an onset in late adolescence (Hudson, Hiripi, Pope, & Kessler, 2007), while body image concerns, a key component of eating disorders, typically onset during early adolescence (Bartholdy et al., 2017). As much research suggests that early intervention promotes optimal outcomes in the treatment of eating disorders (Treasure & Russell, 2011), it is important to identify factors associated with the development of eating disorders in adolescence in order to target these factors in prevention programs to reduce the personal and public burden of these disorders in adulthood.

With much research demonstrating a temporal shift across eating disorder diagnoses over time, an emphasis on identifying factors associated with eating disorders transdiagnostically has emerged (Fairburn, Cooper, & Shafran, 2003), rather than isolating factors relating specifically to one diagnostic group. This approach seems sensible given the transdiagnostic nature of most eating disorder symptoms, with over evaluation of weight and shape identified as the core pathology underlying a range of diagnostic categories (American Psychiatric Association, 2013), and the very high rates of diagnostic crossover between eating disorders (Castellini et al., 2011). One potential transdiagnostic associated factor is fear of negative

evaluation. Fear of negative evaluation, a core feature of social anxiety, is defined as anxiety regarding negative evaluations of oneself by others (Heimberg, Brozovich, & Rapee, 2014). Fear of negative evaluation may be particularly important in the development of eating disorders, as worry about how one's body weight/shape is evaluated by others may increase weight/shape concerns. Previous research examining the role of fear of negative evaluation among adolescents found a significant positive association with weight/shape concerns, especially among girls (Cook-Cottone et al., 2016; Trompeter et al., 2018). Furthermore, fear of negative evaluation has been theorized as a driving factor in the pathology of bulimia nervosa and has been included in a revised version of an influential model of bulimia nervosa: the dual pathway model (Utschig, Presnell, Madeley & Smits, 2010). However, to date, this model has only been examined among adult women, and it remains unclear whether fear of negative evaluation is also linked to other diagnostic groups across gender and age cohorts

Most existing research has linked fear of negative evaluation to symptoms of body dissatisfaction and weight/shape concerns, rather than behavioral symptoms of eating disorders (Maraldo, Zhou, Dowling, & Vader Wal, 2016; Utschig et al., 2010). Thus, it is unclear whether fear of negative evaluation is associated with eating disorders in general, or whether it is associated specifically with eating disorders diagnostically characterized by weight/shape concerns. While eating disorders are generally considered to involve weight/shape concerns (Fairburn et al., 2003), there are several eating disorders that do not include this diagnostic criterion, including binge eating disorder and avoidant/restrictive food intake disorder (ARFID; American Psychiatric Association, 2013). Regarding the latter,

ARFID is the only eating disorder diagnostic group that specifically excludes weight/shape concerns (American Psychiatric Association, 2013). On the other hand, the diagnostic criteria for binge eating disorder do not include a weight/shape concerns criterion. However, it has been argued that this criterion should be included given its importance as a core component of eating disorders, it's high prevalence rate, and it's ability to predict health outcomes among individuals with binge eating disorder (Grilo, White, Gueorguiva, Wilson, & Masheb, 2013). Similar research is also emerging for night eating syndrome and purging disorder, two "other specified feeding or eating disorder" (OSFED) groups that are also not diagnostically characterized by weight/shape concerns, showing that adults meeting criteria for these disorders have greater weight/shape concerns compared to adults without these disorder (Lundgren, Allison, Reardon, & Stunkard, 2008; Lydecker, Shea, & Grilo, 2018). Taken together, this body of research suggests that while these disorders are not diagnostically characterized by weight/shape concerns, weight/shape concerns are notably prevalent amongst people meeting criteria for such disorders. Given the known links between weight/shape concerns and fear of negative evaluation, it may be expected that the latter is associated with eating disorders across the spectrum. To date, we are unaware of any research that has examined this relationship and whether fear of negative evaluation relates differently to diagnostic groups that are characterized by weight/shape concerns compared with other eating disorders.

Another disorder centrally characterized by concerns with weight/shape is muscle dysmorphia, a subtype of body dysmorphic disorder characterized by a pathological desire to become more muscular (Pope, Gruber, Choi, Olivardia, & Phillips, 1997). While previous

research has shown that fear of negative evaluation is significantly higher in adults with body dysmorphic disorder, relative to adults without the disorder (Osman, Cooper, Hackman, & Veale, 2004), no research has examined this relationship with muscle dysmorphia specifically. Yet, the proposed criteria for muscle dysmorphia includes avoidance of situations where one's body is exposed to others, and/or endurance of such situations only with marked distress or intense anxiety, suggesting that fear of negative evaluation may be a highly specific factor associated with this disorder (Pope et al., 1997). Muscle dysmorphia, characterized by a drive to gain muscle mass, has frequently been compared to anorexia nervosa, a disorder associated with a drive for extreme thinness. It has been proposed that these disorders share core cognitions and features (Murray et al., 2017). Furthermore, transdiagnostic risk factors for eating disorders (e.g., perfectionism, and low self-esteem) have been suggested as possible risk factors for muscle dysmorphia (Murray, Rieger, Karlov, & Touyz, 2013). Thus, it could be expected that fear of negative evaluation may not only be associated with eating disorders but also with muscle dysmorphia.

The current study aimed to address these gaps by examining whether fear of negative evaluation was associated with higher odds for meeting criteria for an eating disorder, especially those diagnostically characterized by weight/shape concerns. In line with DSM-5 criteria, the current study considered anorexia nervosa, bulimia nervosa, atypical anorexia nervosa, subthreshold bulimia nervosa, UFED, and muscle dysmorphia as disorders diagnostically characterized by weight/shape concerns. By contrast, binge eating disorder, subthreshold binge eating disorder, purging disorder, night eating syndrome, and ARFID were considered as disorders not diagnostically characterized by weight/shape concerns.

Specifically, it was hypothesized (i) that greater fear of negative evaluation was associated with higher odds of meeting criteria for any eating disorder compared to not meeting criteria for an eating disorder. In regards to individual diagnostic groups, it was further hypothesized (ii) that higher fear of negative evaluation was associated with higher odds of meeting criteria for an eating disorder diagnostically characterized by weight/shape concerns (e.g., anorexia nervosa, bulimia nervosa) compared to an eating disorder not diagnostically characterized by weight/shape concerns (e.g., binge eating disorder, ARFID). Furthermore, given the lack of research conducted on the association between fear of negative evaluation and muscle dysmorphia, the current study aimed to explore whether this relationship would be comparable to the association between fear of negative evaluation and eating disorders diagnostically characterized by weight/shape concerns. Specifically, it was hypothesized (iii) that greater fear of negative evaluation was associated with higher odds of meeting criteria for muscle dysmorphia compared to an eating disorder not diagnostically characterized by weight/shape concerns.

Method

Participants and procedure

Data were used from the first wave of the EveryBODY study, a longitudinal questionnaire-based study of eating disorders and body image concerns among 5191 Australian adolescents (see Trompeter et al., 2018 for the detailed study methodology). Data were used from all participants who had complete data (n = 4030) on all variables used in the current study (BFNE, EDE-Q, height and weight, postcode). Compared to those students who were excluded from the current study, this subset over-represented older students (t(5104) =

4.86, $p < .001$), students from higher socio-economic status (SES) backgrounds ($t(5010) = 2.36$, $p = .019$), female students ($\chi2(1) = 7.95$, $p = .005$), and Australian-born students ($\chi2(1) = 16.56$, $p < .001$). However, the groups were similar in terms of body mass index (BMI) percentile scores ($t(4684) = -1.61$, $p = .108$, fear of negative evaluation ($t(4487) = 0.48$, $p = .631$) and weight/shape concerns ($t(5049) = -0.20$, $p = .845$).

The sample included 2150 girls, 1852 boys, and 28 students who reported their gender as non-binary. In terms of immigrant status, 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. At the time of the survey, 19.3% of students were in seventh grade, 20.4% were in eighth grade, 19.4% of students were in ninth grade, 22.5% of students were in tenth grade, 12.2% of students were in eleventh grade, and 6.2% of students were in twelfth grade.

Adolescents currently meeting diagnostic criteria for eating disorders were diagnostically separated into specific eating disorder categories: anorexia nervosa ($n = 19$), bulimia nervosa ($n = 167$), binge eating disorder ($n = 40$), ARFID ($n = 107$), atypical anorexia nervosa ($n = 49$), subthreshold bulimia nervosa ($n = 97$), subthreshold binge eating disorder ($n = 11$), purging disorder ($n = 96$), night eating syndrome ($n = 98$), unspecified feeding or eating disorder (UFED) ($n = 143$), or muscle dysmorphia ($n = 20$). Participants with multiple diagnoses were excluded from analyses ($n = 198$). Students not meeting criteria for any of these disorders were classified as having no disorder ($n = 2975$). Criteria for diagnostic groups were adopted from a recent prevalence study using the same sample

(Mitchison et al., under review), see supplementary file. Additionally, the current study also included ARFID as a non-weight/shape concerns disorder (criteria included in supplementary file). Table 1 outlines sample characteristics of each diagnostic group. Furthermore, the distribution of fear of negative evaluation scores by diagnostic groups can be seen in Figure 1.

Measures

Fear of Negative Evaluation. Participants' fear of negative evaluation was measured using the positively-worded items from the Brief Fear of Negative Evaluation (BFNE) scale (Leary, 1983). As 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 & 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 (from 8 to 40) with higher scores indicating greater fear of negative evaluation. The scale has been shown to have good reliability with adolescents (White, Maddox, & Panneton, 2015). Sufficient internal consistency was demonstrated in the current study as indicated by a Cronbach's α of .97.

Eating Disorder Diagnoses. The Eating Disorder Examination Questionnaire (EDE-Q; Fairburn, Cooper, & O'Conner, 2008), assessed participants' current weight and height, which was used to calculate BMI percentile, recent weight loss, frequency of additional extreme weight control behaviors (fasting, strict dieting, detoxes, insulin misuse, other drug use for weight loss), and weight/shape concerns. The Night Eating Questionnaire (NEQ;

Allison et al., 2008) assessed behavioral and psychological symptoms of Night Eating Syndrome, such as awaking in the night to eat and lack of appetite in the morning. Furthermore, participants completed questions to assess the avoidance of foods not linked to weight loss, distress of binge eating, and additional features of binge eating. Distress and impairment were assessed using the K10 Psychological Distress Scale (K10; Kessler et al., 2002), which showed sufficient internal consistency as indicated by a Cronbach's α of .94. The weight/shape concerns subscale of the EDE-Q (which ranges from 0 to 6, with higher scores indicating greater weight/shape concerns) has demonstrated good reliability among Australian adolescent boys and girls (Mond et al., 2014). The current study found the measure to have sufficient internal consistency as indicated by a Cronbach's α of .96.

Muscle dysmorphia diagnosis. To assess whether participants met criteria for muscle dysmorphia the current study used scores from the Drive for Muscularity Scale (DMS; McCreary, 2007), the EDE-Q and the K10. Consistent with the diagnostic criteria proposed by Pope and colleagues (1997), muscle dysmorphia was conceptualized as 1) an excessive preoccupation with not being sufficiently lean and muscular; 2) at least two of the following: frequently giving up important activities, discomfort with body exposure, psychological distress, continuing to work-out, diet, and/or substance use; and 3) a primary focus on desire a to be more muscular, rather than thinness. See supplementary file for the full operationalisation of this diagnosis. The Drive for Muscularity Scale showed sufficient internal consistency as indicated by a Cronbach's α of .92.

Demographic variables. We controlled for demographics that have proven and putative associations eating disorders. These included age (measured in months), gender,

BMI percentile, socio-economic status as measured by postal area index (POA), an index of relative socio-economic advantage and disadvantage (Australian Bureau of Statistics, 2013), and immigrant status (categorized as 'born in Australia' compared to 'born overseas'). Each postcode within Australia (similar to a ZIP code), is given a postal area index scores by the Australian Bureau of Statistics which are 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

To test hypothesis (i) and assess whether great fear of negative evaluation was associated higher odds of meeting an eating disorder, multinomial regression analysis was performed using the "no disorder" group as a reference group. To assess hypotheses (ii) and (iii), and to examine whether participant's odds for meeting an eating disorder with the weight/shape concerns criteria compared to those without the weight/shape criteria increased as a function of fear of negative evaluation, additional multinomial regression analyses were performed. To minimize the number of analyses conducted, five analyses were conducted with the four full syndrome eating disorders (anorexia nervosa, bulimia nervosa, binge eating disorder, ARFID) and muscle dysmorphia as the reference categories, respectively. The regression model showed no evidence of multicollinearity (Tabachnick & Fidell, 2001), however the assumption of linearity was violated for some diagnostic groups. Therefore, bootstrapping analyses were conducted to provide bias-corrected p-values.

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 subsequent analyses.

Relationship between FNE and any eating disorder

The model examining the effects of fear of negative evaluation on the likelihood of meeting criteria for any eating/muscle dysmorphic disorder compared to no disorder, adjusting for age, gender, BMI, SES, and immigrant status, was statistically significant, $\chi^2(72) = 1590.84$, $p < .001$. It should be noted that as immigrant status did not vary within the subthreshold binge eating disorder groups, the summary statistics for this relationship may be unreliable.

As shown in Table 2, greater fear of negative evaluation was associated higher adjusted odds of meeting criteria for any eating disorder or muscle dysmorphia. Odds were the highest for meeting criteria for anorexia nervosa and UFED compared with no disorder.

Comparison between diagnostic groups

A binary logistic regression analysis was conducted to examine the effects of fear of negative evaluation on the likelihood of meeting criteria for a disorder diagnostically characterized by weight/shape concerns (anorexia nervosa, bulimia nervosa, atypical anorexia nervosa, subthreshold bulimia nervosa, UFED, muscle dysmorphia) compared to a disorder without this criteria (binge eating disorder, subthreshold binge eating disorder, purging disorder, night eating syndrome, ARFID), controlling for age, gender, BMI, SES, and immigrant status. The model was statistically significant, $\chi2(6) = 109.89$, $p < .001$, and

greater fear of negative evaluation was significantly associated with higher adjusted odds of meeting criteria for a disorder diagnostically characterized by weight/shape concerns compared to a disorder without this criterion, B = 0.07, $p < .001$, odds-ratio (*OR*) = 1.07. Thus, a one point increase in a given participant's fear of negative evaluation (for reference, total scores can range from 8 through 40) is associated with a 7% increase in the predicted probability of that participant meeting criteria for a disorder diagnostically characterized by weight/shape concerns compared to a disorder without this criterion.

Comparisons to anorexia nervosa

Table 3 outlines results from the multinomial regression analysis using anorexia nervosa as a reference group. Results revealed that greater fear of negative evaluation was associated with lower adjusted odds of meeting criteria for almost all disorders not diagnostically characterized by weight/shape concerns (subthreshold binge eating disorder, purging disorder, night eating syndrome and ARFID), compared to anorexia nervosa. The one exception to this was binge eating disorder (B = - .02, $p = .477$, *OR* = 0.98). The adjusted odds for meeting criteria for this disorder were similar to anorexia nervosa irrespectively of fear of negative evaluation. There was no significant association with fear of negative evaluation when comparing the adjusted odds of meeting criteria for anorexia nervosa to other disorders with weight/shape concerns.

Comparisons with bulimia nervosa

Similarly, as outlined in Table 3, greater fear of negative evaluation was associated with lower adjusted odds of meeting criteria for almost all disorders not diagnostically

characterized by weight/shape concerns (subthreshold binge eating disorder, purging disorder, night eating syndrome and ARFID) compared to bulimia nervosa. The one exception to this was again binge eating disorder (B = -0.01, p = .664, OR = 0.99). The adjusted odds for meeting criteria for this disorder were similar to bulimia nervosa. There was no significant effect for fear of negative evaluation when comparing the adjusted odds of meeting criteria for bulimia nervosa to other disorders with weight/shape concerns, except for subthreshold bulimia nervosa (B = -0.04, p = .003, OR = 0.96). Greater fear of negative evaluation was associated with lower adjusted odds of meeting criteria subthreshold bulimia nervosa compared to bulimia nervosa. Thus a one unit increase in fear of negative evaluation scores is associated with a 4% increase in the predicted probability of meeting criteria for bulimia nervosa compared to subthreshold bulimia nervosa.

Comparisons with binge eating disorder

Table 3 shows that there was no significant association with fear of negative evaluation when comparing the adjusted odds of meeting criteria for binge eating disorder to eating disorders diagnostically characterized by weight/shape concerns (anorexia nervosa, atypical anorexia nervosa, bulimia nervosa, subthreshold bulimia nervosa, UFED, and muscle dysmorphia). However, greater fear of negative evaluation was associated with lower adjusted odds of meeting criteria for most disorders not diagnostically characterized by weight/shape concerns (purging disorder, night eating syndrome and ARFID) compared to binge eating disorder,. The exception to this was subthreshold binge eating disorder (B = -0.07, p = .072, OR =0.94). The adjusted odds for meeting criteria for this disorder were similar to binge eating disorder.

Comparisons with ARFID

As can be seen in Table 3, greater fear of negative evaluation was associated with higher adjusted odds of meeting criteria for most disorders diagnostically characterized by weight/shape concerns compared to ARFID. Furthermore, greater fear of negative evaluation was also associated with higher adjusted odds for meeting criteria for almost all other eating disorders not diagnostically characterized by weight/shape concerns compared to ARFID. The exception to this was subthreshold binge eating disorder (B = 0.03, p = .315, *OR* =1.03). The adjusted odds for meeting criteria for this disorder were similar to ARFID.

Comparisons with muscle dysmorphia

Lastly, as outlined in Table 4, greater fear of negative evaluation was associated with lower adjusted odds of meeting criteria for some disorders not diagnostically characterized by weight/shape concerns (night eating syndrome and ARFID) compared to muscle dysmorphia. However, there was no significant association when compared with binge eating disorder, subthreshold binge eating disorder, or purging disorder. The adjusted odds for meeting criteria for this disorder were similar to muscle dysmorphia. There was no significant effect of fear of negative evaluation when comparing the odds of meeting criteria for muscle dysmorphia to most other disorders with weight/shape concerns.

Discussion

The current study showed that greater fear of negative evaluation was associated with higher odds of meeting criteria for an eating disorder, especially for those characterized by weight/shape concerns in their diagnostic criteria. This highlights that fear of negative evaluation might constitute a transdiagnostic feature for the development and/or maintenance of an eating disorder. This finding accords with previous research highlighting fear of negative evaluation as a significant factor in the development of bulimia nervosa (Utschig, et al., 2010), and extends these and previous findings on the association between fear of negative evaluation and weight/shape concerns in adolescents (Trompeter et al., 2018).

As hypothesized, greater fear of negative evaluation was associated with higher odds of meeting criteria for any eating disorder. Furthermore, in line with expectations, fear of negative evaluation was associated with even greater odds of meeting criteria for diagnostic groups characterized by weight/shape concerns compared with diagnostic groups not characterized by weight/shape concerns. An exception to this was binge eating disorder, where the pattern found in the current study suggests that in regards to fear of negative evaluation, binge eating disorder is more similar to diagnostic groups characterized by such weight/shape concerns as opposed to diagnostic groups not characterized by weight/shape concerns. This is despite the fact that the DSM-5 criteria for binge eating disorder does not include a criterion for significant weight/shape concerns. Rather, the current study supports previous research indicating that adolescents with binge eating disorder also experience significant weight/shape concerns (Grilo et al., 2013). Several researchers in the field have examined the relationship between binge eating and binge eating disorder with key weight/shape concern factors, such as overvaluation of weight/shape (e.g., Grilo et al., 2013;

Mitchison et al., 2018). The high frequency of weight/shape concerns across individuals who meet criteria for binge eating disorder as well as the associated indicators of impairment, suggest that overvaluation of weight and shape should be considered for inclusion in the diagnostic criteria of binge eating disorder, either as a specifier or criterion (Grilo et al., 2013; Linardo, 2017). This is especially important when considering the moderating role of higher BMI on the relationship between fear of negative evaluation and weight/shape concerns (Trompeter et al., 2018), as adolescents who meet criteria for binge eating disorder typically also have a higher BMI compared to their peers (Kessler et al., 2013; Mitchison et al., under review). This also places them at a greater risk for experiencing weight stigma (Latner & Stunkard, 2003), leading to still further psychological distress (Puhl & Heuer, 2010). Thus, the current study suggests that in terms of fear of negative evaluation, binge eating disorder is more similar to other eating disorders diagnostically characterized by weight/shape concerns, as opposed to eating disorders without this diagnostic criterion, which is in line with previous research suggesting that adolescents with the disorder also experience significant weight/shape concerns (Grilo et al., 2013).

In terms of clinical applications, these results suggest that the treatment of eating disorders ought to consider including treatment strategies that target fear of negative evaluation, especially when treating adolescents with an eating disorder characterized by weight/shape concerns. Indeed, current evidence showing high rates of comorbidity and diagnostic crossover between eating disorders, and disorders characterized by fear of negative evaluation, particularly social anxiety disorder (Swinbourne & Touyz, 2007), suggests that this factor may be a particularly important transdiagnostic mechanism. As

emerging treatments aim to augment exposure-based approaches for the treatment of eating disorders (Murray et al., 2016), fear of negative evaluation may be important to incorporate into these approaches, in addition to fears relating to shape and weight. Furthermore, these results support the proposition that fear of negative evaluation should be considered in theoretical models of eating disorders, such as the revised dual pathway model (Utschig et al., 2010). Cumulatively, these data suggest, similar to treating low self-esteem in enhanced cognitive behavioral therapy (CBT-E), the widely-used transdiagnostic treatment for eating disorders (Fairburn, Cooper, & Shafran, 2008), that addressing fear of negative evaluation within the context of eating disorders may also enhance treatment. Future research is needed to examine whether incorporating interventions targeting fear of negative evaluation improve treatment success when applied in the context of eating disorders.

The current study had several limitations. First, diagnostic groups were established using self-report measures, as clinical interviews were not feasible given the large sample size. Second, the timeframe of symptoms included only the past one month in order to reduce the timeframe over which adolescents were expected to remember, which is in contrast to the 3-month duration criteria in the DSM-5. Thirdly, the current study relied on cross-sectional data, thus no inference about causality could be made. Future research should examine whether fear of negative evaluation poses a risk for later onset of eating disorders using longitudinal data to provide support for the current findings Furthermore, given that participants with comorbid diagnoses were excluded from analyses, some of the diagnostic groups were small ($n < 20$). Comorbid diagnoses were frequently observed in the current study ($n = 198$) and were largely due to comorbid OSFED diagnoses or comorbidity between

eating disorders and muscle dysmorphia. However, people with comorbid eating disorder and muscle dysmorphic diagnoses are a naturally occurring group that require further research, which was beyond the scope of this paper. Moreover, the current study did not control for self-esteem as a possible confounding variable. Self-esteem has been linked to both fear of negative evaluation (Kocovski, & Endler, 2000), eating disorders (Fairburn, et al., 2003) and muscularity concerns (Olivardia, Pope, Borowiecki, & Cohane, 2004), making it an important consideration for future research. Furthermore, while the current study was representative of the Australian population in terms of demographic characteristics, there were some differences between participants who completed the sur-vey and those who did not. Lastly, the study relied on a community sample rather than a clinical sample. Thus, results may not be representative of adolescents with eating disorders who seek treatment.

The strengths of the current study were first that it included a large sample of adolescents across a broad age range and from socio-economically diverse areas allowing greater confidence in the generalizability of the results. This study also examined the full spectrum of eating disorders, in addition to ARFID, a common feeding disorder, and muscle dysmorphia. Moreover, the current study included previously understudied diagnostic groups, such as night eating syndrome, providing more accurate information regarding the transdiagnostic nature of the association between fear of negative evaluation and eating disorders. Finally, while previous research within the eating disorder field has frequently focused on females to the exclusion of males, our study included both girls and boys, again strengthening the generalizability of the results.

In conclusion, the present study examined whether fear of negative evaluation is associated with higher odds of meeting criteria for eating disorders among adolescents. Results showed that greater fear of negative evaluation is not only associated with higher odds of meeting criteria for an eating disorder in general, but that this association is especially strong for those diagnostic groups characterized either diagnostically or phenomenologically (in the case of binge eating disorder) by weight/shape concerns.

References

Allison, K. C., Lundgren, J. D., O'Reardon, J. P., Martino, N. S., Sarwer, D. B., Wadden, T. B., … , Stunkard, A. J. (2008). The Night Eating Questionnaire (NEQ): psychometric properties of a measure of severity of the Night Eating Syndrome. *Eating Behavior, 9*, 62-72. doi: 10.1016/j.eatbeh.2007.03.007

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed.). Arlington, VA: American Psychiatric Publishing.

Bartholdy, S., Allen, K., Hodsoll, J., O'Daly O. G., Campbell, I. C., Banaschewski, T., … , Schmidt, U. (2017). Identifying disordered eating behaviours in adolescents: how do parent and adolescent reports differ by sex and age? *European Child & Adolescent Psychiatry, 26*, 691-701. doi: 10.1007/s00787-016-0935-1

Castellini, G., Lo Sauro, C., Mannucci, E., Ravaldi, C., Rotella, C. M., Faravelli, C., & Ricca, V. (2011). Diagnostic crossover and outcome predictors in eating disorders according to DSM-IV and DSM-V proposed criteria: A 6-year follow-up study. Psychosomatic medicine, 73(3), 270-279. doi:10.1097/PSY.0b013e31820a1838

Cook-Cottone, C., Serwacki, M., Guyker, W., Sodano, S., Nickerson, A., Keddie-Olka, E., & Anderson, L. (2016). The role of anxiety on the experience of peer victimization and eating disorder risk. *School Mental Health, 8*, 354–367. doi: 10.1007/s12310-016-9178-z.

Fairburn, C. G., Cooper, Z., & O'Connor, M. E. (2008). Eating Disorder Examination (Edition 16.0D). In C. G. Fairburn (Ed.), *Cognitive behavior therapy and eating disorders* (pp. 265–308). New York: Guilford Press.

Fairburn, C. G., Cooper, Z., & Shafran, R. (2003). Cognitive behaviour therapy for eating disorders: a "transdiagnostic" theory and treatment. *Behaviour Research and Therapy 41*, 509–528. doi: 10.1016/S0005-7967(02)00088-8.

Fairburn, C. G., Cooper, Z., & Shafran, R. (2008). *Enhanced cognitive behavior therapy for eating disorders ("CBT-E"): an overview*. In: Fairburn CG, editor. Cognitive Behavior Therapy and Eating Disorders. Guilford; New York: 2008

Fichter, M. M., & Quadflieg, N. (2016). Mortality in eating disorders - results of a large prospective clinical longitudinal study. *International Journal of Eating Disorders, 49*, 391-401. doi: 10.1186/s40337-017-0149-z.

Fisher, M., Golden, N. H., Katzman, D. K., Kreipe, R. E., Rees, J., Schebendach, J., … , & Hoberman, H. M. (1995). Eating disorders in adolescents: A background paper. *Journal of Adolescent Health, 16*, 420-437.

Grilo, C. M., White, M. A., Gueorguiva, R., Wilson, G. T., & Masheb, R. M. (2013). Predictive significance of the overvaluation of shape/weight in obese patients with binge eating disorder: findings from a randomized controlled trial with 12-month follow-up. *Psychological Medicine, 43*, 1335-1344. doi: 10.1017/S0033291712002097

Heimberg, R. G., Brozovich, F. A., & Rapee, R. M. (2014). A cognitive-behavioral model of social anxiety disorder. In S. G. Hofmann & P. M. DiBartolo (Eds.), Social anxiety: Clinical, developmental, and social perspectives (3rd ed., pp. 704-728). Amsterdam; Boston: Elsevier/Academic Press.

Hudson, J. I., Hiripi, E., Pope, H. G., & Kessler, R. C. (2007). The prevalence and correlates of eating disorders in the national comorbidity survey replication. *Biological Psychiatry, 61*, 348-358. doi: 10.1016/j.biopsych.2006.03.040.

Kessler, R. C., Andrews, G., Colpe, L. J., Hiripi, E., Mroczek, D. K., Normand, S., Walters, E. E., Zaslavsky, A.M. (2002) Short screening scales to monitor population prevalences and trends in non-specific psychological distress. P*sychological Medicine, 32*, 959–976. doi: 10.1017/S0033291702006074.

Kessler, R. C., Berglund, P. A., Chiu, W. T., Deitz, A. C., Hudson, J. I., Shahly, V., … , Xavier, M. (2013). The Prevalence and Correlates of Binge Eating Disorder in the World Health Organization World Mental Health Surveys. *Biological Psychiatry, 73*, 904-914. doi: 10.1016/j.biopsych.2012.11.020

Kocovski, N. L., & Endler, N. S. (2000). Social anxiety, self-regulation, and fear of negative evaluation. *European Journal of Personality, 14*, 347–358.

Latner, J. D., & Stunkard, A. J. (2003) Getting Worse: The stigmatization of obese children. *Obesity Research, 11*, 452-456.

Leary, M. R. (1983). A brief version of the fear of negative evaluation scale. *Personality and Social Psychology Bulletin, 9*, 371-375. doi: 10.1177/0146167283093007.

Linardo, J. (2017). Correlates of the over-evaluation of weight and shape in binge eating disorder and mixed eating disorder samples: A meta-analytic review. *Eating Disorders, 3*, 183-198. doi: 10.1080/10640266.2016.1260374

Lundgren, J. D., Allison, K. C., Reardon, J. P., & Stunkard, A. J. (2008). A descriptive study of non-obese persons with night eating syndrome and a weight-matched comparison group. *Eating Behaviors, 9,* 343-351. doi:10.1016/j.eatbeh.2007.12.004

Lydecker, J. A., Shea, M., & Grilo, C. M. (2018). Driven exercise in the absence of binge eating: Implications for purging disorder. International Journal of Eating Disorders, 51, 139-145. doi: 10.1002/eat.22811

Maraldo, T. M., Zhou, W., Dowling, J., & Wal, J. S. (2016). Replication and extension of the dual pathway model of disordered eating: The role of fear of negative evaluation, suggestibility, rumination, and self-compassion. *Eating Behaviors, 23,* 187-194. doi: 10.1016/j.eatbeh.2016.10.008

McCreary, D.R. (2007). *The Drive for Muscularity Scale: Description, psychometrics, and research findings*. In J.K. Thompson & G. Cafri (Eds.), The muscular ideal: Psychological, social, and medical perspectives (pp. 87-106). Washington, DC: American Psychological Association.

Mitchison, D., Mond, J., Bussey, K., Trompeter, N., Lonergan, A., Griffiths, S., Pike, K., Murray, S., & Hay, P. (submitted manuscript). How does the criterion for clinical significance impact eating disorder prevalence in the adolescent population? Findings from the EveryBODY Study.

Mitchison, D., Morin, A., Mond, J., Slewa-Younan, S., Hay, P. (2015). The bidirectional relationship between quality of life and eating disorder symptoms: A 9-year community-based study of australian women. *PLoS ONE 10*(3): e0120591. doi:10.1371/journal.pone.0120591

Mitchison, D., Rieger, E., Harrison, C., Murray, S., Griffiths, S., & Mond, J. (2018). Indicators of clinical significance among women in the community with binge-eating disorder symptoms: Delineating the roles of binge frequency, body mass index, and overvaluation. *International Journal of Eating Disorders, 51*, 165-169. doi: 10.1002/eat.22812

Mond J, Hall A, Bentley C, Harrison C, Gratwick-Sarll K, Lewis V. (2014) Eating disorder features in adolescent boys: Eating disorder examination questionnaire norms *International Journal of Eating Disorders , 47*, 335–341.

Murray, S. B., Nagata, J. M., Griffiths, S., Calzo, J. P., Brown, T. A., Mitchison, D., Blashill, A. J., & Mond, J. M. (2017). The enigma of male eating disorders: A critical review and synthesis. *Clinical Psychology Review, 57*, 1-11, doi:10.1016/j.cpr.2017.08.001

Murray, S. B., Rieger, E., Karlov, L. & Touyz, S. W. (2013). An investigation of the transdiagnostic model of eating disorders in the context of muscle dysmorphia. *European Eating Disorders Review, 21*, 160-164. doi: 10.1002/erv.2194

Murray, S. B., Treanor, M., Liao, B., Loeb, K. L., Griffiths, S., & Le Grange, D. (2016). Extinction theory & anorexia nervosa: Deepening therapeutic mechanisms. *Behavior Research and Therapy, 87*, 1-10. doi: 10.1016/j.brat.2016.08.017

Olivardia, R., Pope, H. G., Jr., Borowiecki, J. J. III, & Cohane, G. H. (2004). Biceps and Body Image: The Relationship Between Muscularity and Self-Esteem, Depression, and Eating Disorder Symptoms. *Psychology of Men & Masculinity, 5*(2), 112-120. doi: 10.1037/1524-9220.5.2.112

Osman, S., Cooper, M., Hackmann, A., & Veale, D. (2004). Spontaneously occurring images

and early memories in people with body dysmorphic disorder. *Memory, 12*, 428-436. DOI: 10.1080/09658210444000043

Pope, H. G., Gruber, A. J., Choi, P. Y., Olivardia, R., Phillips, K. A. (1997). Muscle dysmorphia: an underrecognized form of body dysmorphic disorder. *Psychosomatics, 38*, 548–557.

Puhl, R., M., & Heuer, C. A. (2010). Obesity Stigma: Important Considerations for Public Health. *American Journal of Public Health, 100*, 1019-1028. doi: 10.2105/AJPH.2009.159491

Swinbourne, J. M., & Touyz, S. W. (2007). The co-morbidity of eating disorders and anxiety disorders: A review. *European Eating Disorders Review, 15*, 253–274. DOI: 10.1002/erv.784

Tabachnick, B. G., & Fidell, L. S. (2001). *Using Multivariate Statistics (4th ed.).* Boston, MA: Allyn and Bacon.

Treasure, J., & Russell, G. (2011). The case for early intervention in anorexia nervosa: theoretical exploration of maintaining factors. *The British Journal of Psychiatry, 199*, 5–7. doi: 10.1192/bjp.bp.110.087585

Trompeter, N., Bussey, K., Hay, P., Mond, J., Murray, S., Lonergan, A., Griffiths, S., Pike, K., & Mitchison, D. (2018). Investigating the role of gender and body mass index in relationship between fear of negative evaluation and body image concerns in adolescents. *Journal of Youth and Adolescence, 47*, 1398-1408.

Utschig, A. C., Presnell, K., Madeley, M. C., & Smits, J. A. (2010). An investigation of the

relationship between fear of negative evaluation and bulimic psychopathology. *Eating Behaviors, 11,* 231-238, doi: 10.1016/j.eatbeh.2010.05.003.

Watson, D., & Friend, R. (1969). Measurement of social-evaluative anxiety. *Journal of Consulting and Clinical Psychology, 33,* 448-457. doi: 10.1037/h0027806.

White, S. W., Maddox, B. B., & Panneton, R. K. (2015). Fear of negative evaluation influences eye gaze in adolescents with autism spectrum disorder: A pilot study. *Journal of Autism and Developmental Disorders, 45,* 3446-3457. doi: 10.1007/s10803-014-2349-6.

Table 1. *Descriptive statistics for each diagnostic group.*

Diagnostic group	BMI-percentile	EDE-Q	FNE	SES	Age in months	Female participants
	Median (IQR)					N (%)
No diagnosis	53.00 (54.00)	.50 (1.50)	12.00 (11.50)	987.35 (45.20)	178.00 (29.00)	46.30
Anorexia Nervosa	2.40 (5.00)	4.42 (1.00)	32.00 (15.00)	980.27 (34.83)	175.00 (37.00)	94.70
Bulimia Nervosa	74.60 (49.00)	4.92 (1.42)	31.00 (13.00)	989.72 (46.17)	186.00 (21.00)	81.40
Binge Eating Disorder	76.80 (32.00)	4.58 (1.85)	31.00 (13.50)	987.35 (19.82)	186.00 (27.00)	90.00
Atypical Anorexia Nervosa	69.90 (56.00)	4.83 (1.21)	28.00 (14.00)	980.27 (34.83)	184.00 (26.00)	83.70
Subthreshold Bulimia Nervosa	69.80 (40.00)	3.67 (1.92)	25.00 (11.50)	989.72 (48.29)	186.00 (27.50)	75.30
Subthreshold Binge Eating Disorder	72.70 (37.00)	3.75 (1.42)	24.00 (15.00)	980.27 (9.45)	200.00 (30.50)	81.80
Purging Disorder	63.45 (40.00)	3.17 (2.81)	22.00 (18.00)	989.72 (43.11)	181.00 (27.75)	78.10
Night Eating Syndrome	62.85 (58.00)	1.08 (2.85)	23.00 (15.25)	980.27 (43.09)	185.00 (20.00)	41.80
ARFID	55.30 (58.00)	1.33 (1.75)	16.00 (16.00)	987.35 (44.78)	174.00 (35.00)	66.40
UFED	73.50 (40.00)	4.75 (1.17)	32.00 (12.00)	989.72 (50.42)	182.00 (24.50)	84.60

Muscle Dysmorphia	30.20 (65.00)	2.21 (2.00)	30.50 (12.50)	979.08 (26.78)	189.50 (39.50)	25.00
Combined	70.95 (44.00)	5.00 (1.52)	32.00 (15.00)	987.35 (45.20)	183.00 (26.00)	71.20

Table 2. *Multinomial logistic regression analyses using bootstrapping for FNE predicting diagnostic groups. Reference group: No disorder*

Diagnostic group	B	SE	*P*	Odds Ratio	95% CI Odds Ratio
Anorexia Nervosa	0.16	.03	<.001	1.18	[1.12, 1.26]
Bulimia Nervosa	0.15	.01	<.001	1.16	[1.14, 1.18]
Binge Eating Disorder	0.14	.02	<.001	1.15	[1.11, 1.19]
Atypical Anorexia Nervosa	0.14	.02	<.001	1.14	[1.11, 1.19]
Subthreshold Bulimia Nervosa	0.11	.01	<.001	1.12	[1.09, 1.14]
Subthreshold Binge Eating Disorder	0.07	.03	.005	1.08	[1.01, 1.15]
Purging Disorder	0.08	.01	<.001	1.09	[1.06, 1.10]
Night Eating Syndrome	0.08	.01	<.001	1.08	[1.06,1.11]
ARFID	0.04	.01	<.001	1.04	[1.02, 1.07]
Unspecified Feeding/Eating Disorder	0.16	.01	<.001	1.17	[1.15, 1.20]
Muscle Dysmorphia	0.14	.02	<.001	1.14	[1.09, 1.20]

Note. Adjusted for BMI, gender, SES, age, immigrant status.

Table 3. *Multinomial logistic regression analyses using bootstrapping for FNE predicting each eating disorder diagnostic group.*

Diagnosis	B	OR (95% CI)	Diagnosis	B	OR (95% CI)	Diagnosis	B	OR (95% CI)	Diagnosis	B	OR (95% CI)
AN (ref)	-	-	BN (ref)	-	-	BED (ref)	-	-	ARFID (ref)	-	-
BN	-.02	.98 (.93, 1.04)	AN	.02	1.02 (.96, 1.08)	AN	.02	1.03 (.96, 1.10)	AN	.12*	1.13 (1.07, 1.20)
BED	-.02	.98 (.91, 1.04)	BED	-.01	.99 (.95, 1.03)	BN	.01	1.01 (.97, 1.05)	BN	.12*	1.11 (1.08, 1.15)
AAN	-.03	.98 (.92, 1.04)	AAN	-.01	.99 (.96, 1.03)	AAN	.00	1.00 (.95, 1.05)	BED	.10*	1.12 (1.06, 1.15)
sBN	-.05	.95 (.89, 1.01)	sBN	-.04*	.96 (.94, .99)	sBN	-.03	.97 (.93, .1.01)	AAN	.10*	1.10 (1.06, .1.15)
sBED	-.09*	.91 (.84,.99)	sBED	-.08*	.93 (.87,.99)	sBED	-.07	.94 (.87, 1.01)	sBN	.07*	1.07 (1.04, 1.11)
PD	-.08*	.92 (.87,.98)	PD	-.07*	.94 (.91,.96)	PD	-.06*	.94 (.91, .98)	sBED	.03	1.03 (.97, 1.11)
NES	-.08*	.92 (.87,.98)	NES	-.07*	.93 (.91,.96)	NES	-.06*	.94 (.91, .98)	PD	.04*	1.04 (1.01, 1.08)
ARFID	-.12*	.88 (.83, .94)	ARFID	-.11*	.90 (.87, .92)	ARFID	-.10*	.91 (.87, .94)	NES	.04*	1.04 (1.01, 1.07)
UFED	-.01	1.00 (.94, 1.06)	UFED	.01	1.01 (.99, 1.04)	UFED	.02	1.02 (.98, 1.06)	UFED	.12*	1.13 (1.10, 1.16)
MD	-.03	.96 (.91, 1.04)	MD	-.01	.99 (.94, 1.04)	MD	-.01	1.00 (.94, 1.05)	MD	.10*	1.10 (1.05, 1.16)

Note. Adjusted for BMI, gender, SES, age, immigrant status. AN = anorexia nervosa, BN = bulimia nervosa, BED = binge eating disorder, AAN = atypical anorexia nervosa, sBN = subthreshold bulimia nervosa, sBED = subthreshold binge eating disorder, PD = purging disorder, NES = night eating syndrome, MD = muscle dysmorphia

* $p < .05$

Table 4. *Multinomial logistic regression analyses using bootstrapping for FNE predicting diagnostic groups. Reference group: Muscle dysmorphia*

Diagnostic group	B	SE	*P*	Odds Ratio	95% CI Odds Ratio
Anorexia Nervosa	0.03	.04	.440	1.03	[0.96, 1.11]
Bulimia Nervosa	0.01	.02	.630	1.01	[0.97, 1.07]
Binge Eating Disorder	0.01	.03	.890	1.01	[0.95, 1.07]
Atypical Anorexia Nervosa	0.00	.03	.905	1.00	[0.95, 1.06]
Subthreshold Bulimia Nervosa	-0.03	.03	.372	0.98	[0.93, 1.03]
Subthreshold Binge Eating Disorder	-0.06	.04	.130	0.94	[0.87, 1.02]
Purging Disorder	-0.05	.03	.056	0.95	[0.90, 1.00]
Night Eating Syndrome	-0.05	.03	.043	0.95	[0.90, .99]
ARFID	-0.10	.03	<.001	0.91	[0.87, .96]
Unspecified Feeding/Eating Disorder	0.03	.03	.334	1.03	[0.98, 1.08]
Muscle Dysmorphia (reference group)	-	-	-	-	-

Note. Adjusted for BMI, gender, SES, age, immigrant status.

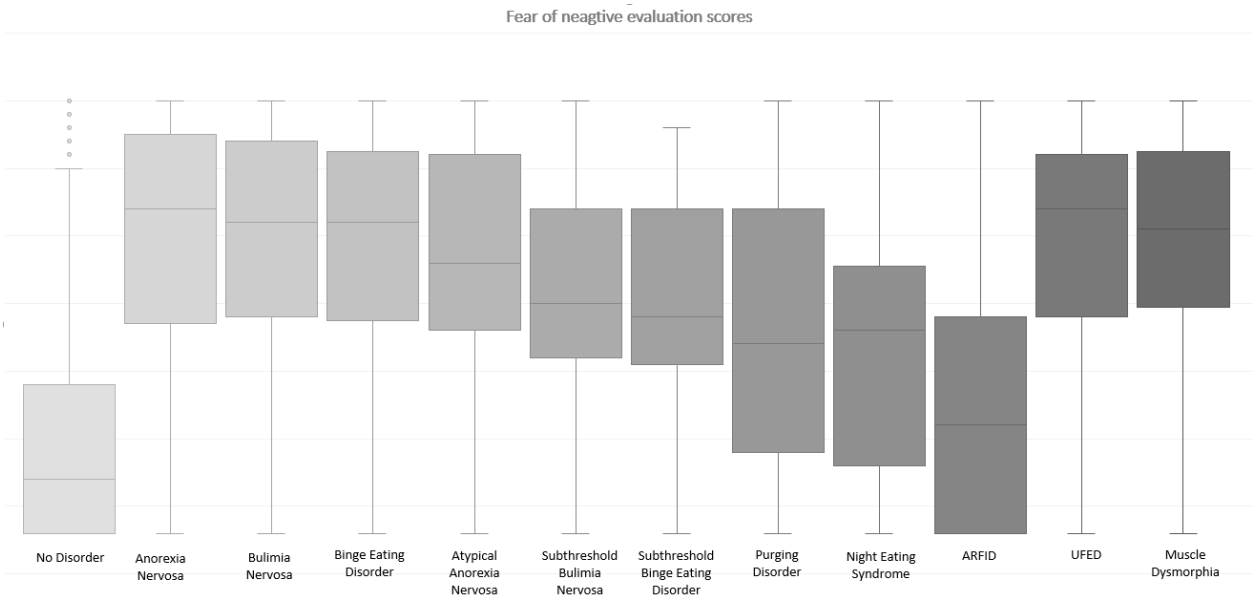

Figure 1. Box-and-whisker plot of participant's fear of negative evaluation scores by diagnostic group. Centre lines of each box represent the median. Box width represent the interquartile range. Box whiskers extend to 5th and 95th percentiles. Circles represent outliers.