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Research paper

The classification of body dysmorphic disorder symptoms in male and female adolescents

Sophie C. Schneider[a], Andrew J. Baillie[a,b], Jonathan Mond[c,d], Cynthia M. Turner[e], Jennifer L. Hudson[a,*]

[a] Centre for Emotional Health, Department of Psychology, Macquarie University, Sydney, Australia
[b] NHMRC Centre of Research Excellence in Mental Health and Substance Use, Australia
[c] Centre for Rural Health, School of Health Sciences, University of Tasmania, Launceston, Australia
[d] Centre for Health Research, School of Medicine, Western Sydney University, Sydney, Australia
[e] School of Psychology, Australian Catholic University, Brisbane, Australia

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ABSTRACT

Background: Body dysmorphic disorder (BDD) was categorised in *DSM-5* within the newly created 'obsessive-compulsive and related disorders' chapter, however this classification remains subject to debate. Confirmatory factor analysis was used to test competing models of the co-occurrence of symptoms of BDD, obsessive-compulsive disorder, unipolar depression, anxiety, and eating disorders in a community sample of adolescents, and to explore potential sex differences in these models.

Methods: Self-report questionnaires assessing disorder symptoms were completed by 3149 Australian adolescents. The fit of correlated factor models was calculated separately in males and females, and measurement invariance testing compared parameters of the best-fitting model between males and females.

Results: All theoretical models of the classification of BDD had poor fit to the data. Good fit was found for a novel model where BDD symptoms formed a distinct latent factor, correlated with affective disorder and eating disorder latent factors. Metric non-invariance was found between males and females, and the majority of factor loadings differed between males and females. Correlations between some latent factors also differed by sex.

Limitations: Only cross-sectional data were collected, and the study did not assess a broad range of *DSM-5* defined eating disorder symptoms or other disorders in the *DSM-5* obsessive-compulsive and related disorders chapter.

Conclusions: This study is the first to statistically evaluate competing models of BDD classification. The findings highlight the unique features of BDD and its associations with affective and eating disorders. Future studies examining the classification of BDD should consider developmental and sex differences in their models.

1. Introduction

The classification of body dysmorphic disorder (BDD) has been the subject of increasing research interest in the past two decades. As BDD is poorly understood and frequently misdiagnosed (Phillips and Feusner, 2010), its classification may have important academic and practical implications, for example, with regard to screening in the presence of related disorders, improved clinical decision making, development of interventions, or understanding of aetiological factors (Abramowitz and Jacoby, 2015; First et al., 2004; Phillips and Stein, 2015; Phillips et al., 2010). Although classified as a somatoform disorder in *DSM-III-R* and *DSM-IV* (American Psychiatric Association, 1987, 1994), BDD has long been conceptualised as related to obsessive-compulsive disorder (OCD) as part of an '*obsessive-compulsive spectrum*' of disorders (Phillips et al., 1995). Studies have found that BDD and OCD share core disorder features, have elevated comorbidity in clinical samples, increased family history, and similarities in treatment response (Abramowitz and Jacoby, 2015; Bienvenu et al., 2012; Kelly and Phillips, 2011; Phillips et al., 2010). Accordingly, in *DSM-5* (American Psychiatric Association, 2013), BDD was included in a new 'obsessive-compulsive and related disorder' (OCRD) category, alongside OCD, hoarding, trichotillomania, excoriation, and several other specified and unspecified OCRD diagnoses.

However, the classification of BDD in DSM-5 has faced criticism. A recent review by Frías et al. (2015) highlighted a number of methodological limitations of studies linking BDD and OCD, including the

* Corresponding author.
E-mail address: jennie.hudson@mq.edu.au (J.L. Hudson).

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lack of control groups in comorbidity studies, reliance on samples recruited from specialised clinics, and limited information on specific aetiological pathways. Further, the authors concluded that the evidence reviewed might in fact support a closer association between BDD and social anxiety disorder than between BDD and OCD. Abramowitz and Jacoby (2015) argued that BDD and OCD are more meaningfully related to anxiety disorders than to other OCRDs regarding the function of core symptoms, comorbidity, familial disorder patterns, and treatment response. Indeed, BDD is strongly associated with anxiety and unipolar depression across important domains including comorbidity, family history, disorder course, and cognitive biases (Abramowitz and Jacoby, 2015; Fang and Hofmann, 2010; Frías et al., 2015; Kelly et al., 2013; Phillips and Stout, 2006). These studies support an alternate conceptualisation of BDD as part of a broader '*affective spectrum*' that also includes anxiety, OCD, and unipolar depression (Phillips et al., 1995).

Other researchers have focused on the relationship between BDD and eating disorders, as these disorders are associated in their clinical features, onset and course, and cognitive biases (Cororve and Gleaves, 2001; Hartmann et al., 2013; Rosen and Ramirez, 1998). It has thus been proposed that BDD and eating disorders may form a separate '*body image spectrum*' of disorders (Cororve and Gleaves, 2001; Phillipou et al., 2017). However, as OCD and eating disorders are also associated (Phillips and Kaye, 2007), this may instead indicate that BDD, OCD, eating disorders, anxiety, and depression all belong to a single overall '*internalising spectrum*'.

While each of these theories regarding the classification of BDD has some empirical support, no prior study has directly compared competing models of BDD classification. Of the different validators used to guide classification decisions in *DSM-5* (American Psychiatric Association, 2013), comorbidity between BDD and associated disorders has been the most widely examined. Statistical techniques such as confirmatory factor analysis (CFA) of disorder co-occurrence have been used to directly compare the fit of theorised classification models to observed data, and such studies have resulted in significant advances to the understanding of the structure of psychopathology. For example, an influential CFA study by Krueger et al. (1998) identified two stable higher order dimensions (also known as latent factors) across disorders that corresponded with the internalising and externalizing syndromes identified in youth by Achenbach and Edelbrock (1984). Sustained research efforts have expanded such dimensional models of psychopathology to include uncommon mental disorders, thought disorders, and personality disorders (Forbush and Watson, 2013; Markon, 2010), and challenge current models of disorder classification (Kotov et al., 2017). For an overview of conceptual issues and future directions of such research, see Kotov et al. (2017) or Krueger and Markon (2006). Findings from these studies suggest several important issues to consider when using CFA to compare models of BDD classification.

First, some studies indicate the potential for developmental differences in the structure of psychopathology. Lahey et al. (2008) found that a dimensional model of psychopathology was appropriate for children and adolescents, but the factors were more highly correlated among children. Wittchen et al. (2009) reported that a theoretical classification model that fit well in adolescents and young adults did not fit adequately in children and older adults. Waszczuk et al. (2014) found differential associations between symptoms of depression and anxiety in children, adolescents, and young adults. Although further research is needed to establish whether such differences are robust and meaningful, these studies suggest that the structure of psychopathology may differ across developmental groups. As BDD typically begins during adolescence (Bjornsson et al., 2013), the current study will focus on the classification of BDD at this time of peak disorder onset. CFA is an appropriate tool for modelling comorbidity in adolescents, and has supported the inclusion of OCD, anxiety, depression, and eating disorders in an internalising spectrum of disorders (Beesdo-Baum et al., 2009; Blanco et al., 2015; Kessler et al., 2012; Lahey et al., 2008; Wittchen et al., 2009). However, as current theoretical BDD models are primarily derived from adult research, it is unclear how well they will fit in an adolescent sample. The current study will therefore include a novel model, where BDD symptoms form their own factor, correlated with separate affective and eating disorders factors.

Second, most adolescent studies have involved categorical analyses of the diagnostic status of a disorder. This approach relies on the application of validated thresholds to determine disorder status (Carragher et al., 2016). However, measures assessing BDD have rarely been evaluated in adolescents and thus do not have well-validated cut-points. Further, categorical approaches ignore the potential importance of subthreshold disorder presentations (Roberts et al., 2015). The current study will thus examine the relationships between symptoms, not diagnostic status.

Third, sex differences have been observed in child and adolescent studies in the strength of the association between particular disorders and their latent factor (Lahey et al., 2008), and in overall internalising factor scores (Carragher et al., 2016; Caspi et al., 2014). Hence, while sex differences are not part of the theoretical models of BDD, fitting the models separately for males and females may provide sex-specific information about disorder associations.

Fourth, previous CFA studies suggest that models of affective disorders such as anxiety and depression may show the best fit when lower-order fear and distress factors are identified (Beesdo-Baum et al., 2009; Blanco et al., 2015; Kessler et al., 2012; Wittchen et al., 2009). However, as this structure is not always observed (Lahey et al., 2008), the utility of identifying these factors will be assessed prior to fitting the BDD classification models.

Finally, when seeking to model comorbidity between disorders, clinical samples will not be representative of the general population (Angold et al., 1999). This may be particularly true for BDD, where access to appropriate mental health services is low (Buhlmann et al., 2010; Marques et al., 2011; Schneider et al., 2016) and misdiagnosis is common (Grant et al., 2001; Veale et al., 2015). Therefore, the classification of BDD will be examined in a community sample.

1.1. The current study

The aim of the current study was to use CFA to test competing models of the classification of BDD in relation to OCD, anxiety, depression, and eating disorders among adolescents. Fig. 1 presents the models that were selected for CFA testing, though for simplicity of presentation, correlations among factors and item residual variances are not depicted. In *Model 1*, BDD is part of a single unidimensional internalising factor that also includes OCD, anxiety, depression, and eating disorders. In *Model 2*, BDD is part of an affective spectrum of disorders that includes anxiety, depression, and OCD, with a separate correlated eating disorders factor. In *Model 3*, BDD and eating disorders form a body image spectrum of disorders that is correlated with an affective disorders factor that includes anxiety, depression, and OCD. In *Model 4*, BDD and OCD form an obsessive-compulsive spectrum factor that is correlated with separate affective and eating disorders factors. Finally, *Model 5* tests the novel hypothesis that BDD forms a separate factor that is correlated with affective disorders and eating disorders factors. Initial analyses will evaluate the utility of anxiety and depression symptoms being modelled as a single factor, or as separate fear and distress factors. The study will then test the fit of each model of the classification of BDD. As prior adolescent studies have found sex differences in models of psychopathology, models will be fit separately for males and females, and the measurement invariance of model fit parameters will be examined in the best fitting model.

2. Method

2.1. Participants

Participants were adolescents recruited from seven high schools in