Subthreshold body dysmorphic disorder in adolescents: Prevalence and impact

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ABSTRACT

The aim of the current study was to establish the prevalence of subthreshold body dysmorphic disorder (subthreshold-BDD) in a community sample of adolescents, and to compare disorder correlates in individuals with subthreshold-BDD to those with probable full-syndrome BDD (probable-BDD) and those without BDD (non-BDD). Self-report questionnaires assessing *DSM-IV* BDD criteria, past mental health service use, and symptoms of body dysmorphic disorder, anxiety, depression, obsessive-compulsive disorder and eating disorders, were completed by 3149 Australian high school students (mean age =14.6 years, 63.5% male). Male participants also completed measures assessing quality of life, muscularity concerns, emotional symptoms, conduct problems, hyperactivity, and peer problems. The prevalence of subthreshold-BDD was 3.4%, and probable-BDD was 1.7%. Compared to the non-BDD group, subthreshold-BDD was associated with elevated symptoms of comorbid psychopathology and greater past mental health service use, and in male-only measures, with poorer quality of life and elevated muscularity concerns. Subthreshold-BDD participants reported significantly lower mental health service use, and fewer symptoms of depression, eating disorders, and hyperactivity than probable-BDD participants, however, other comorbid symptoms did not differ significantly between these groups. These findings indicate that subthreshold-BDD is associated with substantial difficulties for adolescents in the general community. BDD screening should include subthreshold presentations, as these may be an important target for early intervention programs.

1. Introduction

Body dysmorphic disorder (BDD) is an obsessive-compulsive spectrum disorder involving preoccupation with perceived defects in appearance (American Psychiatric Association, 2013). BDD typically begins in the adolescent years (Phillips et al., 2005); it affects 1.7–2.3% of adolescents, prevalence does not appear to differ between adolescent males and females, but is higher in older adolescents than younger adolescents (Mayville et al., 1999; Rief et al., 2006; Schneider et al., 2016). In clinical samples, adolescent BDD is associated with high rates of suicidality, functional impairment, and comorbid psychopathology, particularly depression, anxiety, and obsessive-compulsive disorder (Albertini and Phillips, 1999; Phillips et al., 2006). Recent community studies have also linked probable cases of adolescent BDD to elevated comorbidity, impaired quality of life, and deficits in social and emotional functioning (Mastro et al., 2016; Schneider et al., 2016).

Although BDD appears to be a potentially severe disorder in adolescence, little is known about the prevalence and relative severity of subthreshold-BDD. There is no established definition of subthreshold-BDD, but subthreshold disorders involve the presence of core disorder symptoms and associated distress or impairment that do not meet full diagnostic criteria (Pincus et al., 1999). In adolescents, subthreshold mental disorders are approximately twice as common as full-syndrome disorders, and constitute a substantial disease burden (Roberts et al., 2015). For example, adolescent subthreshold depression, anxiety, and obsessive-compulsive disorder are linked to increased comorbidity, greater functional impairment, and higher risk of later full-syndrome disorders (Balázs et al., 2013; Haller et al., 2014; Shankman et al., 2009; Wesselhoeft et al., 2013; Wolitzky-Taylor et al., 2014). No study has systematically examined subthreshold BDD in adolescence. However, one recent study found that those at moderate risk for BDD reported depression symptoms, self-worth, and appearance-related rejection sensitivity at levels intermediate between high-

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risk and low-risk groups (Mastro et al., 2016). There were similar numbers of adolescents in the high and moderate risk groups (9% vs 8% of the sample). However, as the study did not directly identify those with full syndrome and subthreshold BDD presentations, the prevalence of subthreshold-BDD in adolescents thus remains uncertain.

The current study aimed to establish the prevalence of subthreshold-BDD in a large community sample of adolescents. It also sought to examine the relative severity of subthreshold-BDD by comparing disorder correlates both to those with probable full-syndrome BDD (referred to as probable-BDD), and those without BDD (non-BDD). It was hypothesized that subthreshold-BDD prevalence would be elevated in older adolescents compared to younger adolescents, and that no significant sex difference in prevalence would be observed. Further, it was hypothesized that the subthreshold-BDD group would report higher symptoms of anxiety, depression, obsessive-compulsive disorder, and eating disorders, and greater past mental health service use, when compared with the non-BDD group. It was also hypothesized that the subthreshold-BDD group would report lower levels of anxiety, depression, obsessive-compulsive disorder, and eating disorder symptoms, and lower past mental health service use, than those with probable-BDD. Due to the nature of the recruitment methods, outlined below, a number of measures were administered to male participants only, and therefore the final hypotheses are specific to male participants. It was hypothesized that adolescent males with subthreshold-BDD would report higher quality of life impairment, muscularity concerns, emotional symptoms, peer problems, conduct problems, and hyperactivity, than non-BDD males, and lower scores on these measures than probable-BDD males.

2. Methods

2.1. Participants and procedure

Participants were recruited from seven high schools in New South Wales, Australia. Male participants were recruited from four single-sex Catholic boys' schools participating in a study about the utilization of an online treatment program for anxiety and depression. Female participants were recruited from two independent schools and one government girls' high school participating in a study of the development and prevention of anxiety and depression. All schools were located in the Greater Sydney area of New South Wales, Australia. School-level information was collected about socio-educational advantage (ICSEA; Australian Curriculum and Assessment Reporting Authority, 2013). This index is a standardized score (M =1000.0, SD =100.0) indicating socio-educational advantage relative to other schools in Australia. ICSEA of the participating schools ranged from 1002.0 to 1201.0 (M =1092.5, SD =70.8), indicating that schools ranged from average to high ICSEA.

Of 5005 eligible students, 3149 (62.9%) consented and took part in the current study; 2000 (63.5%) male, mean age 14.58 years (SD =1.4, range =12–18). Full information about study participants and procedures are available elsewhere (Schneider et al., 2016). Briefly, assessment sessions took place in class or year groups during school time, supervised by members of the research team, and teachers where available. Responses were collected confidentially using de-identified alphanumeric codes and participants were informed that the breaking of confidentiality would be considered only if their questionnaire responses indicated serious risk of harm, such as current suicidal ideation or evidence of abuse. The research was approved by the Human Research Ethics Committee of Macquarie University. Approval was also granted by each school and their relevant governing body. Information about the study was provided directly to parents and students, and informed consent and assent were obtained.

2.2. Measures

2.2.1. All participants

The Body Dysmorphic Disorder Questionnaire-Adolescent Version (BDDQ-A; Phillips, 2005) assesses *DSM-IV* criteria for BDD in a series of yes/no questions assessing appearance preoccupation, distress, and impairment (American Psychiatric Association, 1994). For example, preoccupation is assessed with the item 'Do you think about your appearance problems a lot and wish you could think about them less?' Participants are excluded if they report that their primary appearance concern is related to their weight, or concerns about not being thin enough. Participants also describe the body areas of concern and the nature of any associated impairment. Time spent thinking about appearance per day is also assessed, with a duration of at least one hour required to indicate BDD. Although the BDDQ-A has not been validated in adolescent samples, it is highly similar to the adult BDDQ, which has good sensitivity (100%) and specificity (89–93%) in adult psychiatric samples (Grant et al., 2001; Phillips et al., 1995).

BDDQ-A responses were used to determine BDD group membership. Individuals who were preoccupied with their appearance, experienced related distress or impairment, and were not primarily concerned about weight were classified as *probable-BDD* if they thought about their appearance for at least one hour per day, or *subthreshold-BDD* if they spent less than one hour per day thinking about appearance. All remaining participants were classified as *non-BDD*.

The Body Image Questionnaire, Child and Adolescent Version (BIQ-C; Veale, 2009) examines BDD symptoms including appearance checking, distress, avoidance, and impairment. The questionnaire begins with a screening item asking about the presence of any appearance concerns. If the participant does not report any concerns, they are given a total score of 0 and do not answer further items. Those with appearance concerns rank up to five body areas from most to least concerning. Twelve items then assess the nature and severity of appearance concerns, with varying response options scored 0–8. Current study internal consistency of the 12 symptom items α=0.88.

The child version of the 26-item Eating Attitudes Test (ChEAT-26; Maloney et al., 1988) measures disordered eating attitudes and behaviors. The least problematic responses (*never, rarely, sometimes*) are scored 0, the remaining responses scored as 1 (*often*), 2 (*very often*), or 3 (*always*). In the current study, internal consistency was α=0.87.

The Spence Children's Anxiety Scale (SCAS: Spence, 1998) contains 38 items assessing social anxiety, separation anxiety, generalized anxiety, panic-agoraphobia, obsessive-compulsive disorder, and physical injury fears, scored 0 (*never*) to 3 (*always*). Current study total scale internal consistency α=0.93.

The Short Mood and Feelings Questionnaire (SMFQ; Angold et al., 1995) assesses depression symptoms over the past two weeks. This 13 item measure is scored from 0 (*not true*) to 2 (*true*). Current study α=0.92.

A screening item was included to assess whether participants had ever received assessment or treatment for any mental health concerns. If so, they were asked to indicate the type of mental health professionals consulted (psychologist/psychiatrist/school counselor/other), and to briefly describe their reasons for seeking treatment.

2.2.2. Male participants

The drive for muscularity scale (DMS; McCreary and Sasse, 2000) is a 15 item measure of muscularity-driven behaviors and body image concerns from 1 (*never*) to 6 (*always*), the total score is the mean of all items. The item assessing anabolic steroid use was omitted. As muscularity concerns are linked primarily to body image dissatisfaction in males (McCreary, 2007), the DMS was administered to male participants only. Current study internal consistency α=0.93.

Due to differences in the design of the two larger studies, two additional measures were administered only at boys' schools. The

Strengths and Difficulties Questionnaire (SDQ; Goodman, 1997) measures emotional symptoms, conduct problems, hyperactivity and peer problems over 20 items, rated 0 (*not true*) to 2 (*certainly true*). A total difficulties score is the sum of these items, and in this study, internal consistency for male total difficulties was α=0.83. The internal consistency of the subscales was moderate but consistent with self-reported data in other Australian samples (Mellor, 2005); emotional symptoms α=0.74, conduct problems α=0.58, hyperactivity α=0.71 and peer problems α=0.57.

The Pediatric Quality of Life Enjoyment and Satisfaction Questionnaire (PQ-LES-Q; Endicott et al., 2006), uses 14 items to assess quality of life across physical, emotional and social domains. Items are scored from 1 (*very poor*) to 5 (*very good*), and the total score (range 14–70) is converted to the percentage of the maximum possible score (range 0–100%). Male internal consistency for the current study was α=0.92.

2.3. Statistical analyses

Analyses were performed using SPSS version 23. Pearson's chi-square was used for categorical variables, with Cramer's V or odds ratio as measures of effect size. Analysis of variance (ANOVA) was used to compare continuous variables between groups, with eta square effect size. Games-Howell pairwise comparisons were selected due to group size differences and unknown population variances (Field, 2013).

3. Results

Subthreshold-BDD was reported by 107 (3.4%) participants, probable-BDD by 55 (1.7%) participants, and non-BDD by 2987 (94.9%) participants. Table 1 presents the demographic characteristics of each group. Pairwise comparisons indicated that the probable-BDD group was significantly older than the non-BDD group, whereas the subthreshold-BDD group did not differ from either of the other groups with respect to age. Chi-square tests indicated that mother's cultural background also differed between groups; non-BDD participants more likely to report an Oceanian background whereas probable-BDD participants reported higher rates of 'other' cultural background and lower rates of Oceanian backgrounds. Finally, both the subthreshold and probable-BDD groups were more likely than non-BDD participants to live in an 'other' household type, which included step and blended families, and families with non-parent primary caregivers. There were no other differences between groups on demographic variables and no association between the school attended and BDD group membership; χ^2 (1, N =3149) =18.54, p=0.100, Cramer's V =0.05.

Comparisons of subthreshold-BDD prevalence across age and gender were conducted after excluding the 55 participants with probable-BDD (see Table 2). As hypothesized, subthreshold-BDD prevalence was higher in older adolescents than in younger adolescents. Contrary to expectations, prevalence was also elevated in female participants compared to males.

Table 3 presents the ANOVAs comparing quality of life and comorbid psychopathology between the subthreshold-BDD, probable-BDD and non-BDD groups. Subthreshold-BDD participants reported higher levels of all comorbid symptoms than non-BDD participants, except for eating disorder symptoms. Comparisons between subthreshold and probable-BDD participants were mixed. For the total sample, symptoms of BDD, depression and eating disorders were lower in the subthreshold-BDD group, whereas symptoms of anxiety did not differ between subthreshold and probable-BDD groups. In males, SDQ total difficulties and hyperactivity were lower in the subthreshold-BDD group than the probable-BDD group, whereas quality of life, muscularity concerns, and other SDQ subscales did not differ between these groups.

Table 1
Comparison of demographic characteristics between subthreshold-BDD, probable-BDD and non-BDD participants.

Variable	N	Subthreshold-BDD (*n*=107)	Probable-BDD[+] (*n*=55)	Non-BDD (*n*=2987)	F or χ^2	p	η^2 or Cramer's V
Age	3149	14.77 ± 1.40	15.04 ± 1.17	14.57 ± 1.37	4.15	0.016	0.00
ICSEA	3149	1098.96 ± 71.14	1089.15 ± 74.28	1092.33 ± 70.75	0.52	0.597	0.00
Sex (Male)	3149	58 (54.2)	35 (63.6)	1907 (63.8)	4.14	0.126	0.04
Speak English at home	2335	74 (90.2)	36 (90.0)	2021 (91.3)	0.20	0.906	0.01
Mother Cultural Background	2669				26.06	< 0.001	0.07
Oceanian		31 (31.6)	7 (15.2)	1047 (41.5)			
European		47 (48.0)	21 (45.7)	979 (38.8)			
Asian		16 (16.3)	9 (19.6)	323 (12.8)			
Other		4 (4.1)	9 (19.6)	176 (7.0)			
Father Cultural Background	2592				6.52	0.367	0.04
Oceanian		30 (31.6)	14 (31.1)	966 (39.4)			
European		47 (49.5)	24 (53.3)	1040 (42.4)			
Asian		14 (14.7)	4 (8.9)	278 (11.3)			
Other		4 (4.2)	3 (6.7)	168 (6.9)			
Occupation of Mother	2178				14.34	0.073	0.06
Not in the workforce		11 (14.3)	9 (23.7)	460 (22.3)			
Manager/skilled professional		45 (58.4)	21 (55.3)	962 (46.6)			
Trade/manual		2 (2.6)	0 (0.0)	80 (3.9)			
Sales/clerical		8 (10.4)	5 (13.2)	399 (19.3)			
Community/health		11 (14.3)	3 (13.2)	162 (7.9)			
Occupation of Father	2144				$	$	$
Not in the workforce		4 (5.4)	3 (8.1)	96 (4.7)			
Manager/skilled professional		45 (60.8)	20 (54.1)	1108 (54.5)			
Trade/manual		11 (14.9)	7 (18.9)	558 (27.4)			
Sales/clerical		8 (10.8)	6 (16.2)	149 (7.3)			
Community/health		6 (8.1)	1 (2.7)	122 (6.0)			
Household Type	2333				13.44	0.009	0.05
Two parent household		63 (78.6)	27 (67.5)	1766 (79.9)			
Single parent household		8 (9.8)	5 (12.5)	285 (12.9)			
Step/blended/other household		11 (13.4)	8 (14.5)	160 (7.2)			

Data are presented as mean ± standard deviation or *n* (valid %). $ Could not be calculated due to low expected cell counts.
Abbreviations. BDD=body dysmorphic disorder. ICSEA=Index of Community Socio-educational advantage.
[+] Data have been reported elsewhere.

Table 2

Prevalence of subthreshold body dysmorphic disorder by age and sex.

Group	N	Subthreshold-BDD		Non-BDD		χ^2	p	Odds Ratio	95% CI
		n (%)	95% CI	n (%)	95% CI				
Total	3094	107 (3.4)	2.8, 4.1	2987 (94.9)	64.0, 95.6				
Age						4.47	0.035	1.53	1.03, 2.27
12–14 years	1496	41 (2.7)	2.0, 3.7	1455 (96.2)	95.2, 97.1				
15–18 years	1598	66 (4.0)	3.2, 5.1	1532 (93.6)	92.3, 94.7				
Sex						4.14	0.042	1.49	1.01, 2.20
Male	1965	58 (2.9)	2.2. 3.7	1907 (95.4)	94.3, 96.2				
Female	1129	49 (4.3)	3.2, 5.6	1080 (94.0)	92.5, 95.2				

Notes: Probable-BDD participants were excluded from these analyses BDD=body dysmorphic disorder. CI=Confidence interval.

Table 3

Comparison of Symptom Severity and Quality of Life between Probable-BDD, Subthreshold-BDD and Non-BDD groups.

Measure	N	Subthreshold-BDD	Probable-BDD[+]	Non-BDD	ANOVA
All Participants	3149				
BDD Symptoms	3057	35.74 ± 14.79	**46.53 ± 15.92**	**13.97 ± 18.37**	$F_{(2, 91.31)}$§=141.83, $p < 0.001$, η^2=0.09
Depression Symptoms	3146	9.97 ± 5.76	**12.69 ± 6.52**	**5.28 ± 5.50**	$F_{(2, 3143)}$=83.55, $p < 0.001$, η^2=0.05
SCAS Total Anxiety Symptoms	3146	34.06 ± 15.54	37.69 ± 15.07	**22.68 ± 15.72**	$F_{(2, 3143)}$=50.44, $p < 0.001$, η^2=0.03
SCAS Panic/Agoraphobia Symptoms	3146	4.66 ± 4.45	6.15 ± 5.03	**2.66 ± 3.77**	$F_{(2, 98.33)}$§=23.13, $p < 0.001$, η^2=0.02
SCAS Separation Anxiety Symptoms	3146	3.36 ± 2.59	3.36 ± 2.24	**2.32 ± 2.45**	$F_{(2, 3143)}$=13.73, $p < 0.001$, η^2=0.01
SCAS Social Phobia Symptoms	3146	8.68 ± 3.53	9.38 ± 3.24	**5.85 ± 3.67**	$F_{(2, 3143)}$=54.46, $p < 0.001$, η^2=0.03
SCAS Physical Injury Symptoms	3146	3.51 ± 2.63	3.67 ± 2.40	**2.70 ± 2.39**	$F_{(2, 3143)}$=10.05, $p < 0.001$, η^2=0.01
SCAS Generalised Anxiety	3146	8.48 ± 3.91	8.67 ± 3.64	**5.41 ± 3.48**	$F_{(2, 3,143)}$ = 61.54, $p < .001$, $\eta2$ =.04
SCAS Obsessive-Compulsive Symptoms	3146	5.37 ± 3.43	6.44 ± 3.69	**3.73 ± 3.43**	$F_{(2, 3143)}$=27.90, $p < 0.001$, η^2=0.02
Eating Disorder Symptoms	2940	8.33 ± 6.39	**11.94 ± 8.13**	8.39 ± 9.67	$F_{(2, 90.92)}$§=3.33 p=0.036, η^2=0.00
Male Participants Only	2000				
SDQ Total Difficulties	1994	14.28 ± 6.15	**17.49 ± 5.04**	**8.90 ± 5.60**	$F_{(2, 1991)}$=64.59, $p < 0.001$, η^2=0.06
SDQ Emotional Symptoms	1994	3.84 ± 2.35	**4.80 ± 2.00**	**1.75 ± 1.96**	$F_{(2, 58.92)}$§=60.81, $p < 0.001$, η^2=0.07
SDQ Conduct Problems	1994	3.03 ± 2.26	3.37 ± 2.05	**1.94 ± 1.71**	$F_{(2, 58.44)}$§=14.75, $p < 0.001$, η^2=0.02
SDQ Hyperactivity	1994	4.50 ± 2.35	**5.69 ± 2.26**	**3.47 ± 2.24**	$F_{(2, 1991)}$=22.17, $p < 0.001$, η^2=0.02
SDQ Peer Problems	1994	2.90 ± 2.02	3.63 ± 2.05	**1.74 ± 1.65**	$F_{(2,58.48)}$§=23.32, $p < 0.001$, η^2=0.03
Muscularity Concerns	1929	3.17 ± 1.01	3.46 ± 1.21	**2.41 ± 1.11**	$F_{(2, 1926)}$=26.40, $p < 0.001$, η^2=0.03
Quality of Life	1709	64.11 ± 18.57	54.40 ± 18.91	**76.07 ± 16.32**	$F_{(2, 1706)}$=33.96, $p < 0.001$, η^2=0.04

Note. Bold text indicates a significant pairwise comparison to the subthreshold-BDD group.

Data are presented as mean ± standard deviation. §Welch's Adjusted F reported. [+]Data have been reported elsewhere.

Abbreviations: BDD=body dysmorphic disorder. SCAS=Spence Children's Anxiety Scale. SDQ=Strengths and Difficulties Questionnaire.

Comparisons between groups on each measure were repeated controlling for age, mothers' cultural background, family setting, and sex (where applicable). Due to missing data on some items, these analyses included 2206 participants (70.1% of the sample). In this subset of participants, BDD group remained a significant predictor in these models with little change in partial eta squared, except for eating disorder symptoms, which were no longer predicted by BDD group (details available from the corresponding author upon request),

Mental health service use was more common in subthreshold-BDD (24.7%) than non-BDD participants (14.7%), χ^2 (1, N =2555) =10.56, p=0.001, odds ratio =1.90 (95% CI: [1.28, 2.81]), but less common in subthreshold-BDD participants (24.7%) than in probable-BDD (45.8%), χ^2 (1, N =229) =10.80, p=0.001, odds ratio =2.58 (95% CI: [1.46, 4.58]).

4. Discussion

The current study aimed to establish the prevalence and relative severity of subthreshold-BDD in a community sample of adolescents. The prevalence of subthreshold-BDD (3.4%) was twice as high as the prevalence of probable-BDD observed in a previous study of this sample (1.7%; Schneider et al., 2016). As hypothesized, subthreshold BDD prevalence was significantly higher in older adolescents (15–18 years) compared to younger adolescents (12–14 years). This is consistent with adult reports that the mean age of BDD onset is 16 years, and BDD symptoms are usually present from the age of 13 (Phillips et al., 2005). Contrary to hypotheses, subthreshold-BDD was

significantly more prevalent in females than in males. Though studies of the prevalence of full-syndrome BDD often fail to find significant sex differences (Buhlmann et al., 2010; Koran et al., 2008; Mayville et al., 1999; Rief et al., 2006; Schneider et al., 2016), higher female prevalence has been reported in adult samples (Boroughs et al., 2010; Schieber et al., 2015), and females were overrepresented in a study of adolescents at high risk for BDD (Mastro et al., 2016).

Subthreshold-BDD was associated with increased past mental health service use, and higher symptoms of anxiety, depression, and obsessive-compulsive symptoms compared to non-BDD. The male-only measures followed the same pattern; quality of life impairment, emotional symptoms, conduct problems, hyperactivity, peer problems, and muscularity concerns were higher in the subthreshold-BDD group than the non-BDD group. The only exception was eating disorder symptoms, which did not differ between subthreshold-BDD and non-BDD participants. This finding may reflect, in part, the use of the BDDQ-A, as this measure excludes individuals with primary weight concerns from the subthreshold-BDD and probable-BDD groups (Phillips, 2005).

Contrary to hypotheses, the severity of some comorbid symptoms did not differ significantly between subthreshold and probable-BDD groups. There was no difference in any anxiety symptoms, and in males, no difference in emotional symptoms, conduct problems, peer problems, muscularity concerns, or quality of life. However, compared to probable-BDD, subthreshold-BDD was associated with relatively lower use of mental health services, lower symptoms of BDD, depression, and eating disorders, and, in males, lower SDQ total difficulties

and hyperactivity. Subthreshold and probable-BDD presentations were similar in several important disorder correlates, but probable-BDD was associated with increased difficulties in some domains.

The current findings indicate that distressing or impairing BDD concerns that do not meet full criteria for BDD are more common in females than in males, and in older adolescents than younger adolescents. The association between subthreshold BDD in adolescents and increased impairment and comorbidity, albeit less severe than that associated with probable-BDD on some measures, is consistent with findings from studies of other subthreshold disorders (for example, depression and anxiety; Balázs et al., 2013), and from a study of those at moderate risk of BDD (Mastro et al., 2016). Taken together, this suggests that subthreshold-BDD does not represent a normal level of appearance concern, and that early intervention for BDD should include the identification of subthreshold presentations.

The detection of subthreshold-BDD in adolescence may open new pathways for BDD treatment, as adult research indicates that subthreshold-BDD symptoms may respond to non-BDD focused treatments such as attentional retraining or cognitive behavioral therapy for social anxiety (Fang et al., 2013). Additionally, internet-delivered CBT with minimal therapist support is an effective treatment for those with milder BDD presentations (Enander et al., 2016). Low-intensity treatments for subthreshold or mild BDD in adolescence may be beneficial both in increasing the availability of low cost treatment at the early stages of the disorder and in preventing the escalation of subthreshold-BDD into a full-syndrome presentation.

Some limitations to the current study should be acknowledged. The study included a relatively large sample size; however participants were primarily from non-government schools with relatively high levels of socio-educational advantage. Further research is required to examine subthreshold-BDD in less advantaged groups, and in countries other than Australia. ANCOVA analyses controlling for demographic differences between groups generally found similar results to the group ANOVA analyses, but approximately 30% of the sample were not included in these analyses due to missing responses to one or more demographic items. The association of demographic factors to BDD should be explored more thoroughly in future studies. Though the adult version of the BDDQ-A has good sensitivity and specificity (Grant et al., 2001), this has not been established in adolescents. There is a strong correspondence between BDD prevalence estimates using *DSM IV* and *DSM 5* criteria (Schieber et al., 2015), but future studies should directly evaluate the effect of *DSM 5* criteria on adolescent BDD prevalence. Female participants did not complete certain measures due to differences in larger study methods for males and females. The association of subthreshold-BDD and quality of life and emotional, conduct and peer problems in females requires examination in future research. It would be valuable to study the initial emergence of subthreshold BDD in longitudinal research to accurately determine the typical age of onset, the stability of these symptoms, and the risk of escalation into probable-BDD. Finally, this study defined subthreshold BDD based on a general definition of a subthreshold disorder, and utilizing available BDD measures. Future studies should establish a theoretically and empirically supported definition of subthreshold BDD that can be used across research studies and measurement tools, as a lack of consistent definitions has complicated research into other subthreshold disorders (Bertha and Balázs, 2013).

In conclusion, subthreshold-BDD in adolescence is associated with increased mental health service use, greater comorbid psychopathology, and in males, with reduced quality of life, though to a lesser extent than probable-BDD for some measures. The correlational nature of this study does not allow for causal inferences, so longitudinal research is greatly needed to establish the impact of subthreshold BDD in adolescence. Future studies should also seek to validate a common definition of subthreshold-BDD, to explore prevalence in other samples, and to evaluate the potential of early intervention for subthreshold-BDD to alter the course or reduce the severity of BDD presentations.

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