

Introduction

Individuals with Body Dysmorphic Disorder (BDD) exhibit significant distress, preoccupation, and compulsive behaviors (e.g., excessive grooming) related to imagined or slight appearance defects. BDD has been associated with significant impairment, including school dropout, poor social engagement, and suicidal ideation and attempts (Albertini & Phillips, 1999). BDD typically onsets during adolescence (Phillips, Menard, Fay, & Weisberg, 2005), and the cognitive behavioral model (CBM) of BDD (Veale, 2004) has proposed that childhood stress exposure is a key risk factor for onset. Yet, there has been little prospective research on this stress exposure hypothesis (Cole et al., 2006), whereby stress exposure is a precursor of adolescents' BDD symptoms. It is known that BDD sufferers recall a great deal of interpersonal stress, including appearance teasing, and they recall victimization experiences as more vivid and traumatic than healthy controls (Buhlmann et al., 2011). Adults with BDD retrospectively report higher rates of abuse compared to individuals with obsessive-compulsive disorder (Neziroglu, Khemlani-Patel, & Yaryura-Tobias, 2006) and healthy controls (Buhlmann, Marques, & Wilhelm, 2012). Notably, these studies included, but were not limited to adolescents, as little research (except for case reports) has focused on adolescent BDD (Dyl, Kittler, Phillips, & Hunt, 2006).

Inspired by the stress generation model of depression (Hammen, 1992), here we considered whether there might be evidence that BDD could result in stress generation. In stress generation models, individuals contribute to their environmental stress by inadvertently perpetuating social adversity through their beliefs or behavior. Stress generation has been supported in research on depression and social anxiety (Cole et al. 2006; Conway, Hammen, & Brennan, 2012; Zimmer-Gembeck & Skinner, 2015), whereby individuals with depression or

social anxiety report higher rates of stressful events that are considered dependent on the individual or more controllable (e.g., interpersonal stressors), but do not report higher rates of uncontrollable events (Rudolph et al., 2000). Those with more depressive symptomology seem to exhibit impairments that undermine effective engagement in the social environment (Rudolph et al., 2000; Zimmer-Gembeck, 2015). Similarly, in an attempt to avoid or obtain relief from the distress about appearance defects (which leads to compulsive engagement in checking, grooming, and concealment), individuals with BDD report withdrawing from social situations and people (Fang & Wilhelm, 2015). There is extensive evidence of the social and occupational impairment associated with BDD, including one prospective study which showed that among adolescents and adults diagnosed with BDD, functional impairment remained steadily low over three years (Phillips, Quinn, & Stout, 2008). Accordingly, the present study examined whether adolescents' symptomology of BDD predicted declines in social functioning, suggestive of increasing social stress, over 12 months. Given the adolescent onset of BDD, and that potential sufferers may show elevated symptoms prior to full onset of BDD (Veale, 2004), our aim was to assess a community sample of early adolescents in order to evaluate social risk factors for symptoms associated with BDD during a developmental period when symptoms typically emerge, as well as to assess social functioning over 12 months.

We utilized both self- and peer-reported indicators of social stress exposure in this study, because BDD sufferers have been found to demonstrate biased processing of social information, which might affect their reports of stress exposure. For example, adults with BDD misinterpret ambiguous situations as threatening (Buhlmann et al., 2002) and misidentify others' neutral expressions as contemptuous or angry in self-referent scenarios (Buhlmann, Etcoff, & Wilhelm, 2006). Also, in one cross-sectional study, adolescents who reported higher levels of BDD

symptoms also reported more frequent peer appearance teasing, but BDD symptom level was not associated with peer-reported victimization (Webb et al., 2015).

Participant Sex

The prevalence of BDD has been described in a review as being ‘roughly similar’ in adult men and women, yet some studies show higher rates among women (Fang & Wilhelm, 2015). Notably, our previous study of early adolescents found no significant differences between boys and girls in concurrent associations between BDD symptoms and self- or peer-reported victimization (Webb et al., 2015). Similarly, in a study of 200 adults with BDD, no significant difference was found in social and functional impairment across many domains (e.g., social and occupational, quality of life). However, men with BDD showed significantly greater impairment in a few areas, including being more likely to be out of work due to psychopathology and receiving a disability pension, and being rated lower on global functioning (Phillips et al., 2006). More generally, in a community sample, adolescent boys, relative to girls, showed stronger associations between elevated symptoms of anxiety and depression and declines in social and emotional functioning over time (Derdikman-Eiron et al., 2011). Accordingly, sex differences in the stress exposure and stress generation hypotheses was examined, and stronger associations between BDD symptoms and later social impairment were anticipated for boys than girls.

Current Study

We focused on a community sample of early adolescents to enable assessment of social risk factors for symptoms characteristic of BDD during the developmental period when symptoms typically emerge. We tested a conjoint longitudinal model of stress exposure and stress generation linking symptoms characteristic of BDD and social functioning (self-reported peer acceptance, and peer-reported social acceptance, popularity, and general victimization),

which permitted simultaneous assessment of whether (1) indicators of stress exposure (e.g., low acceptance, high victimization) predicted an increase in BDD-like symptoms 12 months later, and; (2) BDD-like symptoms predicted an increase in social stress over time. Sex differences were also assessed.

Method

Participants

Participants were 367 (55.5% girls) Australian students in grades 5 (27%), 6 (31%), or 7 (42%) who participated in two waves of a longitudinal study with a 12-month lag between assessments. All students attended one of three participating schools. Participants were 9 to 14 years ($M_{\text{age}} = 12.01$, $SD = 0.91$), and were predominantly White/Caucasian (79%) or Asian (15%).

Measures

BDD symptoms. Examining a community sample of adolescents was vital in order to assess potential sufferers prior to or during the onset of BDD symptoms. It was not, therefore, anticipated that a significant proportion of participants would be experiencing clinical symptom levels. Given this and the large sample assessed, the 10-item Appearance Anxiety Inventory (AAI; Veale et al., 2014) was utilized to measure symptoms associated with BDD. Items were reflective of BDD symptoms as described in the Diagnostic and Statistical Manual of Mental Disorders (*DSM-5*), including obsessional thoughts and repeated behaviors. An example item is: “I check my appearance (e.g., in mirrors, with photos)”. Participants indicated the frequency of symptoms (0 = *Never*, 4 = *Always or almost always*). The total score was computed by summing all items (Cronbach’s α at T1 was .92 for girls, .83 for boys). Veale et al. (2014) calculated a median score of 27 (IQR = 12) for a sample of adult BDD sufferers and a median score of 13

(IQR = 13.5) for an adult community sample. In the present study the median score was 6.25 (IQR = 10) at T1 and 6.00 (IQR = 10) at T2. At T1, 33 adolescents (14% of girls, 2% of boys) showed elevated symptomology (≥ 20 ; midway between the median of the BDD and community samples). At T2, 35 adolescents (15% of girls, 3% of boys) showed elevated symptomology. The AAI has previously been used with an adolescent community sample (Cronbach's α was .94 for girls, .83 for boys; Webb et al., 2015).

Self-reported peer acceptance. Peer acceptance was assessed with one item: "How much do you feel that other kids in your school like you?" (1 = *Not at all*, 5 = *Very much*).

Peer-reported acceptance, popularity, and victimization. To measure peer-reported acceptance, each participant rated how much s/he liked each of their classmates (1 = *Not at all*, 5 = *Very much*). Classmates' responses were averaged to form a peer-reported acceptance score for each participant.

A widely-used peer-nomination procedure was used to assess popularity and victimization. From a list of all students in the same grade, each participant nominated up to 10 grademates that were "the most popular". Students nominated up to three grademates who best fit 5 behavioral descriptors of victimization (e.g., "Who is made fun of by others"; Crick & Grotpeter, 1995). For each participant, nominations received for popularity and for victimization were summed and standardized within grades to adjust for unequal grade sizes.

Procedure

The present study was drawn from waves 1 and 3 of a larger longitudinal study on appearance concerns. Study approval from the university Human Research Ethics Committee was obtained and local schools were contacted. The first three consenting schools were permitted to participate, and parental consent was obtained. A party was awarded to the class within each

grade, at each school, that returned the most forms (regardless of parental consent to participate). Some parents (16%) declined participation and others (42%) failed to return forms. Participants completed paper-and-pencil surveys at school and, to ensure confidentiality, researchers monitored participants, ensured an empty seat between each child, and used ID codes instead of names.

Overview of Analyses

To manage missing data, multiple imputation was used to estimate 10 imputed datasets, and pooled results are reported. The proposed cross-lagged path model was tested using full-information maximum likelihood estimation within AMOS software (IBM Corporation). The cross-lagged model was calculated to test hypotheses pertaining to the prospective prediction of self- and peer-reported indicators of social functioning at T2 relative to T1 from T1 BDD-like symptoms, and to simultaneously test the converse associations. T1 age was included as a covariate and significant associations between measures at each time point were freed. Multiple group models were fit to identify sex differences in cross-lag paths between social functioning measures and BDD.

Results

Table 1 presents *Ms*, *SEs*, *t*-tests results (Bonferroni-corrected), and correlations between measures for boys and girls. Girls reported significantly higher BDD symptoms and boys were rated as significantly less well liked by peers at T1.

Cross-Lagged SEM Model

The cross-lagged model had a good fit to the data, $\chi^2(6, N = 367) = 4.55, p = .60, CFI = 1.00, RMSEA = <.01$ (90% *CI* = .000-.058), and explained 38.8% of the variance in BDD symptoms, 26.5% of self-reported peer acceptance, 34.2% of peer-reported acceptance, 72.2% of

popularity, and 56.7% of victimization at T2. As per Figure 1, T1 BDD symptoms were associated with lower self-reported acceptance at T2 relative to T1. Second, T1 peer-reported victimization showed a significant positive association with BDD symptoms at T2 relative to T1. Age was associated with increased BDD symptoms at T2. Multiple group SEM showed that the model fits did not significantly differ when cross-lagged paths were unconstrained (i.e., allowed to differ) between boys and girls, compared to when sex-equality constraints were applied to all paths, $\chi^2_{\text{diff}}(30, N = 367) = 34.51, p = .26$. This suggests that the pathways from T1 to T2 measures did not significantly differ between boys and girls.

Discussion

Our results provide the first support for the notion that greater exposure to social adversity, in particular, experiences of victimization, including being ignored, excluded, made fun of, and gossiped about by peers, poses a risk for the escalation of symptoms characteristic of BDD over 12 months in a community sample of young adolescents.

Notably, it was the more adverse and salient social experience of peer victimization that posed the unique risk for increasing BDD symptoms, rather than low levels of peer acceptance or popularity. These findings accord with previous studies, which have shown that BDD sufferers, compared to healthy controls, recall more experiences of peer teasing, remember teasing as more vivid and traumatic, and report higher rates of abuse (Buhlmann et al., 2007, 2011, 2012). Here, peers were the informants about who was more victimized; thus this finding cannot be attributed to biased social and emotional processing seen in BDD (Buhlmann et al., 2002), and provides preliminary corroborating evidence for elevated social adversity among individuals experiencing symptoms characteristic of BDD.

Previous research also describes significant disruptions to social functioning found among BDD sufferers (e.g., Albertini & Phillips, 1999). We proposed that these observations could be explained in part by a stress generation model, whereby individuals with more BDD symptoms seek relief from appearance-related distress and compulsive behaviors through withdrawal, and in this way, may self-perpetuate impairments in social functioning. Some support for this hypothesis was found: adolescents with elevated symptoms characteristic of BDD reported more negative perceptions of peer acceptance over time. Conversely, we did not find that symptoms were predictive of declines in peer-reported social functioning, which accords with our previous study that found BDD symptoms to be associated with self-reported peer appearance teasing, but not peer-reported general victimization (Webb et al., 2015), and it may be that these results reflect an increasingly negative bias in perceptions of social functioning as BDD symptoms worsen. Alternatively, it could also be that there was insufficient time and/or severity of BDD symptoms in a community sample for declines in social functioning to become apparent to peers. Future research would benefit from additional follow-up assessments to detect longer-term changes.

Symptoms associated with BDD were higher among girls than boys, but we found no support for the hypothesized stronger association of symptoms with boys', compared to girls', social impairment. Notably, women tend to report earlier onset of BDD (Bjornsson et al., 2013), perhaps partially explaining the lower level of symptoms recorded among boys in our adolescent sample, and the lower median score compared to an adult community sample (Veale, 2013). Also, the finding of no significant sex differences in cross-lag effects corresponds with our previous study of young adolescents, whereby concurrent associations of BDD symptoms with peer victimization did not differ between boys and girls (Webb et al., 2015). It may be that social

impairments become more pronounced among boys compared to girls beyond adolescence, when appearance concerns may be perceived as less acceptable among boys.

Given our focus on a large community sample of adolescents, the AAI (Veale et al., 2014) was used to measure symptoms associated with BDD. However, including no clinical diagnostic assessment of each participant was a limitation. Including a measure of distress or impairment associated with appearance concerns, and validation of the AAI as a diagnostic measure among adolescents would be advantageous for future research, given its ease of use. A second limitation is the inclusion of a limited set of measures pertinent to social functioning, including single-item self-reported acceptance (due to the size of the overarching study). Future research could include additional measures (e.g., social avoidance). Finally, the generalizability of results may have been adversely affected by the relatively low response rate.

To conclude, these results provide preliminary support for a bidirectional social stress model of BDD symptoms in adolescents. BDD symptoms are an outcome of social adversity (i.e., victimization) at the same time that elevated BDD symptoms interfere with positive perceptions of peer relationships. These perceptions may ultimately result in declining social engagement and accumulation of symptoms and psychopathology over time.

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Table 1*Correlations between All Variables for Boys Separate from Girls, and Ms, SEs and t-tests Comparing Boys and Girls*

<i>Variables</i>	1	2	3	4	5	6	7	8	9	10	11
1. BDD symptoms T1	-	.51**	-.18*	-.18*	-.11	-.09	.04	.06	.12	.21**	.20*
2. BDD symptoms T2	.59**	-	-.12	-.14	-.06	-.15	.04	.04	.06	.21**	.26**
3. Self-reported acc T1	-.19**	-.17*	-	.46**	.21**	.13	.10	.09	-.33**	-.27**	-.13
4. Self-reported acc T2	-.34**	-.24**	.33**	-	.34**	.17*	.10	.10	-.36**	-.27**	-.10
5. Peer-reported acc T1	-.08	.02	.18*	.31**	-	.58**	.15	.13	-.47**	-.41**	.15
6. Peer-reported acc T2	-.15*	-.03	.16*	.28**	.54**	-	.13	.14	-.37**	-.30**	.08
7. Popularity T1	-.06	-.05	.17*	.24**	.23**	.25**	-	.83**	-.12	-.17*	.03
8. Popularity T2	-.06	-.06	.17*	.22**	.20**	.24**	.87**	-	-.06	-.13	.12
9. Relational vict T1	.08	.16*	-.12	-.23**	-.47**	-.31**	-.01	-.01	-	.73**	-.02
10. Relational vict T2	.12	.08	-.08	-.19**	-.41**	-.42**	-.12	-.09	.78**	-	.04
11. Age	.15*	.21**	-.12	-.01	.27**	.04	.07	.07	-.08	-.11	-
Boys, <i>M</i>	5.96	5.64	3.50	3.52	3.13	3.03	-0.08	-0.10	-0.05	-0.07	12.01
Boys, (<i>SE</i>)	(.40)	(.45)	(.08)	(.07)	(.05)	(.05)	(.07)	(.07)	(.06)	(.08)	(.07)
Girls, <i>M</i>	10.29	9.92	3.45	3.46	3.34	3.21	-0.04	-0.12	-0.03	-0.15	11.98
Girls, (<i>SE</i>)	(.59)	(.59)	(.07)	(.07)	(.04)	(.05)	(.06)	(.06)	(.07)	(.06)	(.06)
Boys vs. Girls, <i>t</i> (365)	-5.83**	-5.61**	0.55	0.58	-3.30*	-2.57	-0.42	0.16	0.25	0.83	0.32
Cohen's <i>d</i>	0.61	0.59	0.06	0.06	0.35	0.27	0.04	0.02	0.03	0.09	0.03

Note. Correlations above the diagonal are for boys ($n = 167$), and those below the diagonal are for girls ($n = 200$). T1 = time 1. T2 = time 2. acc = acceptance. vict = victimization.

Correlations: * $p < .05$. ** $p < .01$.

t-tests are Bonferroni-corrected: * $p < .005$. ** $p < .001$

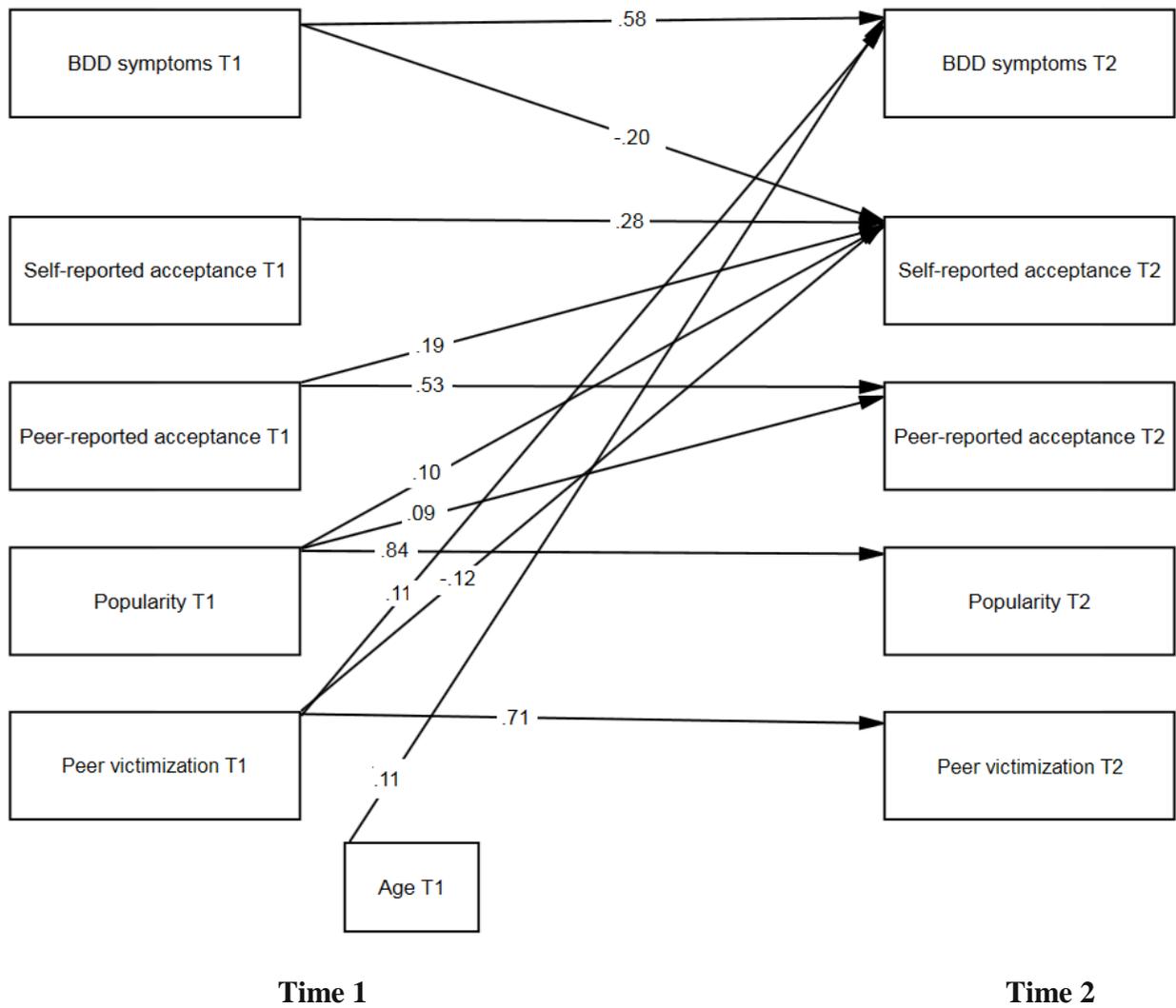


Figure 1. Results of the cross-lag model of BDD symptoms and peer social functioning ($N = 367$).

Note. Only significant ($p < .05$) standardized paths are shown.