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A Cascade of Rejection and Appearance Preoccupation: Adolescents' Body Dysmorphic Symptoms and Appearance Rejection Sensitivity over Four Years

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Abbreviations

BDS = body dysmorphic symptoms
ARS = appearance-based rejection sensitivity

Abstract

Adolescence is a high-risk period for body image disturbance and appearance concerns. In a cascade model, we examined interrelations of body dysmorphic symptoms (BDS) with appearance-rejection sensitivity (ARS), and tested gender moderation. Participants were 397 Australian adolescents (T1 Mage = 11.7, SD = 0.91; 56% girls) who completed six surveys over four years. In a random-intercept cross-lag model, two (of five possible) paths showed ARS predicted higher subsequent BDS, and three (of five possible) paths showed BDS predicted higher subsequent ARS. Girls reported more BDS and ARS than boys, and random intercepts of BDS and ARS were correlated with the correlation stronger in girls than boys. Cross lag BDD-ARS associations over the six waves were not significantly moderated by gender. Overall, girls are at higher risk of appearance concerns than boys, but BDD-ARS cascade effects do not differ between girls and boys.

Keywords: body image; appearance anxiety; body dysmorphia; rejection sensitivity; gender; adolescents

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Abstract

Adolescence is a high-risk period for body image disturbance and appearance concerns. In a cascade model, we examined interrelations of body dysmorphic symptoms (BDS) with appearance-rejection sensitivity (ARS), and tested gender moderation. Participants were 397 Australian adolescents (T1 Mage = 11.7, SD = 0.91; 56% girls) who completed six surveys over four years. In a random-intercept cross-lag model, two (of five possible) paths showed ARS predicted higher subsequent BDS, and three (of five possible) paths showed BDS predicted higher subsequent ARS. Girls reported more BDS and ARS than boys, and random intercepts of BDS and ARS were strongly correlated, with the correlation stronger in girls than boys. Cascading BDS-ARS associations over the six waves were not significantly moderated by gender. Overall, girls are at higher risk of appearance concerns than boys, but cascading BDS-ARS associations do not differ between girls and boys.

Keywords: body image; appearance anxiety; body dysmorphia; rejection sensitivity; gender; adolescents

Introduction

Body dysmorphic symptoms (BDS), characterized by anxious preoccupation with perceived physical deficits involving intrusive, delusional thoughts about appearance, as well as impairing, time-consuming repetitive behaviors (American Psychiatric Association, 2013), usually emerge for the first time in early adolescence (Bjornsson et al., 2013; Kelly & Phillips, 2017). High levels of BDS are not uncommon during adolescence, with prevalence rates of 5.1% (adolescents; Schneider, 2017b), 9% (young adolescents; Mastro et al., 2016) and even 15.9% (late teens and young adults; Weingarden & Renshaw, 2016) reported. Furthermore, BDS have been associated with an increased risk of developing full-syndrome body dysmorphic disorder (Shankman et al., 2009).

Developmental cascade models are useful for (a) identifying patterns of emerging risk for psychopathology and (b) providing a foundation for effective design of therapeutic and clinical interventions for youth (Masten & Cicchetti, 2010). In the present study we test a cascade model of BDS, considering how it may predict expectations of negative social interactions, which in turn result in more BDS. More specifically, the aim was to identify how BDS cascades into biased expectations of rejection by others, with biased expectations measured as appearance-based rejection sensitivity (ARS). To date, there has been no study of developmental cascades of BDS and ARS progression during adolescence.

Body Dysmorphic Symptoms and Appearance Rejection Sensitivity

Theory and definitions. The most widely cited perspective on the developmental origins of clinical body dysmorphic disorder is derived from a cognitive behavioral model (Buhlmann & Wilhelm, 2004; Neziroglu et al., 2008, 2018; Veale, 2004). This theory posits a route from a fear of negative social evaluation to the development of body dysmorphic disorder via appearance-

related anxieties, sensitivities and preoccupations. Despite the identification of fears of negative social evaluation in the cognitive behavioral model of body dysmorphia, research derived from this model has rarely focused on expectations and concerns about negative social evaluation from others in risk factor studies. However, expectations and fears are the specific focus of research on ARS. ARS, derived from Downey and Feldman's (1996; Downey et al., 1998) general model of rejection sensitivity, is defined as readily perceiving, anxiously expecting, and overreacting to social cues of real or implied appearance-based social rejection (Bowker et al., 2013; Park, 2007). Although related to ARS, body dissatisfaction has been described as negative thoughts and feelings about the body more specifically and does not directly consider appearance-related social concerns (Grogan, 2007). Also, ARS tends to have nonsignificant or weak associations with adolescents' body size and physical attractiveness (Webb et al., 2017; Webb & Zimmer-Gembeck, 2015, 2016), whereas body dissatisfaction more strongly positively covaries with body size (Presnell et al., 2004).

Evidence also exists for the unique role of ARS over and above general rejection sensitivity in BDS and clinical body dysmorphic disorder. For example, in studies of university students, ARS was positively associated with BDS even after controlling for levels of general rejection sensitivity (Calogero et al., 2010; Park et al., 2010). Furthermore, individuals with body dysmorphic disorder report higher levels of anxiety regarding the negative evaluation by others of their appearance, their perception of their own appearance and perceptions of others' appearance, and they report avoidance of social situations because they fear their appearance will be judged negatively (Anson et al., 2012; Kelly et al., 2014).

Cascading associations of BDS and ARS. Several studies of adolescents, university students and adults reinforce the association between BDS and ARS. For example, in research

analyzing data from the first wave of the present study, ARS and BDS were associated cross-sectionally (Densham et al. 2017; Mastro et al., 2016) and, across the first two waves of this study, BDS was associated with declining perceptions of social acceptance by peers over a 6-month period of time (Webb et al., 2016). In other research, ARS was associated with BDS in university students (Park et al., 2010), and ARS fully mediated the relationship between adverse appearance-related experiences and BDS in a cross-sectional study of university students (Lavell et al., 2014). Moreover, a meta-analysis reported associations of rejection sensitivity with five mental health outcomes, finding that the association of rejection sensitivity with BDS was the strongest (Gao et al., 2017).

Although untested to date, theory and past research suggest that there may be cascading effects of BDS and ARS over multiple points in time. In such a cascade model, heightened appearance-related concerns about social rejection would be expected to predict increasing BDS at the same time that BDS would predict increasing ARS. First, regarding ARS as a predictor of BDS, engaging in the protective and camouflaging behaviors indicative of BDS could be a response to the appearance-related social concerns and distress that define high ARS. As others have described (Veale, 2004), BDS may be a "safety", protective or compensatory response that is motivated by the need to avoid or minimize expected social rejection. More specifically, social experiences that involve real or imagined appearance-based rejection may create cognitive and interpretative biases and compel BDS safety behaviors, such as social avoidance, escape, checking, seeking reassurance, and camouflaging or concealment of appearance.

Second, regarding BDS as a predictor of ARS, BDS may also maintain or amplify ARS progressively over time because the rumination, worries and "safety" behaviors of BDS would only lead to more ARS. Instead of providing safety, the behaviors consistent with BDS would

serve to draw greater negative attention to appearance resulting in even more appearance-related concerns and expectations of social rejection because of appearance. Thus, a developmental cascade would be expected across several time points, evidenced by associations from ARS to later BDS and from BDS to later ARS. In the present study, we expected to find positive bidirectional associations (i.e., a mutually amplifying relationship or developmental cascade; Masten & Cicchetti, 2010) between BDS and ARS over time.

Gender Differences

Given the known imbalance in appearance concerns between girls and boys (Presnell et al., 2004; Ricciardelli & Yager, 2015; Webb et al. 2014), we expected that there would be important differences by gender in the present study. Research has found a higher level of BDS and ARS in adolescent girls relative to boys (Bjornsson et al., 2013; Enander et al., 2018; Veale et al., 2016). These gender differences were confirmed when analyzing the first wave of data collected as part of the current study (Densham et al., 2017; Mastro et al., 2016; Webb et al., 2016) and in later waves (Webb et al., 2017; Zimmer-Gembeck et al., 2018). For example, in one of our past studies examining growth in BDS, girls reported higher BDS across the age range of 10 to 15 years than boys (Zimmer-Gembeck et al., 2018). It should be acknowledged, however, that several studies have reported no gender difference in BDS (Schneider et al., 2017a, 2017b).

Gender moderation of predictors of BDS or ARS is also important to examine. However, despite evidence supporting gender differences in the levels of BDS and ARS, the association between BDS and ARS, and their associations with other constructs, has not been found to differ by gender in multiple studies (Schneider et al., 2017a; Webb et al., 2014). We also found no gender moderation of the association of BDS with ARS in a study we conducted with the first wave of data from the present study (Densham et al., 2017)

The Present Study

In summary, this is the first multi-wave longitudinal study investigating whether ARS and BDS have a mutually amplifying association, appearing as a developmental cascade of social and cognitive impairment related to appearance concerns. In this study, we expected that adolescents higher in ARS at one wave would be higher in BDS by the next wave, and that the reverse positive amplification effect would also be found. These cascading associations between BDS and ARS were examined across six waves of data spanning the early to middle years of adolescence (four years). This age period is an important risk period for BDS and ARS; research has identified the early teenage years as the time when BDS first emerges among the most at-risk youth (Bjornsson et al., 2013; Kelly & Phillips, 2017) and body image and a range of other appearance concerns are known to onset in late childhood or early adolescence and to increase across the adolescent years (Ricciardelli & Yager, 2015). Also, in a previous study from these data that modeled trajectories of BDS, substantial increases were found for most girls and many boys (Zimmer-Gembeck et al., 2018). In this study, we allowed for the possibility of a mutual amplifying relationship between BDS and ARS symptoms and girls were expected to report more BDS and ARS than boys. Furthermore, gender was tested as a potential moderator of BDS-ARS cascade model effects over the six waves. However, given no previous evidence of gender as a moderator, we made no specific hypotheses.

Method

Participants

The participants at T1 were 397 students (56% female) attending one of three urban Australian schools. The students participated in at least one of the first six waves of a 7-wave longitudinal study (T1 collected in 2013) of adolescents' appearance-related concerns and socio-

emotional functioning. Wave 7 data were not included here because ARS was not collected at Time 7. At T1, participants were, on average, 11.7 years of age (*SD* = 0.91), with average age and SD at the following time points of (T2) M_{age} = 12.3, *SD* = 0.87; (T3) M_{age} = 12.8, *SD* = 0.88; (T4) M_{age} = 13.3, *SD* = 0.86; (T5) M_{age} = 13.9, *SD* = 0.85, and (T6) M_{age} = 15.7, *SD* = 0.98. At T1 students attended Grades 5 (26%), 6 (32%), or 7 (42%) and reported ethnicity as white (79%), Asian (15%), Australian First Peoples, Torres Strait Islander or Pacific Islander (1%), or other ethnic/racial backgrounds (5%). Parents (*n* = 302; 85% mothers, 13% fathers, 2% other) reported their demographic details in a separate survey. Parents' mean age at T1 was 44.4 years (*SD* = 5.8 years) and most reported being married or living with a partner (85%), with 14% reporting divorce or separation, and 1% single, never married. Regarding educational level, 19% of mothers reported completing some or all of high school, 26% attended a trade school, 51% attended university, and 3% reported other. For fathers, 18% completed some or all of high school, 31% attended a trade school, 49% attended university, and 2% reported other.

We compared the demographics of our participants with publicly available school and regional demographic information to assess representative of participating students. It is important to note that questions regarding birth country and language spoken at home are often asked in Australia instead of the questions asked about race/ethnicity in this study. The schools from which the students were drawn report that their student population (all grades) is approximately 52% boys, with 1% Australian First Peoples, Torres Strait Islander or Pacific Islander. Also, about 20% report speaking a language other than English at home. The schools report that 10% of students are in the lowest income quartile, 61% are in the middle two income quartiles, and 29% are in the highest income quartile. A regional demographic survey reports 64% of adults born in Australia, 1.7% First Peoples or Pacific Islander, 17% with a university

degree (18% Year 12 high school maximum, 12% Year 10 high school maximum, with 53% reporting some education beyond high school), and 45% married. Relative to the available school demographic information, our study participants had a slightly higher proportion of girls but was representative otherwise. In comparison to the region, the students in this study had more educated parents, which was likely also reflected in the distribution of income levels in the schools. Students had a higher proportion of married parents than in the adult population in the region, but this would likely be the result of families defined by having children.

Measures

Appearance Anxiety Inventory. BDS were measured with the 10-item self-report Appearance Anxiety Inventory (AAI; Veale et al., 2014). Items on the AAI focus on obsessive personal thoughts about appearance (e.g., "*I am focused on how I feel I look rather than on my surroundings"*) and repeated, specific behaviors to modify or camouflage appearance (e.g., "*I think about how to camouflage or alter my appearance"*). Items were designed to reflect the diagnostic criteria for body dysmorphic disorder outlined in the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) and are measured on a five-point scale (0 – *Never* to 4 – *Always or almost always*). The AAI has been demonstrated to have good reliability and excellent convergent validity (Roberts et al., 2018, 2019; Veale et al., 2014) and has been widely utilised with adolescents (e.g., Mataix-Cols et al., 2015; Roberts et al., 2018). A total score was formed by summing all items, with a higher score indicating more BDS. Across the six waves, Cronbach's α ranged from .86 to .91 for boys and from .89 to .93 for girls.

Adolescent Appearance-Rejection Sensitivity Scale. ARS was measured using the self-report Adolescent Appearance-Rejection Sensitivity Scale (Webb et al., 2014). The ARS presents 10 hypothetical vignettes that involve possible responses from others related to

appearance, followed by two items to assess expectation of appearance-related rejection by peers or others more generally (ranging from 1 – *no!!* to 6 – *yes!!*) and the level of concern about this response (ranging from 1- *not concerned* to 6 – *very concerned*). For example, hypothetical situations read, "*You are leaving the house to go to school when you notice a big pimple on your face*"… *Do you think other people would find you unattractive? and How concerned or anxious would you feel that others would think you were less attractive because of the way you look?*). An overall score was created by multiplying the two ratings for each item and averaging these 10 multiplicative scores, with higher scores representing greater levels of rejection sensitivity. For boys, Cronbach's α ranged from .85 to .92 across the six waves of data, whereas for girls, Cronbach's α ranged from .91 to .94.

Procedure

After Griffith University Human Research Ethics Committee granted study approval (protocol #2013/13) local schools in a large urban city in Australia were contacted, with the first three interested schools accepted into the study. Consent forms for a 5-wave longitudinal study were sent home with students to be signed by their parents/guardians, with 58% returned, and 84% of these agreeing to participate. After T5 and a one-year lag, funding was received to extend the study by an additional two waves. At this time, parents were recontacted to request consent for their adolescent to participate in this extension because all students were still under the age of 18. Overall, 79% of parents consented, 55 participants could not be contacted, and 279 participants completed the T6 survey. The T6 data were collected about 2 years after T5 (T7 data were not included in this study). Students also assented to participation prior to survey completion at all waves.

Waves 1-5 were collected using hard copy surveys at schools during school time in

students' regular classrooms. For Wave 6, students from two schools completed the survey online (because of school preference) and students from the remaining school completed the survey in hard copy format at school. Participants were given small gifts at waves 1 to 5 and received a $20 gift voucher at T6. Completion time was approximately 30 minutes at each time of assessment. Data are available by request from the first author.

Data Analysis

After describing means and standard deviations, and estimating Pearson's correlations between all measures, MPlus7 was used to examine the cross-lagged associations between BDS and ARS over the six waves. Random intercept cross-lagged panel models (RI-CLPM) for BDS and ARS were fit using maximum likelihood estimation with standard errors and a χ^2 statistic that is robust to non-normality (MLR). FIML was used for estimation of missing data (with both BDS and ARS treated as dependent variables) and we also conducted sensitivity analyses using multiple imputation rather than FIML to estimate missing data . We simultaneously modeled a random intercept of BDS and ARS to account for stability across time (or time-invariance) and the interrelation between these stabilities. This allowed for simultaneous consideration of trait-like patterns among examined variables across time, which separates within and between-person levels in the reported estimators, therefore providing more reliable cross-lagged parameters (Hamaker et al., 2015; Selig & Little, 2012). Model fit was assessed using the χ^2 test, χ^2 test divided by the degrees of freedom, comparative fit index (CFI), and root mean square error for estimation (RMSEA). For the $\chi 2$ divided by the df as a criterion, values below 3 are evidence of a good model fit (Kaplan, 2000). For the CFI, values over .90 are considered to be representative of good model fit (Bentler & Bonett, 1980), but Hu and Bentler (1999) suggest a criterion of .95. The root mean square error approximation (RMSEA; Browne & Cudeck, 1992) is considered to

indicate a good fit if values are below .05, a fair fit if values are between .05 and .08, and a mediocre fit if values are between .08 and .10 (Kaplan, 2000).

We first tested and compared multiple RI-CLPMs to determine the impact of various model constraints. This included three models: 1) all stabilities of BDS and ARS constrained to be equal, 2) all covariances between BDS and ARS constrained to be equal, and 3) all cross-lagged paths between BDS and ARS constrained to be equal. Models 2 and 3 resulted in a poorer fit than a fully constrained model, but the fit of Model 1 (constraining all BDS stabilities and all ARS stabilities to be equal) did not differ from the fit of the fully constrained model. Thus, we maintained these constraints in Model 1 throughout all the remaining RI-CLPMs reported below.

A final set of RI-CLPMs was fit to test gender moderation. In a first gender moderation model, we focused on whether the cross-lag associations between BDS and ARS differed between boys and girls. To do this, the 10 cross-lag paths were freed to differ by gender and the fit of this model was compared to a fully gender-constrained model. Next, to identify whether within wave covariances or the latent intercept covariance differed between boys and girls, we fit a model with equality constraints relaxed for these covariances and the fit of this model was compared to a fully gender-constrained model. If there was evidence of gender moderation in either of these models, follow-up analyses were completed to isolate which BDS-ARS associations were stronger or weaker in boys compared to girls.

Results

Missing Data

Across the six waves, 73 (18%) students missed one wave, 10 (3%) missed two, 19 (5%) missed three, 11 (3%) missed four, and 23 (6%) missed five waves of assessment. BDS and ARS at T1 were not significantly associated with missingness at any of the subsequent waves, *p*

ranged from .832 to .885. Multiple imputation was conducted (20 imputed datasets), using all available ARS and BDS scores, gender, and age for estimation. Pooled values across all imputed datasets are reported for descriptive information, correlations and independent groups *t*-tests used to compare boys to girls on all measures.

Descriptive Statistics, Correlations and Group Differences

Table 1 presents correlations between BDS and ARS over time for boys (below the diagonal) and girls (above the diagonal), as well as correlations with age. Correlations indicated substantial individual rank stability in BDS and ARS. Also, within wave correlations between BDS and ARS were strong and significant for boys and girls. T1 age was positively associated with girls' BDS at all waves except T6, and was also positively associated with T2 and T4 ARS. For boys, T1 age was positively associated with BDS at the first three waves but was not significantly associated with BDS thereafter or with ARS.

Table 2 summarizes the results of *t*-tests comparing BDS and ARS between girls and boys. Girls reported significantly more BDS and ARS than boys at all times points. To consider additional covariates, we compared key study measures by school and ethnic/racial background. Measures of BDS and ARS did not differ by school, $F(2, 393)$ ranged from 0.26 to 1.75, all $p > .15$. Also, measures of BDS and ARS did not differ by ethnic/racial background (white vs. other), $F(1, 395)$ ranged from 0.03 to 2.27, all $p > .12$. Thus, we did not control for school or ethnic/racial background in the following models.

Cascade Model of Body Dysmorphic Symptoms and Appearance Rejection Sensitivity

There was a good fit for the RI-CLPM of BDS and ARS, $\chi^2(45) = 115.48$, $p < .001$; $\chi^2/df = 2.4$; CFI= .97, RMSEA= .063 (90% CI .049 - .077), $p = .07$. Figure 1 shows the standardized parameter estimates (βs) from this model. The random intercepts of BDS and ARS were

significantly associated, with adolescents higher in BDS also higher in ARS (r = .78, p < .001), and BDS and ARS were intercorrelated within each wave, r's ranged from .32 to .63. The model results also revealed significant cross-lagged associations between BDS and ARS; ARS was significantly (all p < .05) associated with a relatively higher level of BDS at the next wave initially (between T1 and T2, β = .13) and later (between T4 and T5, β = .14). Conversely, BDS was significantly (all p < .05) associated with a relatively higher level of ARS between T1 and T2 (β = .14), T2 and T3 (β = .19), and T4 and T5 (β = .18).

We conducted three sensitivity analyses to consider the stability in these results. First, we refit the general RI-CLPM using data with missing values replaced using multiple imputation rather than estimated using FIML. The significant paths reported in Figure 1 were all confirmed in this model and no new significant paths emerged. Second, we tested age and gender as covariates. Although age and gender were each associated positively with BDS and ARS random intercepts (age/ARS r = .11, p < .05; age/BDS r = .23, p < .001; gender/ARS r = .37, p < .001; gender/BDS r = .42, p < .001), the results for all other paths were not substantially changed. Third, we refit the model including only adolescents who participated at all waves (n = 248). This model had a very good fit to the data, $\chi^2(45) = 60.82$, p = .058; $\chi^2/df = 1.3$; CFI= .99, SRMR = .047, RMSEA= .038 (90% CI .000 - .060), p = .80. All model paths were confirmed, and one additional significant path emerged, from T3 BDS to T4 ARS (β = .16, p < .01).

Moderation by Gender

To test gender moderation, we used complete data with missing data estimated using multiple imputation, given that (1) there was little difference in the results above using FIML compared to imputed data and (2) evidence from simulation indicates that about 200 in each group is likely to be sufficient with complete data but may not be sufficient with more than 10%

missing data (Wolf et al., 2013). When the 10 cross-lag paths between BDS and ARS were freed to differ by gender, the correction developed for MLR in MPlus (see Satorra & Bentler, 2010) showed that the fit of the model with all paths constrained to equality for boys and girls, $\chi^2(119) = 283.73$, did not differ from the fit of the model with the 10 cross-lag paths freed to differ by gender, $\chi^2(109) = 275.21$, $\chi^2_{diff}(10) = 11.99$, $p > .05$. Thus, there was no indication that the strength of the cross-lagged associations between ARS and BDS differed by gender.

We next compared the fit of the fully constrained model, $\chi^2(119) = 283.63$, to the fit of a model with equality constraints relaxed for the within wave covariances between BDS and ARS and the latent intercept covariance, $\chi^2(112) = 238.72$. The difference in these model fits was significant, $\chi^2_{diff}(7) = 34.82$, $p < .001$. When we freed specific paths one at a time and compared models fits, only the BDS-ARS latent intercept correlation was found to differ significantly by gender, with a stronger association in girls (.80) than in boys (.63), $p < .01$. For the six within wave correlations between BDS and ARS, the average r was .42 for boys and .48 for girls, and these correlations did not differ significantly from each other, $z = -0.74$, $p = .230$.

Discussion

The primary aim of this longitudinal study was to examine the escalation of appearance related concerns and behaviors symptomatic of emerging body dysmorphic disorder. We did this by estimating longitudinal bidirectional relationships between body dysmorphic symptoms (BDS) and appearance rejection sensitivity (ARS) across four years (six waves of data) spanning early to middle adolescence. We also investigated whether girls reported significantly more ARS and BDS than boys, and whether older age was associated with more ARS and BDS. Further, we investigated whether the BDS-ARS cross-lag relationships and within wave correlations (as well as the covariance between trait-level BDS and ARS) differed between girls and boys.

Associations Between ARS and BDS Across Waves

The expected cascade of associations between ARS to BDS was generally supported, although intermittent across the six waves. Regarding the cascade from ARS to BDS, two of the five possible cross-lag paths, providing some evidence that ARS is associated with more BDS at the next wave even after accounting for the high stability of BDS and ARS and their strong within time intercorrelations. We found these associations in early adolescence (between T1 and T2) and bit later at the transition to middle adolescence (between T4 and T5). The reverse associations, from BDS to ARS, were found for three of the possible five cross-lag pathways. Again, these associations are found during early adolescence (between T1 and T2, and between T2 and T3) and around the transition to middle adolescence (T4 to T5). Such a pattern of findings suggests that youth who engage in image-related safety behaviours of BDS (such as escape, checking, reassurance seeking and concealment of perceived appearance flaws) become even more preoccupied and distressed about how others perceive and judge their appearance over time, especially at the transition into early adolescence and at the transition into middle adolescence. This concern and distress, in turn, results in more protective behaviors and rituals related to appearance. Overall, the association of BDS with ARS is best described as an escalating preoccupation with appearance, self-criticism and attempts to hide perceived appearance flaws (i.e., BDS), which can follow from ARS but can also lead to a relatively higher level of concern about appearance-related social rejection. ARS then feeds back into preoccupation with appearance flaws and behaviors to check and hide those flaws (i.e., body dysmorphic disorder). Furthermore, these findings extend upon, but are consistent with previous research on the etiology of BDS that has ARS described as one of its antecedents (Lavell et al., 2014; Park et al., 2010). The findings also support the cognitive behavioral model of BDS

(Veale, 2004), supporting the view that BDS-related behaviors could be a compensatory or safety response to the anxious anticipation of rejection by others.

It is curious that we found no BDS -ARS cascade effects between the final two waves of the study (T5 and T6, age 14 to 16), which had the longest lag between assessments (two years). We would have expected this to have produced the strongest effects given the potential for more change in both BDS and ARS over such a longer period of time. Perhaps, as adolescents move into the later teenage years, there could be some stabilization or merging of preoccupation and worries with perceived personal appearance deficits, on the one hand, and social concerns related to appearance, on the other hand. There may be, for example, more integration of emotional reactivity with cognition and regulation capacity as adolescents get older, as has been suggested by developmental theories of stress reactivity, brain development and emotion regulation (Albert et al., 2013; Casey et al., 2011). Such a possibility is also supported by high covariation of BDS with ARS at T6. Alternatively, it may be that shorter time lags are ideal for capturing temporal effects between two very interrelated levels of appearance-related concerns and behaviors – one derived from personal preoccupation and one derived from socio-cognitive biases.

Gender Effects

As has been reported previously (Bjornsson et al., 2013; Densham et al., 2018; Enander et al., 2018; Veale et al., 2016), girls report more BDS and ARS than boys. In addition, trait level BDS and ARS are more strongly interrelated in girls than boys. One possible explanation for this gender moderation effect is that overt teasing, negative comments about appearance, and harassment related to appearance (e.g., sexual harassment) may be less tolerable, more distressing and provoke more fear, worry or other concerns in girls relative to boys (Duncan et al., 2019; Ekore, 2012; Gruber & Fineran, 2016). Relative to boys, attention placed by others on

girls' appearance may come with a greater awareness that appearance is relevant to being rejected vs. accepted by others, resulting in more covariation between girls' ARS and BDS because these BDS included engaging in behaviors that are attempts to alleviate unwanted or distressing attention to appearance.

Gender was not found to moderate the cascading effects between BDS and ARS. Thus, appearance preoccupation, attempts to hide perceived appearance flaws and expectations of rejection because of appearance cascade over time for both girls and for boys. Yet, because girls are generally higher in BDS and ARS than boys, girls are at greater risk of dysfunctional or worrying levels of BDS and ARS overall.

Study Limitations

The generalizability of findings is limited by the homogeneity of the participants in this study. Future research would benefit from considering how cultural factors and socio-economic status could modify the results (Holmqvist & Frisén, 2010; Swami et al., 2010). For example, Europeans and Australians are less dissatisfied with their bodies than youth in the USA. Also, individuals from western countries more likely report body dissatisfaction than individuals from developing nations, and people from affluent and westernized parts of Asia (such as South Korea and Japan) more likely report greater body dissatisfaction than their US counterparts (Holmqvist & Frisén, 2010). A second limitation was the reliance on a community sample of adolescents. This may have attenuated associations, given that extreme levels of symptoms may have not be represented in this sample. However, on the whole, the level of BDS by T6 was above average, with quite a range of scores.

Third, adolescents self-reported their BDS and ARS, increasing the chance of common-method variance and inflated associations. However, the personal nature of the constructs

examined in this study (particularly ARS), makes it difficult to gather equally valid data using other methods or reporters. Despite this, further research might consider also gaining an indication from parents as to their children's overt body image concerns or collect information from friends. Fourth, this study benefits from having six waves of data from a period when rapid change occurs in young people's appearance concerns and socio-emotional development. One limitation of the data collection, however, was an unavoidable larger gap (2 years) between Waves 5 and 6, than between earlier waves.

Finally, there is the possibility that BDS and ARS are not separate constructs but are instead two different ways of measuring a similar set of symptoms or concerns that have arisen from separate research literatures. Our study findings do not rule this out, but we have been conscious of this issue and taken care in using methods that both identify the strong intercorrelations between BDS and ARS, but also their associations with each other over time.

Implications for Intervention

BDS can interfere with adolescents' emotional and social functioning across a range of domains (Mastro et al., 2016) and is a known risk for developing full-syndrome body dysmorphic disorder (Shankman et al., 2009). By identifying a cascade of concerns that include personal preoccupation with appearance and expectations of rejection because of appearance flaws, the findings of this study have two implications for intervention and prevention. First, ARS and BDS were mutually enhancing for both boys and girls between some of the earliest waves in this study – around the age of 12 to 13, and they then emerged again around the age 14 to 15 years. This highlights the need to begin prevention initiatives in pre-adolescence and to include girls and boys in these initiatives; a focus on pre-adolescents and boys has been lacking in previous prevention programming (Bird et al., 2013).

Second, it was not clear in these data whether BDS or ARS is the first emerging risk factor, as they were highly interrelated and influenced the escalation of the other over time. This escalating, mutually reinforcing cycle of ARS and BDS supports current directions in prevention and intervention designed to address both distorted cognitions about the self (i.e. preoccupation and concern about personal appearance deficits and the need to hide these perceived flaws) and others (i.e., concerns about others' judgements and responses to appearance). Such an integrated approach could add value to existing effective elements of body image interventions, such as exposure techniques or discussing cognitions and using self-monitoring to stop negative thoughts, reduce social comparison, and reduce cognitive distortions, most of which have only small effects on body image or appearance concerns once study bias is adjusted (Alleva et al., 2015; Yager et al., 2013). Without added elements focusing more specifically on providing positive and accepting social experiences, while reducing perceptions of social threats and changing beliefs about how much others' value appearance and how much others engage in judgement about appearance (both online and offline), it will likely remain especially difficult to substantially reduce appearance concerns and related disorders. Related to this, the possible social outcomes of programs designed to address body dissatisfaction or BDS are rarely measured. It may be that current programs have little impact on social relationships or social expectations, such as ARS. In one study that added a module to address perfectionism in girls with clinical eating disorders, girls' self-oriented perfectionism declined but their perceptions of others' values and judgement (socially-prescribed perfectionism) did not change (Hurst & Zimmer-Gembeck, 2019). Given the findings of the present study (and the usually small or moderate effects described in reviews of past intervention research; Alleva et al., 2015; Yager et al., 2013), more focused attention on reducing biases towards expecting rejection by others and

changing judgmental or malicious causal attributions for others' behavior could improve prevention or intervention programs for young people. Moreover, we encourage moving beyond self-reported body dissatisfaction and related personal outcomes to also consider social biases and beliefs as important program outcomes. These social changes may be necessary to maintain personal improvements over time. In addition, given that most young people may have difficulty generalizing psychoeducation or cognitive training to actual day-to-day practice, these program elements might have more impact if they were presented as interactive activities with opportunities to model and practice attending to, describing, and interpreting social cues.

Conclusion

BDS has been related to comorbid psychopathology (such as social anxiety, depression and obsessive-compulsive disorder), poorer quality of life, poorer social functioning, feelings of incompetence, and extreme weight management behaviors (Mastro et al., 2016; Roberts et al., 2015; Schneider et al., 2017a, 2017b). Our findings support substantial covariation between average, trait-level BDS and sociocognitive biased beliefs about rejection because of appearance (i.e., ARS), but also identified an amplifying cascade of associations between BDS and ARS that was not found to differ between girls and boys. This supports the view that, during the early and middle teenage years, BDS includes a set of behavioral responses that can occur in response to upwardly biased expectations of judgement and rejection by others because of appearance (measured here as ARS). In turn, although BDS may be motivated by a need for safety and protection from public scrutiny of perceived appearance flaws, more BDS precedes even more anxious expectations of rejection because of appearance. Moreover, girls are still are higher risk of BDS and ARS, and trait levels of BDS and ARS were more strongly intermingled in girls than boys. Future research should address whether the cascading pattern of BDS and ARS eventually

results in an inability to differentiate personal from social concerns about appearance, perhaps denoting a qualitative transformation in symptom expression, and whether this is the foundation for the emergence of a clinical level of body dysmorphic disorder or other clinical mental health disorders.

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Table 1
Correlations between Body Dysmorphic Symptoms (BDS), Appearance-based Rejection Sensitivity (ARS), and Age (N = 397; 175 Boys and 222 Girls)

	Measure	1	2	3	4	5	6	7	8	9	10	11	12	13
1	BDS-T1	--	.71**	.60**	.55**	.47**	.33**	.69**	.62**	.50**	.45**	.43**	.37**	.17*
2	BDS-T2	.41**	--	.64**	.54**	.53**	.39**	.57**	.74**	.60**	.50**	.46**	.41**	.18**
3	BDS-T3	.50**	.59**	--	.68**	.59**	.47**	.52**	.58**	.69**	.56**	.53**	.40**	.22**
4	BDS-T4	.38**	.44**	.66**	--	.73**	.50**	.39**	.51**	.53**	.64**	.65**	.44**	.22**
5	BDS-T5	.36**	.58**	.52**	.61**	--	.59**	.36**	.53**	.51**	.59**	.72**	.55**	.22**
6	BDS-T6	.17	.36**	.27**	.38**	.48**	--	.33**	.38**	.44**	.47**	.53**	.73**	.16*
7	ARS-T1	.50**	.43**	.39**	.28**	.27**	.32**	--	.68**	.60**	.51**	.44**	.40**	.09
8	ARS-T2	.26**	.66**	.42**	.33**	.42**	.29**	.51**	--	.76**	.60**	.60**	.49**	.14*
9	ARS-T3	.40**	.60**	.51**	.43**	.52**	.38**	.63**	.62**	--	.70**	.65**	.56**	.13
10	ARS-T4	.21**	.44**	.40**	.50**	.56**	.40**	.44**	.57**	.64**	--	.76**	.64**	.19**
11	ARS-T5	.22**	.43**	.38**	.50**	.65**	.41**	.44**	.51**	.61**	.72**	--	.66**	.14
12	ARS-T6	.15	.19*	.08	.18*	.31**	.68**	.37**	.32**	.40**	.50**	.51**	--	.10
13	Age	.17*	.19*	.25**	.08	.13	.01	.09	.08	.15	.04	.02	-.03	--

*$p < .05$. **$p < .01$.
Note. Correlations for boys are reported below the diagonal. Correlations for girls are reported above the diagonal. PRM = parent-report physical maturation status.

Table 2

Means and Standard Deviations of Body Dysmorphic Symptoms (BDS) and Appearance-related Rejection Sensitivity (ARS) for Boys and Girls, and Comparisons by Gender (N = 397)

	Means (*SD*s)			
	Full sample (*N* = 397)	Boys (*N* = 175)	Girls (*N* = 222)	Gender *t*(1, 395) (ES)
BDS-T1	18.4 (7.5)	16.0 (5.3)	20.4 (8.3)	-6.14*** (.09)
BDS-T2	17.6(7.6)	14.9 (5.2)	19.7 (8.6)	-6.73*** (.10)
BDS-T3	18.1 (7.6)	15.6 (5.9)	20.0 (8.3)	-5.99*** (.08)
BDS-T4	19.1 (8.0)	16.7 (6.5)	21.0 (8.5)	-5.76*** (.08)
BDS-T5	19.7 (8.2)	16.8 (6.8)	21.9 (8.5)	-6.70*** (.10)
BDS-T6	24.0 (8.0)	20.9 (7.2)	26.4 (7.7)	-8.37*** (.15)
ARS-T1	10.6 (7.3)	8.5 (5.2)	12.3 (8.2)	-5.45*** (.07)
ARS-T2	10.0 (7.4)	8.1 (6.2)	11.5 (8.0)	-4.67*** (.05)
ARS-T3	10.1 (7.5)	7.3 (5.3)	12.3(8.3)	-7.13*** (.11)
ARS-T4	9.9 (7.2)	7.5 (5.7)	11.8 (7.7)	-6.45*** (.10)
ARS-T5	10.2 (7.3)	7.5 (5.8)	12.3 (7.6)	-7.21*** (.12)
ARS-T6	10.9 (7.7)	8.3 (6.6)	12.9 (7.9)	-7.06*** (.11)

***$p < .001$.

Note. ES = effect size, eta^2. BDS can range from 0 to 40. ARS can range from 1 to 36.

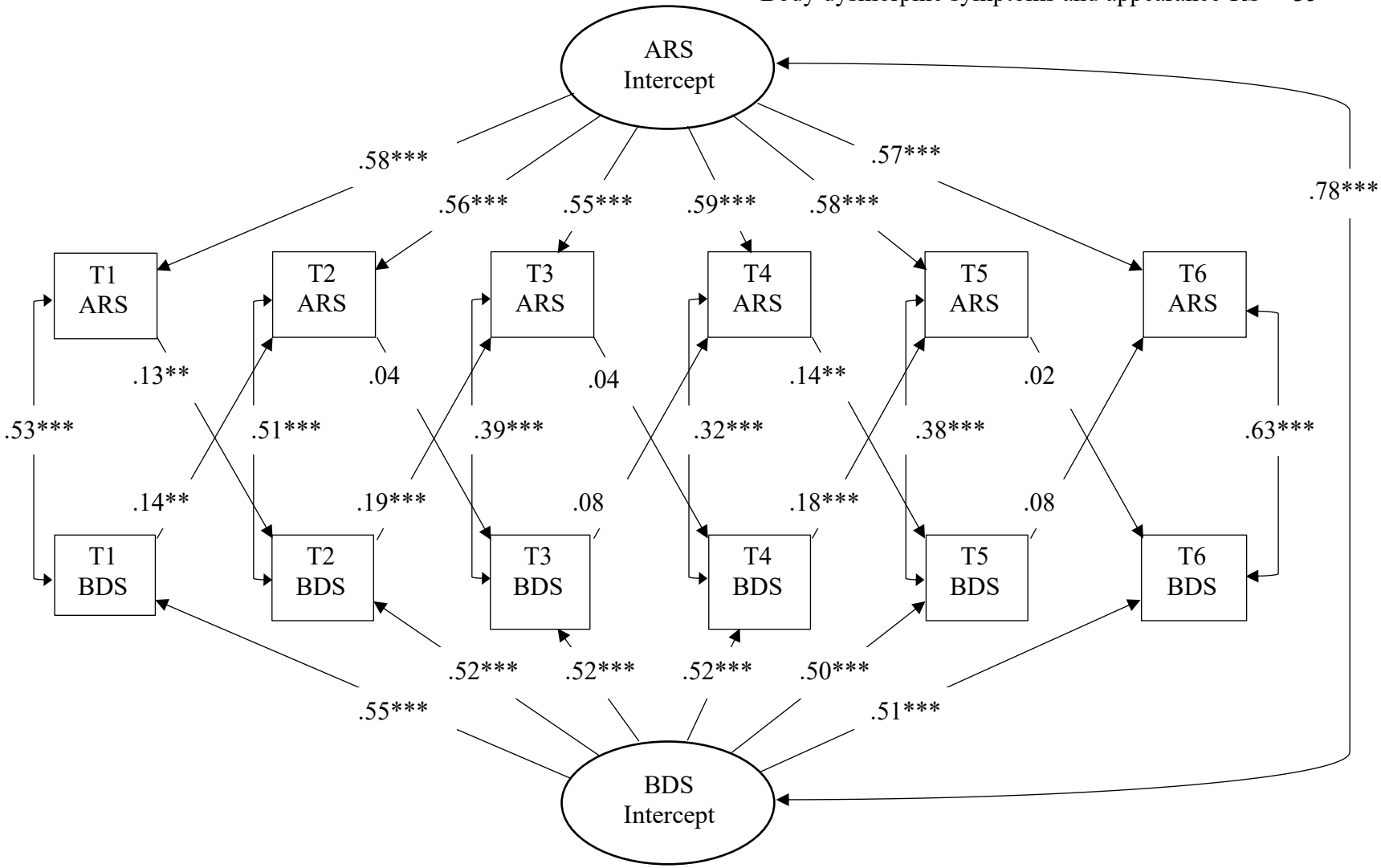

Figure 1. Random intercept cross-lagged panel models testing associations between body dysmorphic symptoms (BDS) and appearance rejection sensitivity (ARS) across six waves ($N = 397$).

Note. *$p < .05$. **$p < .01$. ***$p < .001$. Model fit: $\chi^2(45) = 115.48$, $p < .001$; $\chi^2/df = 2.4$; CFI= .97, RMSEA= .063 (90% CI .049 - .077), $p = .07$. Standardized coefficients, β, are shown. BDS and ARS stability paths were fixed to equality ($B = .27$ for BDS and $B = .19$ for ARS). Age and gender were also tested as covariates in this model, but are not included in the model presented here; gender and age were associated positively with BDS and ARS intercepts, but results for all other paths were not substantially changed.