Abstract

Body image and eating concerns are prevalent among early adolescent girls, and associated with biological, psychological and sociocultural risk factors. To date, explorations of biopsychosocial models of body image concerns and disordered eating in early adolescent girls are lacking. A sample of 488 early adolescent girls, mean age = 12.35 years (SD = 0.53), completed a questionnaire assessing depressive symptoms, self-esteem, body mass index (BMI), sociocultural appearance pressures, thin-ideal internalization, appearance comparison, body image concerns and disordered eating. Structural equation modelling was conducted to test a hypothetical model in which internalization and comparison were mediators of the effect of both negative affect and sociocultural influences on body image concerns and disordered eating. In addition, the model proposed that BMI would impact body image concerns. Although the initial model was a poor fit to the data, the fit was improved after the addition of a direct pathway between negative affect and bulimic symptoms. The final model explained a large to moderate proportion of the variance in body image and eating concerns. This study supports the role of negative affect in biopsychosical models of the development of body image concerns and disordered eating in early adolescent girls. Interventions including strategies to address negative affect as well as sociocultural appearance pressures may help decrease the risk for body image concerns and disordered eating among this age group.

Keywords: early adolescents, body image concerns, disordered eating, biopsychosocial model
Introduction

The prevalence of body image concerns and disordered eating is already reaching concerning levels by early adolescence (Abebe et al. 2012; Lam and McHale 2012; Westerberg Jacobson et al. 2012). Up to 50% of preadolescent girls report dissatisfaction with their shape or weight (Ricciardelli and McCabe 2001), and 10% report currently dieting (Westerberg Jacobson et al. 2012), while 25-55% of 12 year-old girls report dieting, 48% report unhealthy weight control behaviors such as fasting and using food substitutes, and 14% report binge eating with loss of control (Neumark-Sztainer et al. 2011; Westerberg Jacobson et al. 2012). The high prevalence of body image concerns is particularly worrying as body dissatisfaction prospectively predicts a range of negative outcomes including depressive symptoms, low self-esteem and negative affect, dieting and eating pathology, weight gain, and reduced physical activity and fruit and vegetable intake (Neumark-Sztainer et al. 2006; Paxton et al. 2006; Stice and Whitenton 2002). Consequently, research has focused on developing models to describe risk factor pathways for body image concerns and disordered eating to guide the development of effective prevention interventions. This study reports on an examination of a biopsychosocial model of body image concerns and disordered eating in early adolescence that extends on current widely used sociocultural models.

Over the past decade, there has been increasing interest in developing and testing comprehensive models of risk factors for body dissatisfaction. One such model is the Tripartite Model (Thompson et al. 1999) which proposes that the influence of media, family and peer appearance pressures on body image and eating concerns is mediated by internalization of appearance ideals and body comparisons. This model has received empirical support among U.S. (Keery et al. 2004; Shroff and Thompson 2006; van den Berg et al. 2002), Japanese (Yamamiya et al. 2008), French and Australian (Rodgers et al. 2011) samples of adolescents and young adults. Although this model of sociocultural influences is
well supported, evidence also exists for roles in the development of body image concerns and disordered eating for individual psychological (e.g., negative affect) and biological variables (e.g., body size) (Muris et al. 2005; Wertheim et al. 2001). However, models that include all three of these components (sociocultural, psychological and biological) as potential risk factors in a biopsychosocial model have not been widely examined. In this research, we aim to test a biopsychosocial model in which internalization of the thin ideal and body comparison mediate the relationship between sociocultural appearance pressures and negative affect (sociocultural and psychological components) and body dissatisfaction and eating concerns in early adolescent girls. In addition, we sought to include BMI as a biological component, which we hypothesized to be directly related to body dissatisfaction (Figure 1).

As indicated above, there is strong support for the influence of sociocultural pressures on body dissatisfaction and eating concerns. Sociocultural models have highlighted the role of the socially-promoted thin-ideal that represents an increasingly unattainable standard to which young adolescents aspire (Thompson et al. 1999). Girls who are exposed to more intense sociocultural pressures to be thin are more likely to adopt this thin-ideal as their own personal standard (internalisation of the thin ideal) leading to body image dissatisfaction resulting from the perceived discrepancy between the ideal and their own personal physical appearance (Thompson and Stice 2001). This process is facilitated by comparison of one’s body with others including peers or media (appearance comparison), which heightens the perception of the discrepancy between the self and the ideal (Schutz et al. 2002). The resulting body dissatisfaction frequently leads to eating concerns and disordered eating behaviors as young girls perceive their body weight as being highly modifiable and seek to control their weight through dieting and restriction (van den Berg et al. 2002). These relationships have been supported by longitudinal findings in adolescent samples (Field et al., 2001; Paxton et al. 2006). Furthermore, internalization and appearance comparison have
consistently been observed to be mediators of the relationship between sociocultural influences and body dissatisfaction and disordered eating (Keery et al. 2004; Rodgers et al. 2009). Thus, the sociocultural model of body image and eating concerns is well established.

We propose that it would be valuable to extend the sociocultural model of body image and eating concerns to also include the psychological factor of negative affect and the biological factor of body size. In the literature, negative affect has been assessed using a variety of measures; however, two common components are depressive symptoms and low self-esteem (Keery et al. 2004; Stice et al. 2001). Negative affect has been proposed to heighten the risk for body dissatisfaction as depressive symptoms and low self-esteem may be associated with a negative processing bias leading to the perception of one’s own appearance being very discrepant from the social ideal (Stice and Whitenton 2002). Consistent with this theory and among adolescent girls, negative affect has also been found to predict prospective increases in body dissatisfaction (Bearman et al. 2006), as well as disordered eating (Stice et al. 2002). Similarly, among girls, depression at 7 years old has been found to predict dieting at 9 years old (Sinton & Birch, 2005). However, when considered controlling for self-esteem (Paxton et al. 2006), or when only depressive symptoms have been included as a predictor in the absence of self-esteem (Stice and Whitenton 2002), they have not been supported as a predictor of increases in body dissatisfaction among adolescent girls. Furthermore, low self-esteem has been shown to predict prospective increases in body dissatisfaction among early adolescent girls over the course of 5 years (Paxton et al. 2006), as well as to predict disordered eating prospectively (Stice et al. 2002; Wertheim et al. 2001).

One potential reason for the lack of evidence for depressive symptoms as a predictor of prospective increases in body dissatisfaction in females, might be that the effects of depression are mediated by internalization of the thin-ideal and appearance comparison
(Thompson et al. 1999) and that, therefore, in studies in which these factors are already controlled, depressive symptoms do not incrementally contribute to predicting increases in body dissatisfaction (e.g., Stice and Whitenton 2002). Consistent with this view, depressed mood has been cross-sectionally associated with higher levels of social comparison (Gibbons and Buunk 1999). Similarly, low self-esteem, which also contributes to negative affect, has been associated with greater tendency towards social comparison (Wood et al. 1994). In addition, negative affect including depressive symptoms, low self-esteem and low self-concept clarity, has been shown to be cross-sectionally related to both thin-ideal internalization and appearance comparison (Durkin et al. 2007). Examinations of the relationship between negative affect and body dissatisfaction may therefore need to account for potential mediating mechanisms to further clarify these relationships. In addition to this potential explanation, it is possible that the lack of evidence for depressive symptoms as a predictor of prospective increases in body dissatisfaction in females may also result from a focus on examining depression as an outcome rather than a predictor. The examination of depressive symptoms as a predictor of body image and eating concerns is important in view of the existence of a theoretical rationale for this pathway (Stice and Whitenton 2002), but also in view of possible preventive implications as successful depression interventions for adolescents are available (Stice et al. 2009).

The biological factor proposed in the biopsychosocial model is body size as approximated by BMI (Paxton and Wertheim 2011). Longitudinal investigations have consistently supported BMI as a predictor of increases in body dissatisfaction and disordered eating (Jones 2004; Paxton et al. 2006; Stice et al. 2002; Stice and Whitenton 2002). In addition, overweight early adolescents are particularly at risk for the development of body dissatisfaction and disordered eating (Goldschmidt et al., 2008; Tanofsky-Kraff et al., 2004). Furthermore, evidence from cross-sectional studies has suggested that the impact of BMI on
body image dissatisfaction and disordered eating was not mediated by internalization or appearance comparison (Stice and Whitenton 2002; van den Berg et al. 2002). Thus, in the model put forward in the current research, BMI is proposed to be directly related to body dissatisfaction.

Few researchers have attempted to capture the biopsychosocial determinants of body dissatisfaction and disordered eating by including elements of all three components. Three studies, two of which tested the tripartite model, have examined partial versions of the biopsychosocial model (Keery et al. 2004; Muris et al. 2005; van den Berg et al. 2002). While taken together these studies provide emerging evidence for the biospychosocial model, none of them examined a full model. In particular, these studies omitted internalization (van den Berg et al. 2002), depressive symptoms (Muris et al. 2005) and BMI (Keery et al., 2004). Furthermore, in one study negative affect was proposed as an outcome of body image and eating concerns as opposed to a predictor (Keery et al., 2004), and another, while offering the most comprehensive test of the model, used a college student sample (van den Berg. 2002). Thus, to date, the literature is lacking investigations of biopsychosocial models of body dissatisfaction and disordered eating including elements of all three components, particularly among adolescents. The current study addresses this gap by building on previous work and testing a model that includes biological, psychological, and sociocultural sources of influence among a sample of early adolescent girls. Exploring the usefulness of such a model among early adolescent girls is important as predictors of body image and eating concerns have been shown to vary with age in adolescence (Paxton et al. 2006) and the findings from this study will contribute to informing age-appropriate prevention and intervention programs.

The Current Study
The present study aimed to test a biopsychosocial model of body dissatisfaction and disordered eating among young adolescent girls, including sociocultural influences, negative affect and BMI as three different types of factors influencing the development of these concerns. Consistent with previous research (Durkin et al. 2007; Rodgers et al. 2011), we propose that the effect of sociocultural influences and negative affect would be mediated by internalization and appearance comparison, while BMI would be only directly associated with body dissatisfaction as there is little support for its effect on body image concerns being mediated by other factors (Figure 1).

Method

Participants

A sample of 565 Grade 7 school girls was recruited from three co-educational and one single-sex school in the Melbourne, Australia, area to be involved in a body image intervention trial. In this analysis baseline data has been used. In total, 488 girls provided parental consent and complete data at baseline and were thus included in the analyses. The mean age of participants was 12.35 years (SD = 0.53), and mean BMI was 20.47 (SD = 3.88). The majority of participants reported being born in Australia or New Zealand (87.3%). However, 4.8% indicated being born in South East Asia, and 2.6% the Middle-East, and the remaining 5.3% in other countries.

Measures

Negative affect.

Depressive symptoms.

The 10-item Children’s Depression Inventory-Short form (Kovacs 1992) was used to assess depressive symptoms over the last two weeks including for example “sadness,” and
“loneliness.” Each item is scored on a 3-point scale with 0 indicating low levels of depressive symptoms (e.g., “once in a while”), and 2 indicating high levels of depressive symptoms (e.g., “all the time”). Higher scores indicate higher levels of depressive symptoms. As an example, the responses for the sadness item are 0 (I am sad once in a while), 1 (I am sad many times), 2 (I am sad all the time). In adolescent samples, the scores from this scale have shown good internal validity (Kovacs 1992) and criterion validity (Allgaier et al. 2012). In the present sample $\alpha = .85$.

**Self-esteem.**

Self-esteem was assessed using the 10-item Rosenberg Self-esteem Scale (Rosenberg 1965). Items are scored on a 4-point scale ranging from 1 (Strongly agree) to 4 (Strongly Disagree), with higher scores indicating higher levels of self-esteem. An example item is “On the whole I am satisfied with myself.” The scores from this scale have been shown to have good internal reliability among a sample of similar adolescent girls (Durkin et al. 2007). In the present sample $\alpha = .85$.

**Sociocultural influences.**

**Sociocultural pressures.**

The Perceived Socio-Cultural Pressure Scale (Stice and Bearman 2001) assessed perceived pressure to be thin from family, friends, and the media. The original scale includes 10 items. However, in our study the 2 items focusing on dating partners were not included as they were thought to not be relevant to this age group. The items are scored on a 5-point scale ranging from 1 (None) to 5 (A lot), with higher mean scores indicating greater perceived pressure. An example item is “I’ve felt pressure from my friends to lose weight.” The scores
from this scale have demonstrated good reliability among samples of adolescent girls (Stice and Whitenton 2002). In the present sample $\alpha = .85$.

**Peer weight teasing.**

Peer weight-related teasing was assessed using the peer teasing subscale from the McKnight Risk Factor Survey (Shisslak et al. 1999). The 8 items assess the frequency with which participants have been teased about their weight during the previous year. Items are scored on a 5-point scale ranging from 1 (Never) to 5 (Always), with higher mean scores indicating more frequent experiences of teasing. An example item is “How often have girls/young women (including sisters) made fun of you because of your weight?” The scores from this scale have demonstrated good internal reliability among adolescent girls (Shisslak et al. 1999). In the present sample $\alpha = .92$.

**Internalization and comparison.**

**Internalization of the thin ideal.**

The Internalization subscale of the Sociocultural Attitudes Towards Appearance Questionnaire was used to assess internalization of the thin-ideal (Thompson et al. 2004). The subscale includes 9 items assessing the degree to which participants adopt the social standard of thinness as their own. Items are scored on a 4-point scale ranging from 1 (Strongly disagree) to 5 (Strongly agree), with higher scores indicating higher levels of internalization. The scores from this scale have been shown to have good internal reliability among female adolescents (Heinicke et al. 2007). In the present sample $\alpha = .95$.

**Appearance Comparison.**

Appearance comparison was assessed using the Physical Appearance Comparison Scale (Thompson et al. 1991). The 5 items assess the degree to which participants tend to
compare their physical appearance to that of other individuals in social situations at the present time. Items are rated on a 5-point scale ranging from 1 (Never) to 5 (Always), with higher scores indicating greater tendencies towards social comparison. An example item is “In social situations, I compare my figure to the figures of other people.” The scores from this scale have been shown to have good internal reliability and test-retest reliability in female adolescents (Schutz et al. 2002). In our sample $\alpha = .89$.

**Body image concerns.**

**Body dissatisfaction.**

Body dissatisfaction was assessed using the 9-item Body Dissatisfaction subscale of the Eating Disorder Inventory (Garner et al. 1983), which assesses dissatisfaction with the size of various body areas over the last two weeks. Items are rated on a 6-point scale ranging from 1 (Never) to 6 (Always), with higher scores indicating more marked body dissatisfaction. An example item is “I think that my stomach is too big.” The scores from this scale have demonstrated high internal reliability among adolescent girls (Richardson et al. 2009). In our sample $\alpha = .90$.

**Shape and weight concerns.**

Shape and weight concerns were assessed with the 12 items of the Weight and Shape Concern subscales of the Eating Disorders Examination-Questionnaire (Fairburn and Beglin 1994). Each item is rated on a 7-point scale. Five items assess the frequency of thoughts or feelings over the past 28 days, with ratings ranging from 0 (No days) to 6 (Every day), while seven items assess the intensity of these thoughts and feelings with scores ranging from 0 (Not at all) to 6 (Markedly). Higher mean scores indicate greater levels of shape and weight concerns. An example item is “Have you had a strong desire to lose weight?” Scores have
demonstrated good internal reliability among female adolescents (Mond et al. 2007). In our sample $\alpha = .94$.

**Dietary restraint.**

The Dutch Eating Behaviors Questionnaire Restraint subscale (Van Strien et al. 1986) was used to assess extent of deliberate weight control and food restriction. The 10 items are rated on a 5-point scale ranging from 1 (Never) to 5 (Very often), with higher mean scores indicating higher levels of restriction. An example item is “When you have put on weight, do you eat less than you would usually eat?” The scores from this scale have demonstrated excellent internal reliability among adolescent girls (Heinicke et al. 2007). In the present study, $\alpha = .94$.

**Bulimic symptoms.**

Bulimic symptoms over the past two weeks (e.g., binging, purging) were assessed with the Bulimia subscale of the Eating Disorder Inventory (Garner et al. 1983). The 7-items of this subscale are rated on a 6-point scale ranging from 0 (Never) to 5 (Always), with higher scores indicating more intense bulimic symptomatology. An example item is “I stuff myself with food.” The untransformed scores from this scale, as recommended for non-clinical samples, (Schoemaker et al. 1994) have been demonstrated to have good internal consistency among adolescent girls (Richardson et al. 2009). In our sample $\alpha = .78$.

**Body mass index.**

BMI was calculated from self-reported height and weight (weight kgs/height squared m) which is considered reliable and valid in adolescent girls despite a tendency to over-estimate height and under-estimate weight (Himes et al. 2005). As our study sought to
examine cross-sectional relationships, rather than establish epidemiological data, this was not considered to be a problematic bias.

**Procedure**

The La Trobe University Human Ethics Committee approved the study. Students from participating schools were invited to participate. Girls who supplied written parental consent were invited to complete a self-report questionnaire. Data collection was conducted in supervised classroom settings. Due to the potential sensitivity of having weight measured by a researcher, participants could choose to not provide this information, or to privately weigh themselves and record their own weight (they were not weighed by the researcher in this case). Scales and a measure were available in a secluded area for students to do this if they wished. As the intervention was designed as a prevention trial, participants were not screened for risk or referred for assistance.

**Statistical analyses**

A correlation matrix was computed to explore relationships between study variables. Multicollinearity in the data was explored using the correlation matrix, as well as the tolerance values and variance inflation factors when potential multicollinear variables were entered into regression models. The hypothetical model was tested using structural equation modelling. Model fit was assessed using Bentler’s Comparative Fit Index (CFI ≥ .95 indicates good fit), the Goodness of Fit Index (GFI ≥ .95 indicates good fit), and the root mean square error of approximation (RMSEA ≤ .05 indicates a good fit; RMSEA ≤ .08 indicates moderate fit) (Hu and Bentler 1999; MacCallum et al. 1996). Chi-square test statistics have been provided but were not used as a fit indices, as previous research has shown that for samples of over 400 chi-square can be oversensitive, limiting its usefulness for evaluating goodness of fit (Hair et al. 2010). Modification indices were examined in order to guide
model improvement in the case of suboptimal fit of the hypothetical model. Nested model tests were then conducted to assess the improvements in goodness of fit of successive models. Analyses were conducted using SPSS 21 and AMOS 21.

**Results**

Table 1 presents the means and standard deviations for all study variables as well as correlations between variables. The sample mean BMI was within the normal range with 69.7% of participants reporting a BMI falling within the normal range. Three percent of participants reported a BMI below the 5th percentile, 8.2% of participants reported 85th percentile \( \leq \) BMI < 95th percentile, and 19.1% reported a BMI above the 95th percentile (Kuczmarski et al., 2002). Using the clinical cut-off for girls aged 13-17 years old for CDI, which is more conservative than that for girls aged 7-12 years old, 11.7% of the sample reported a score classified as “much above average” For depressive symptoms.

All the study variables were significantly correlated, with \( r \) values ranging from .13 to .78. The highest values were found for relationships between body dissatisfaction and weight and shape concerns (\( r = .78 \)), teasing and sociocultural pressure (\( r = .70 \)), weight and shape concerns and dietary restraint (\( r = .68 \)), and depression and self-esteem (\( r = -.68 \)).

Examination of the tolerance values and variance inflation factors for these variables suggested that multicollinearity would not be a problem as all tolerance values were < .20 and variance inflation factors were < 4.00. Furthermore, with the exception of weight and shape concerns and dietary restraint, these variables were used together as indicators of latent variables.

When tested, the hypothetical model (Figure 1) revealed a poor fit to the data, \( \chi^2(37) = 173.86, p = .000, \text{CFI} = .954, \text{GFI} = .936, \text{RMSEA} = .087 \). Examination of the modification indices revealed that the model would be improved by the inclusion of a direct
pathway between negative affect and bulimic symptoms. As this pathway was supported by the literature (Stice et al. 2002; van den Berg et al. 2002), we decided to include it. The modification indices also suggested that the fit of the model would be improved following the inclusion of a direct pathway between BMI and internalization and comparison. Most previous studies have not found evidence of this relationship (Schutz et al. 2002; van den Berg et al. 2002). Furthermore, the modification indices indicated that in our model the relationship between these variables would be negative, suggesting a suppression effect due to the complexity of the model. Therefore we decided not to include an additional pathway between BMI and the latent internalization and comparison variable. In addition, the non-significant pathway between dietary restraint and bulimia was removed. Following these two modifications, the model revealed moderately good fit to the data, \( \chi^2(34) = 148.43, p = .000, \) CFI = .962, GFI = .946, RMSEA = .080, explaining 84% of the variability in internalization and comparison, 86% in the variability of body image concerns, 50% of dietary restraint, and 23% of the variability in bulimia. The final model with standardized path coefficients and explained variance is presented in Figure 2. A comparison of the hypothetical model and the final model revealed the latter to be a significantly better fit to the data (\( p < .001 \)).

**Discussion**

The aim of the present study was to test a biopsychosocial model of body image concerns and disordered eating among a sample of early adolescent girls and to fill the gap in integrative conceptualizations of risk factors in this age group. The overall fit of our final model was only moderate. However, it was comparable to that of previous similar investigations using structural modelling (van den Berg et al. 2002). Furthermore, while the overall model fit was moderate, our model accounted for a very large proportion of the explained variance in internalization and appearance comparison (84%) as well as in body appearance concerns (86%) and a large proportion of variance in dietary restraint (50%).
Overall, our findings support the inclusion of negative affect and BMI in a biopsychosocial model of predictors of body image concerns and disordered eating among young adolescent girls. These results highlight the importance of considering biological, psychological and sociocultural risk factors for body image and eating concerns in early adolescents. As body dissatisfaction has been shown to increase over the course of adolescence (Bucchianeri et al. 2013), it is important to increase our understanding of the factors contributing to these concerns among young adolescents, with a view to prevention.

In our model, the effect of sociocultural influences, including sociocultural pressure and peer weight-related teasing was entirely mediated by internalization and appearance comparison. Although previous studies have often reported a direct pathway between sociocultural influences and dietary restraint (Rodgers et al. 2011; Shroff and Thompson 2006), that pathway was not supported in our model. As Shroff and Thompson (2006) found evidence of the direct pathway between sociocultural influences and dietary restraint among a similar age group, it is unlikely that this difference is due to age. It may be that the difference stems from the use of the dietary restraint scale from the Dutch Eating Behaviors Questionnaire (Van Strien et al. 1986) as opposed to the drive for thinness subscale from the Eating Disorders Inventory (Garner et al. 1983), as was used in the previous studies mentioned above. The dietary restraint subscale used in the present study is very behaviourally focused and assesses the control of food at and between meals for weight control purposes. In particular, items focus on behaviors to prevent weight increases or for the purposes of caloric compensation. In contrast, the frequently used drive for thinness scale focuses somewhat more on attitudes and preoccupation with thinness and the centrality of weight to identity. It may be that these attitudes and preoccupations are predicted by the social environment as reported in previous models (Rodgers et al. 2011; Shroff and
Thompson 2006), while weight control behaviors may be only indirectly related to social influences as suggested in the present findings.

In our final model, negative affect, including depressive symptoms and low self-esteem was associated with both the internalization and appearance comparison latent variable as well as bulimic symptoms. The indirect relationship between negative affect and body image concerns via internalization and appearance comparison is consistent with previous findings (Durkin et al. 2007), and suggests that adolescent girls with low self-esteem and high levels of depressive symptoms may be particularly vulnerable to adopting societal standards as their own measure of self-worth and may seek to evaluate themselves through social comparison. Consistent with this, prospective studies have suggested that adolescents displaying high levels of depressive symptoms and body dissatisfaction were at higher risk of onset of disordered eating (Stice et al. 2011). This pathway particularly supports the inclusion of negative affect as a precursor of body image concerns and disordered eating as suggested in the biopsychosocial model (Paxton and Wertheim, 2012), rather than only as an outcome as it has sometimes been suggested (Rodgers et al. 2011; Shroff and Thompson 2006).

The pathway in our model between negative affect and bulimic symptoms is also consistent with the literature (Stice et al. 2002; van den Berg et al. 2002). Interestingly, the strength of the relationship between negative affect and bulimic symptoms was over twice that of the relationship between body image concerns and bulimic symptoms, suggesting that among this age group, negative affect might be particularly important in the development of disordered eating. Consistent with this, previous studies have reported that among 11 and 13 year old adolescents, the percentage of variance in disordered eating accounted for by depressive symptoms was larger than that accounted for by body dissatisfaction (Gardner et al. 2000). These findings are also consistent with the suggestion that bulimic behaviours may develop as a means of regulating negative affect (Stice et al. 1996). In this way, early
adolescents experiencing high levels of negative affect might develop disordered eating patterns as a means of coping with negative affect which may not necessarily arise from feelings of body dissatisfaction or weight concerns. These findings suggest that negative affect might play an important role in the development of disordered eating among this age group, and further clarification of the impact of negative affect among young adolescents may help inform prevention interventions.

Consistent with the literature providing evidence for body size as a risk-factor for body dissatisfaction (Jones 2004; Paxton et al. 2006), our model included a direct pathway from BMI to body image concerns. Western society is as vehement in its glorification of thinness as it is in its demonization of overweight (Brownell 2005), and weight bias has been reported in children as young as 3 years old (Spiegel et al. 2012). These prevailing attitudes no doubt contribute to the direct relationship between BMI and body image concerns in young adolescents. Furthermore, the physical changes associated with puberty may be perceived by female adolescents as distancing them from the thin-ideal and biological factors may therefore play a particularly important role in this age group (Ricciardelli and McCabe 2001).

Our study is not exempt from a number of limitations. Limitations to our study include the cross-sectional design, the use of self-reported BMI, and the absence of other variables hypothesized to contribute to the biopsychosocial model of body image concerns and disordered eating such as perfectionism and pubertal timing (Stice 2002). Also in relation to measurement in a comprehensive model, future studies could examine social influences, including parental, peer and media pressures, in greater depth. In addition, our study only included girls and the same factors may not be relevant in boys the same age (McCabe and Ricciardelli 2005). It would be interesting to explore similar biopsychosocial conceptions of body image concerns and disordered eating among male adolescents in this age group.
Conclusion

Our study demonstrated the importance of including psychological and biological factors as well as sociocultural pressures in models of body image and eating concerns in young female adolescents. The findings highlight the role of negative affect in heightened internalization and appearance comparison and in the development of disordered eating. Further longitudinal research tracking the development of body image concerns and disordered eating from childhood through adolescence would help clarify the role of biological, psychological and sociocultural factors during entry into adolescence. Moreover, the lack of available resources targeting body image and eating concerns in this age group has previously been underscored (Ross, Rodgers & Paxton, 2013). The present findings support early adolescence as an important period for prevention and intervention and suggest that targeting negative affect may be helpful in decreasing risk for body image concerns and disordered eating in this age group.


and frequent dieting among preadolescent and adolescent girls and boys. *Pediatrics, 107*(1), 54-60.


treatment of and treatment-seeking for bulimia nervosa. *Journal of Youth and Adolescence, 36*(6), 753-762.


BMI

Bulimic symptoms

Depression
Self-esteem

Negative affect

BMI

Body dissatisfaction
Weight and shape concerns

Dietary restraint

Sociocultural influence

Sociocultural pressure
Peer weight-teasing

Internalization & comparison

Internalization
Comparison

Body image concerns

Figure 1: Hypothetical model
Figure 2: Final Structural Model with Standardized path Coefficients and Explained Variance

*p<.05  **p<.001
### Table 1

*Descriptive Statistics and Correlations for Study Variables*

<table>
<thead>
<tr>
<th></th>
<th>Mean (SD)</th>
<th>Range</th>
<th>2</th>
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<th>4</th>
<th>5</th>
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<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
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</thead>
<tbody>
<tr>
<td>1. BMI</td>
<td>20.47 (3.88)</td>
<td></td>
<td>.21</td>
<td>-.18</td>
<td>.36</td>
<td>.43</td>
<td>.19</td>
<td>.16</td>
<td>.48</td>
<td>.48</td>
<td>.36</td>
<td>.13</td>
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<tr>
<td>2. Depression</td>
<td>3.33 (3.61)</td>
<td>0-20</td>
<td>-.68</td>
<td>.49</td>
<td>.53</td>
<td>.36</td>
<td>.56</td>
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<td>.36</td>
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<td>.36</td>
<td>.40</td>
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<tr>
<td>3. Self-esteem</td>
<td>29.98 (5.17)</td>
<td>10-40</td>
<td>-.42</td>
<td>-.45</td>
<td>-.38</td>
<td>-.48</td>
<td>-.54</td>
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<td>-.39</td>
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<td>4. Sociocultural pressure</td>
<td>1.64 (.74)</td>
<td>1-5</td>
<td>.70</td>
<td>.54</td>
<td>.55</td>
<td>.56</td>
<td>.62</td>
<td>.48</td>
<td>.36</td>
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<tr>
<td>5. Teasing</td>
<td>1.80 (.88)</td>
<td>1-5</td>
<td>.46</td>
<td>.54</td>
<td>.61</td>
<td>.70</td>
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<td>.29</td>
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<tr>
<td>6. Internalization</td>
<td>20.32 (9.53)</td>
<td>9-45</td>
<td>.62</td>
<td>.47</td>
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<td>.47</td>
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<td>7. Appearance comparison</td>
<td>12.63 (5.03)</td>
<td>5-25</td>
<td>.52</td>
<td>.61</td>
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<td>8. Body dissatisfaction</td>
<td>17.64 (9.79)</td>
<td>0-45</td>
<td>.78</td>
<td>.58</td>
<td>.34</td>
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<tr>
<td>9. Weight /shape concerns</td>
<td>1.98 (1.52)</td>
<td>0-6</td>
<td>.68</td>
<td>.37</td>
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<tr>
<td>10. Dietary restraint</td>
<td>2.36 (.99)</td>
<td>1-5</td>
<td>.28</td>
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<td>11. Bulimic symptoms</td>
<td>5.21 (5.01)</td>
<td>0-35</td>
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*Note: all correlations significant at p < .01*