Comorbidity between depression and disordered eating in adolescents

Melissa Santos a,⁎, C. Steven Richards b, M. Kathryn Bleckley b

a Department of Psychology, The Institute of Living, 200 Retreat Avenue, Hartford, CT 06106, USA
b Department of Psychology, Texas Tech University, Lubbock, TX 79409-2051, USA

Received 3 November 2006; received in revised form 26 February 2007; accepted 16 March 2007

Abstract

Depression is one of the most common mental health disorders seen in adolescence. Low self-esteem, lack of social support and poor body image have been found to be risk factors for depression. However, these risk factors have not adequately explained why adolescent female rates of depressive episodes rise to almost twice that of males. This study had three purposes. The first is to identify the prevalence and comorbidity of depressive and disordered eating symptoms in a sample of high school students. The second is to examine predictors of depressive and disordered eating symptoms. Finally, a model predicting depressive symptoms is examined. Significant depressive and disordered eating symptomatology and a high level of comorbidity were observed in this sample. Predictors of depressive and disordered eating symptoms were similar for both genders. Finally, a model predicting depressive symptoms, via body image factors, was found to be supported in both boys and girls. The results of this study suggest that males and females are more similar than different, regarding predictors of depressive symptoms and disordered eating symptoms.

© 2007 Elsevier Ltd. All rights reserved.

Keywords: Adolescence; Depression; Disordered eating; Comorbidity; Gender differences

1. Depressive comorbidity in adolescents

Depressive disorders are viewed as one of the most prevalent psychiatric disorders among children and adolescents (Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993). Studies have found the lifetime prevalence rate of major depression for adolescents varies from 10 to 28% (Birmaher, Ryan, Williamson, Brent, & Kaufman, 1996; Hauenstein, 2003; Lewinsohn et al., 1993). Depression is often associated with various negative outcomes, including disordered eating behavior, increased substance use, binge eating, and body image dissatisfaction (Measelle, Stice, & Hogansen, 2006; Fulkerson, Sherwood, Perry, Neumark-Sztainer, & Story, 2004). In addition, children and adolescents diagnosed with depression have been found to have recurrent depressive symptoms, with approximately 40% of children and adolescents having at least one reoccurrence of depressive symptoms after their initial depressive episode (Birmaher et al., 2004).
Depression is also a disorder often seen with other conditions. The term comorbidity can be used to describe circumstances when an individual meets criteria for two or more psychological disorders (Newman, Moffitt, Caspi, & Silva, 1998) or when an individual is experiencing psychopathology with additional chronic difficulties, such as chronic health problems or severely distressed close relationships (Richards & Perri, 2002). Numerous epidemiological studies suggest that comorbidity is very common among children and adolescents (Nottlemann & Jensen, 1995) and is found more frequently in this population than in adulthood (Pataki & Carlson, 1995). Studies have consistently shown that a worse prognosis, less response to treatment and more chronicity are seen in individuals with psychiatric comorbidity (Newman, et al., 1998). In children and adolescents an increased risk for suicide attempts and less frequent utilization of mental health services are also associated with comorbidity (Cicchetti & Toth, 1998).

A comorbid relationship has been found between depressive disorders and disordered eating symptoms (Perez, Joiner, & Lewinsohn, 2004; Leon, Fulkerson, Perry, Keel, & Klump, 1999). Research has also found that these disorders share similar risk factors, such as body image dissatisfaction (Johnson & Wardle, 2005; Stice, Hayward, Cameron, Killen, & Taylor, 2000; Thompson, Heinberg, Altabe, & Tantleff-Dunn, 1999), low self-esteem (Muris, Meesters, van de Blom, & Mayer, 2005; Crockett, Randall, Shen, Russell, & Driscoll, 2005; Dori & Overholser, 1999; Shisslak et al., 1998; Fisher, Pastore, Schneider, Pegler, & Napolitano, 1994) and poor social support (Stice, Ragan, & Randall, 2004; Burton, Stice, & Seeley, 2004; Lewinsohn et al., 1994; Windle, 1992; Slavin & Ranier, 1990). However research has been inconsistent in studying male and female samples often using only females.

In addition to a comorbid relationship, disordered eating symptoms have also been implicated as a possible factor in the gender differences seen in depression. An examination of the gender differences in depression finds that depression in children tends to be found equally in boys and girls (Richards & Perri, 2002), and when gender differences have been found, boys have tended to have higher rates of depression (Gotlib & Hammen, 2002). However, a notable gender difference is seen in depression during adolescence. By late adolescence, girls are two times more likely to be diagnosed with depression than boys (Keller, 2003).

Various possible explanations for why girls’ rates of depression double to that of boys during adolescence have been suggested. Stice and Bearman (2001) proposed a gender additive model of depression, which suggests that many of the risk factors for depression are shared by both boys and girls. Stice and Bearman hypothesized, however, that there are additional risk factors for depression that are not shared, but rather are specific to girls, such as body mass, pressure to be thin, thin-ideal internalization, body dissatisfaction, dieting and bulimic symptoms. They hypothesize that these factors might help explain the gender differences seen in depression during adolescence (see Stice & Bearman, 2001, for a full discussion of this model). One disadvantage of much of the research in this area, including some of the work by Stice and colleagues, is the lack of a comparison group of boys.

1.1. Aims of the present study

This study had three aims. The first was to examine the prevalence of depressive symptoms in a sample of adolescent boys and girls, and examine its comorbidity with disordered eating symptoms. Second, the role of three constructs – low social support, low self-esteem and low body satisfaction – found in the literature to be correlated with depression and eating disorders, were examined. Of specific interest is whether, when the effects of these three risk factors are statistically controlled, disordered eating contributes above and beyond these risk factors to depressive symptom scores. Finally, a modified version of the gender additive model developed by Stice and colleagues was examined to analyze the effects of a combination of disordered eating and body dissatisfaction variables on depressive symptoms. Throughout the study, a focus was placed on comparing the differences and similarities between males and females.

2. Methods

2.1. Participants

Two hundred and forty one high school students (115 males and 126 females) from a southwestern high school participated in the study. The surveys of thirty-nine students (14 males and 25 females) were not used for reasons including their surveys not being complete or due to their placement in a special education class where the teacher did not believe they understood the survey well enough to answer appropriately. This reduced the sample to two hundred and two high school students (101 males and 101 females). The mean age was 16.40
(SD=1.23; range=14 through 19). Twenty five percent of the students were in 9th grade, 19% were in 10th grade, 30% were in 11th grade, and 25% of the students were in 12th grade. A majority of the participants self-identified as being Caucasian (n=140, 69%) and almost 23% (n=46) identified as Hispanic.

This study was fully approved by the Texas Tech University Institutional Review Board as well as the principal of the high school. Parental or guardian consent forms were obtained for students under the age of eighteen. All participant responses were kept anonymous.

2.2. Measures

2.2.1. Demographic information

To obtain information such as gender, ethnicity, grade level and height and weight, participants completed a demographics questionnaire, which was developed for this study.

2.2.2. Body mass

To calculate body mass index, students self-reported their height and weight on the demographics questionnaire. The following standard formula was used to calculate their body mass index: BMI=kg/m² (BMI = weight in kilograms divided by height in metric squared).

2.2.3. Depressive symptoms

In order to assess self-reported depressive symptoms, The Center for Epidemiological Studies-Depressed Mood Scale (CES-D) (Radloff, 1977) was used. The CES-D is a 20-item self-report scale, with a primary emphasis on negative affect or depressed mood. Items are answered on a 4-point scale, ranging from rarely to most of the time. Scores may range from 0 to 60, with higher scores indicating greater depressive symptomatology. The alpha for the measure in this study was .90. The CES-D has been used in numerous studies and typically has satisfactory psychometric properties (Nezu, Nezu, McClure, & Zwick, 2002).

2.2.4. Eating attitudes

The Eating Attitudes Test (EAT-26) (Garner, Olmstead, Bohr, & Garfinkel, 1982) was used to measure self-reported disordered eating symptoms. The EAT-26 is a measure of self-reported symptoms and concerns distinctive of disordered eating. It has been widely used as a screening instrument in non-clinical samples. It is made up of 26 forced choice items scored on a 6-point scale ranging from “always” to “never”, with higher scores indicating greater disordered eating symptomatology. The alpha for the measure was .87 in this study.

2.2.5. Self-esteem

To assess the participant’s feelings of self-esteem, The Rosenberg Self-Esteem Scale (Rosenberg, 1965) was given. The scale is made up of 10 forced choice items scored on a 4-point scale, with higher scores indicating greater feelings of self-worth. The alpha for the measure was .76 in this study.

2.2.6. Body dissatisfaction

The Body-Esteem Scale Revised (BES) (Mendelson, White, & Mendelson, 1998) was used to assess self-reported body satisfaction. The questionnaire consists of twenty-three forced choice items on a 5-item scale, ranging from “never” to “always”. Responses are scored from 1 to 5, with higher scores indicating greater dissatisfaction. The alpha for the measure was .93 in this study.

2.2.7. Social support

The Multidimensional Scale of Perceived Social Support (MSPSS) (Zimet, Dahl, Zimet, & Farley, 1988) was used to assess perceived social support. The MSPSS is made up of 12 forced choice items with higher scores indicating higher levels of perceived social support. The alpha for the measure was .90 in this study.

3. Results

Table 1 provides the means and standard deviations for the major variables separated by gender.
3.1. Prevalence of depressive and disordered eating symptoms

Forty percent of participants met the cutoff score of 16, indicating possible significant depressive symptoms on the CES-D. When a more conservative cutoff score of 24 was used as recommended by Roberts, Lewinsohn, and Seeley (1991), the total decreased to 23%. An independent sample t-test found that there was a significant difference between males and females in depressive scores ($p < .01$), with females having significantly higher depressive symptomatology than males.

Twelve percent of students surveyed met the criteria on the EAT-26 for possible significant disordered eating symptomatology. These percentages are similar to averages found for this age group using this measure (Gardner, 1991). An independent samples $t$-test found no gender differences between males and females in disordered eating symptomatology. Therefore, males and females did not differ significantly in their self-reports of disordered eating symptomatology. An examination of the subscales that make up the EAT-26 found gender differences in the diet subscale, but not in the bulimia or oral control subscales. Thus, females had significantly higher dieting scores, but there were no gender differences on bulimic or oral control scores between males and females.

3.2. Comorbidity of depressive and disordered eating symptoms

To assess if there was a relationship between disordered eating and depressive symptoms, a correlation was computed between total scores on the EAT-26 and total scores on the CES-D. The results showed that eating attitudes and depressive symptoms were strongly and positively correlated ($r = .53$; $p < .01$ for females; $r = .50$; $p < .01$ for males), regardless of gender. Those relationships were also found regardless of grade level ($r = .57$; $p < .01$ for grade 9; $r = .55$; $p = .01$ for grade 10; $r = .54$; $p = .01$ for grade 11; $r = .48$; $p = .01$ for grade 12). This finding suggests that as disordered eating attitudes increase, depressive symptoms also increase.

In evaluating the comorbidity between eating attitudes and depressive symptoms, 10% of the sample ($n=21$; 8 males, 13 females) met the cutoff score of 20 on the EAT-26, and the more conservative score of 24 on the CES-D indicating comorbid symptomatology. An independent sample $t$-test found no significant gender effect ($p > .01$). Thus, the rate of comorbidity for boys and girls was not significantly different. When the less conservative cutoff score of 16 on the CES-D was used, 12% of the sample ($n=24$; 9 males, 15 females) met the criteria for comorbid depressive and disordered eating symptomatology. An independent sample $t$-test found a significant gender effect under this condition ($p < .01$), indicating females were more likely to experience comorbidity than males.

3.3. Relationships of body dissatisfaction, self-esteem and social support with eating attitudes and depressive symptoms

To assess the relationships of body dissatisfaction, self-esteem and social support with disordered eating and depressive symptoms, correlations were computed between all variables (Table 2). For females, body dissatisfaction,
low self-esteem and low social support were all found to be significantly related to depressive and disordered eating symptoms \((p<.01)\). For males, body dissatisfaction and low social support, but not low self-esteem, were found to be significantly related to depressive and disordered eating symptoms \((p<.01)\).

A hierarchical regression analysis (Table 3) was carried out to predict depressive symptoms from disordered eating attitudes, while holding the effects of self-esteem, body dissatisfaction and social support statistically constant. The results indicated that, when the effects of self-esteem, body dissatisfaction and social support are statistically removed, eating attitudes still contribute a significant amount of the variance in self-reported depressive symptoms \((p<.01)\). When this analysis was run separately by gender, the same results were found \((p<.01)\). This indicates that regardless of gender, eating attitudes contribute significantly above and beyond the effects of self-esteem, body dissatisfaction and social support to depressive symptoms.

### 3.4. Gender additive model

Five variables were used in the study of the modified gender additive model (Stice & Bearman, 2001):

1. BMI as measured by self-reported height and weight.
2. Body esteem as measured by the BES.
3. Dieting as measured by the dieting subscale of the EAT-26.
4. Bulimia as measured by the bulimia subscale of the EAT-26.
5. Depression as measured by the CES-D.

While many fit indices may be used to evaluate model fit, the following criteria were used to evaluate the adequacy of the models according to recommendations from Kline (1998):

1. \(X^2/df<3\): a measure of overall fit with an ideal fit being less than 3.
2. Comparative Fit Index (CFI): a measure that describes how much of the overall proportion of the variance is explained by this model. An ideal CFI would be greater than .90.
3. Non-Normed Fit Index (NNFI): a measure that is similar to the CFI, however, it accounts for model complexity. An ideal NNFI would be greater than .90.
4. Standardized Root Mean Square Residual (SRMR): a measure that compares predicted and observed variances. An ideal SRMR would be lower than .10.

Path analyses were analyzed using EQS Structural Equation Modeling Software by Multivariate Software, Inc. In order to test the hypothesis of whether the model would only be supported in females, a path analysis was conducted. As stated previously, the majority of research looking at a gender additive model of depression used only a female sample. Therefore, the data from the female sample was used as a baseline model and examined first. The initial female model provided variable fit to the data, $X^2/df=3.56$, CFI=.95, NNFI=.83 and SRMR=.05. The model was revised, and a path was added from body mass index to depressive symptoms in order to produce a better fitting model. The revised model (Fig. 1) provided excellent fit to the female data, $X^2/df=.68$, CFI=1, NNFI=1 and SRMR=.02.

In order to examine gender differences using our revised model, the female and male data samples were tested simultaneously initially with all paths constrained to be equal. Paths were released individually until the best fitting model was found. In our final model, the paths that were no longer constrained indicating variability between the genders were the paths between body mass index and depressive symptoms, body esteem and depressive symptoms and bulimic symptoms and depressive symptoms. As with the female data, the male data fit the revised model very well, $X^2/df=1.75$, CFI=.98, NNFI=.95 and SRMR=.04.

Comparing the female model with the male model suggests that there is no significant loss in fit of the models. Therefore, the results indicate that the gender additive model of depression does not differ significantly based on gender. In addition, the gender additive model of depression tested by Stice and Bearman (2001) did not find support for a significant relationship between body mass index and depressive symptoms. In our sample, however, the inclusion of the significant path between body mass index and depressive symptoms led to a better-fitting model.

### 4. Discussion

The results of this study indicate that comorbid depression and disordered eating symptoms are two significant problems facing both male and female adolescents today. Previous research has assumed that there are significant

---

**Table 3**
Hierarchical regression analyses predicting depressive scores

<table>
<thead>
<tr>
<th>Predictor variable</th>
<th>B</th>
<th>Beta</th>
<th>t</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Males</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>35.162</td>
<td>8.033</td>
<td>3.00</td>
<td>.00</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>−.165</td>
<td>−.097</td>
<td>−.957</td>
<td>.34</td>
</tr>
<tr>
<td>Social support</td>
<td>−.108</td>
<td>−.144</td>
<td>−1.767</td>
<td>.08</td>
</tr>
<tr>
<td>Body esteem</td>
<td>−.121</td>
<td>−.184</td>
<td>−1.864</td>
<td>.06</td>
</tr>
<tr>
<td>Eating attitudes</td>
<td>.437</td>
<td>.427</td>
<td>4.981</td>
<td>.00</td>
</tr>
<tr>
<td>$R^2 = .47$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Females</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>44.866</td>
<td>7.498</td>
<td>6.00</td>
<td>.00</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>−1.141</td>
<td>−.507</td>
<td>−5.350</td>
<td>.00</td>
</tr>
<tr>
<td>Social support</td>
<td>−.008</td>
<td>−.075</td>
<td>−.970</td>
<td>.335</td>
</tr>
<tr>
<td>Body esteem</td>
<td>−.001</td>
<td>−.020</td>
<td>−.202</td>
<td>.840</td>
</tr>
<tr>
<td>Eating attitudes</td>
<td>.312</td>
<td>.281</td>
<td>3.269</td>
<td>.001</td>
</tr>
<tr>
<td>$R^2 = .52$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total sample</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>38.519</td>
<td>10.682</td>
<td>3.56</td>
<td>.00</td>
</tr>
<tr>
<td>Self-esteem</td>
<td>−.761</td>
<td>−.387</td>
<td>−5.834</td>
<td>.00</td>
</tr>
<tr>
<td>Social support</td>
<td>−.008</td>
<td>−.090</td>
<td>−1.679</td>
<td>.095</td>
</tr>
<tr>
<td>Body esteem</td>
<td>−.007</td>
<td>−.113</td>
<td>−1.589</td>
<td>.114</td>
</tr>
<tr>
<td>Eating attitudes</td>
<td>.412</td>
<td>.377</td>
<td>6.455</td>
<td>.00</td>
</tr>
<tr>
<td>$R^2 = .50$</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Note: Males: $N=101$; female: $N=101$; total sample: $N=202$. 

---

differences between the two genders particularly in the area of eating disorders. Therefore, many studies exclude male samples. However, this study suggests that, regarding depression and eating disorders in high school students, the genders may be more alike than they are different.

Forty percent of students (or 23% of students if using a more conservative approach) met criteria for possible significant depressive symptomatology. Females had significantly higher depressive scores. This finding suggests higher prevalence of significant depressive symptoms (but not necessarily possible depressive diagnoses of Major Depressive Disorder; American Psychiatric Association, DSM-IV, 2000) than indicated in some recent studies (i.e., Fergusson, Horwood, Ridder, & Beaumont, 2005; Galambos, Leadbeater, & Barker, 2004). These other studies found prevalence rates from 15 to 18%. The reasons for such a higher prevalence rate in this study are not known. One possible reason for this rate may be due to the data being collected in an area low in mental health resources which may increase the amount of mental health concerns seen. Other reasons may include variability in the measures used and sample size. In the present study, 12% of students met criteria for significant disordered eating symptomatology. This finding is similar to the prevalence rates found in the study of Kjelsas, Bjornstrom, and Gotestam (2004). In the present study, no significant gender differences were seen in disordered eating symptoms.

As expected, a significant positive correlation was found between depressive and disordered eating symptomatology. This finding was present in both the male and female samples. Further, 12% of the sample (or 10% of the sample, if using a more conservative approach) met criteria for comorbidity. That is, these participants met criteria for significant depressive symptoms as well as significant disordered-eating symptoms. The present finding is similar to that found by Spady et al. (2005). No gender difference was seen in comorbidity, unless the less conservative approach to assessing depressive symptoms was used: Then females had slightly higher levels of comorbidity.
Regarding risk factors, poor body image satisfaction and little social support were correlated with disordered eating symptomatology in males. In females, poor body image satisfaction, low self-esteem and little social support were correlated with disordered eating symptomatology. This result may suggest that self-esteem does not impact eating disorder symptomatology in males the way it does in females. Self-esteem was also found not to be a significant predictor of eating problems in boys in the study by Muris et al. (2005). Regarding comorbidity with depressive symptoms, body image dissatisfaction, low self-esteem and little social support were associated with higher depression scores in both males and females.

When the effects of social support, body dissatisfaction and self-esteem are statistically controlled for, disordered eating continues to contribute significantly to depressive symptoms of both males and females in the present sample. This may suggest that males and females are not different regarding factors that influence depressive symptoms. Further, more support was found for the modified gender additive model of depression not only for girls but also for boys. In addition, no gender differences were seen in disordered eating symptomatology and no gender differences were found in the correlation between depression and eating disorders. These findings indicate that the differences between males and females make not be as great as previously thought. It would also seem to indicate that eating disorders may not fully explain the gender differences seen in depression.

While this study was not a treatment study, these results may imply that community interventions aimed at adolescents are important. Adolescents are a population at risk for significant psychopathology. By intervening during adolescence, problems that may become chronic into adulthood may be lessened or prevented. These results may also suggest that interventions should be targeted at both males and females, due to the high prevalence of difficulties in both genders.

This present study has several strengths. It is one of the few studies to compare male and female high school student’s depressive and disordered eating symptomatology. It further adds to the much needed research in adolescent comorbidity between these two disorders. The measures included in this study were psychometrically sound and well researched in the adolescent population. Finally, a relatively large community sample was collected.

There are several limitations to the present study. First, the sample was collected from one high school located in a rural area of the state. This may limit generalizability to other groups. In addition, all data was collected using self-report measures, which may influence results and limit some interpretations. Further, several survey packets were returned incomplete for unknown reasons. The fact that students who are experiencing significant symptomatology may be more likely to not complete the study may have influenced some of the findings. Finally, since correlations do not equal causation, alternative explanations for the relationships seen in this study should be examined.

Future research should continue to look at the comorbidity in children and adolescence regarding depressive symptoms, eating disorder symptoms and other relevant types of psychopathology such as antisocial behaviors and substance abuse (e.g., Measelle et al., 2006). Longitudinal studies would provide valuable data regarding development and possible causation. In addition, further studies on age and ethnic differences would provide valuable information.

In conclusion, this study found notable levels of depressive and disordered eating symptoms and a high level of comorbidity between the two in both male and female high school students. Risk factors for both depressive and disordered eating symptoms were found equally in both males and females. Further, a model predicting depressive symptoms, from a variety of body image variables, was found to be supported in both the male and female high school students.

Acknowledgements

Melissa Santos, Institute of Living; C. Steven Richards and M. Kathryn Bleckley, Department of Psychology, Texas Tech University.

This research is based on a dissertation by Melissa Santos, conducted under the supervision of the second and third authors, at Texas Tech University. The authors wish to thank the following individuals for their help and feedback regarding this study: Joaquin Borrego, Gary Fireman and Susan Hendrick. We further wish to thank the high school staff and students for participating and making this study possible.


