Developmental Trends of Eating Disorder Symptoms and Comorbid Internalizing Symptoms in Children and Adolescents

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Abstract

Objective—To determine when gender differences in disordered eating symptoms emerge, when correlations between disordered eating and internalizing symptoms develop, and whether the relationship between internalizing and disordered eating symptoms varies based on age and/or gender.

Method—We used questionnaire data from a community sample (N=424) of third, sixth, and ninth grade girls and boys.

Results—Gender differences in eating pathology emerge between 12 and 15 years. The relationship between anxiety symptoms and eating pathology among both genders is weak and remains constant between third and ninth grade. The relationship between depressive symptoms and eating pathology increases between third and sixth grade for boys, and sixth and ninth grade for girls.

Conclusion—Before age 12, prevention programs for eating disorders should be given to both genders, whereas after age 12, they should target girls. Further, providers should offer intervention for comorbid depressive symptoms by third grade for boys and sixth grade for girls.

Keywords

Eating Disorders; Depression; Anxiety; Children; Adolescents

1. Introduction

Eating disorders are increasing in prevalence among adolescents (Fisher et al., 1995; Lucas, Beard, O'Fallon, & Kurland, 1991) and first occurring at increasingly younger ages (Favaro, Caregaro, Tenconi, Bosello, & Santonastaso, 2009). Despite these findings, little research has examined developmental trends in the onset of eating disorder symptoms and their correlates among pre-adolescents. The current study seeks to address gaps in the literature by assessing eating disorder symptom development and its internalizing disorder correlates among children and adolescents from a community sample.

Results from the recent National Adolescent Comorbidity Survey Replication Adolescent Supplement revealed the median ages of onset for Anorexia Nervosa (AN), Bulimia Nervosa (BN), and Binge Eating Disorder (BED) were 12.3, 12.4, and 12.6 years, respectively (Swanson, Crow, Le Grange, Swendsen, & Merikangas, 2011). Although adolescent girls had higher rates of BN and BED than adolescent boys, there was no gender difference for AN (Swanson et al., 2011). Little information about eating disorder symptom levels among children before initial diagnosis is available.

Subclinical disordered eating is more prevalent than full-threshold disordered eating. Moreover, it is dangerous because it puts affected individuals at risk for the subsequent development of clinically significant disordered eating (Bunnell, Shenker, Nussbaum, Jacobson, & Cooper, 1990; Mitchell & Crow, 2006). Subclinical disordered eating has also been associated with poor health-related quality of life and high rates of mood-related psychopathology (Latner, Vallance, & Buckett, 2008). Therefore, understanding emerging patterns of subclinical disordered eating is of clinical importance. Binge eating reportedly occurs in approximately 9% of children ages 8–13 (Allen, Byrne, La Puma, McLean, & Davis, 2008). Although rates of subclinical AN and BN in youngsters are largely unknown, Sancho, Arija, Asorey, and Canals (2007) reported that the point prevalence of Eating Disorder Not Otherwise Specified (EDNOS), a diagnostic category that includes cases of subclinical AN and BN, among children ages 9–13 was 1.84–3.23% for boys and 3.63%– 5.67% for girls.

Most adolescents with an eating disorder meet criteria for at least one comorbid disorder (Swanson et al., 2011); however, information regarding the temporal development of disordered eating symptoms and internalizing disorders among children and adolescents is almost entirely lacking. One previous study demonstrated that among females aged 12–19, initial depression predicted subsequent eating pathology; however, initial eating disorder symptoms did not predict later depressive symptoms (Measelle, Stice, & Hogansen, 2006). To our knowledge, no information regarding the temporal relationship between the onset of anxiety and disordered eating symptoms among youngsters is available. Given the relatively high comorbidity rate between eating and internalizing disorders observed among treatment-seeking adults (Braun, Sunday, & Halmi, 1994) and the increased impairment that accompanies comorbid disorders (Andrews, Henderson, & Hall, 2001), obtaining information regarding the temporal onset patterns between disordered eating and internalizing symptoms among children and adolescents is vital.

There are many theoretical reasons to predict a co-occurrence between eating disorders and depression or anxiety. For instance, researchers have shown that common cognitive styles (e.g., those defined by high perfectionism and low self-efficacy; Abramson, Bardone-Cone, Vohs, Joiner, & Heatherton, 2006) and negative affect (Stice, Presnell, & Spangler, 2002) contribute to the emergence of both eating disorders and depression, whereas personality variables such as perfectionism and harm avoidance are vulnerabilities for both anxiety and disordered eating (Kaye, Bulik, Thornton, Barbarich, & Masters, 2004). Researchers have also demonstrated that hormonal changes that occur during puberty may partially explain the age of onset and gender differences observed these three disorders (Hayward & Sanborn, 2002).

The primary purpose of the current study was to augment existing knowledge by examining developmental trends of eating disorder symptoms among a community sample of children and adolescents. Specifically, we sought to address gaps in the existing literature by: 1. Assessing the prevalence of subclinical eating pathology and internalizing symptoms in children; 2. Determining at which age gender differences in rates of disordered eating symptoms emerge; 3. Examining when during childhood correlations between disordered eating symptoms and depressive and anxious symptoms emerge; and 4. Investigating whether the strength of any observed associations between internalizing symptoms and disordered eating symptoms varies as a function of age and/or gender. We hypothesized that subclinical eating disorder symptom rates would increase during the course of development, and that by adolescence, girls would display higher rates than boys. We further predicted that significant correlations between depressive and anxious symptoms and subclinical disordered eating symptoms would be observed within each age cohort, and that these relations would become stronger among girls than boys as development progressed.

2. Method

2. 1. Participants

Participants were 424 children and adolescents recruited to participate in a study on depression and associated conditions. They were from the third, sixth, and ninth grades at public schools from Colorado and New Jersey. Twenty-seven percent of the sample was in third grade, 38% in sixth grade, and 35% in ninth grade. Youth ranged in age from 7–16 (*M*=12.0; *SD*=2.4). Forty-three percent of the sample was male. The ethnic and racial breakdown of the sample was as follows: Caucasian (68%), African American (7%), Latino (7%), Asian/Pacific Islander (4%), and Mixed Race/Other (14%). Gender and ethnic/racial percentages were similar across the three grade cohorts (gender: *p* = .68; ethnic/racial *p* = . 53).

2. 2. Procedure

Administrators of schools participating in the larger research project on depression and associated conditions sent letters home to parents of third (ages 7–9 years), sixth (ages 10–12 years), and ninth (ages 10–12 years) grade students. Of the families who received the recruiting letters, 1105 contacted the research laboratories to request more information about the study. Of the families who contacted a research laboratory, 639 (57.8%) provided data

that were included in this study. The remaining 466 potential participants' data were excluded for the following reasons: 17 did not meet the study's inclusion criteria (i.e., 4 (1%) had severe learning disabilities (i.e., IQ<70) or autism spectrum disorders and 13 (3%) were non-English speaking), 332 (71%) declined to participate after learning about the study's time commitments, 113 (25%) did not show for their first scheduled assessment, and 4 (1%) provided insufficient information on the eating disorder questionnaire.

Due to time constraints at the assessment appointment, not all participants completed all surveys. Four hundred twenty four (66%) of the 639 children who participated in the larger study on depression completed the eating disorder questionnaire, and they are the focus of the current study. The 215 participants who did not complete the eating disorder questionnaire were compared to the 424 who did to assess whether differences between the subsamples existed. Participants who completed the eating disorder symptom questionnaire did not significantly differ from those who did not complete this questionnaire with regard to family income ($t(599)=1.46$, $p=.15$), depression symptoms ($t(630)=1.28$, $p=.20$), or anxiety symptoms ($t(629)=0.24$, $p=.81$); however, children who completed the eating disorder symptom questionnaire were older on average than those who did not (age: $t(637)=2.13$, $p=.03$; mean age of participants=11.9 and non-participants=11.6).

Participating youth and their parents visited one of the laboratories to complete interviews and questionnaires. Youth provided assent and parents provided informed consent, and were remunerated for their participation. Youth responses on the measures described below were the focus of this study. The Institutional Review Boards at the participating universities approved all procedures.

2. 3. Measures

2. 3. 1. Eating Disorder Diagnostic Scale—The Eating Disorder Diagnostic Scale (EDDS; Stice, Telch, & Rizvi, 2000) contains items assessing the Diagnostic and Statistical Manual of Mental Disorders, fourth edition's (American Psychiatric Association, 2004) diagnostic criteria for AN, BN, and BED, and responses can be used to generate DSM–IV diagnoses for each of those eating disorders. An overall eating disorder symptom composite can also be computed which reflects eating disorder symptom levels, and the composite score was the focus of this study. The composite is computed by summing EDDS items 1–8 and 21 (Stice et al., 2000). In this study, we then divided the EDDS sum score by 19 (i.e., the number of EDDS items that contributed to the composite). Internal reliability in this sample for the symptom composite was acceptable (α=.71). The EDDS has been shown to have high criterion validity when it is compared to the gold standard of eating disorder clinical interviews (i.e., the Eating Disorders Examination; EDE (Fairburn & Cooper, 1993); kappa=.78 (Stice, Fisher, & Martinez, 2004)). It has also shown high internal consistency when used with female adolescents (e.g., internal consistency=.89 (Stice et al., 2004)), although its psychometric properties have not yet been evaluated with young children or male adolescents.

2. 3. 2. Children's Depression Inventory—Depressive symptoms were assessed using the Children's Depression Inventory (CDI; Kovacs, 1985), a self-report measure assessing

depressive symptoms using 27 items. Each item is rated on a scale from 0–2, with the total score ranging from 0–54. Higher scores indicate more depressive symptoms. Internal consistency in this sample was strong, α=.89. The CDI has been shown to have good reliability and validity as a measure of depression in children and adolescents (Klein, Dougherty, & Olino, 2005).

2. 3. 3. Multidimensional Anxiety Scale for Children—The Multidimensional Anxiety Scale for Children (MASC; March, 1997) is a 39-item, 4-point Likert scale, self-report measure of anxious symptoms in children that has undergone extensive psychometric evaluation (March, Parker, Sullivan, Stallings, & Conners, 1998). The MASC provides a composite anxiety score, which was the primary focus of this study. Internal consistency of the MASC composite scale was strong, α=.89. Previous research has shown the MASC to have high reliability and validity in children (Silverman & Ollendick, 2005).

2. 4. Data Analytic Strategy

Analyses were conducted using SPSS version 20. We first conducted a factorial ANOVA to examine the effects of grade, cohort, sex, and the cohort x sex interaction in the prediction of EDDS scores. Next, we examined the strength of the relationship between EDDS scores and depression and anxiety in each of the grade and sex cohorts using Pearson correlation coefficients. Comparisons of the magnitude of correlations between each group were made using the Fisher r-to-z transformation.

3. Results

3. 1. Descriptive Statistics

Descriptive statistics for the full sample, for each grade cohort, and by sex can be viewed in Table 1.

3. 2. Grade, Sex, and Grade x Sex Effects on EDDS scores

A factorial ANOVA was used to examine the impact of grade/cohort, sex, and the grade x sex interaction on eating disorder symptom scores. Results indicated a significant impact of grade cohort on eating disorder symptom level, $F(2, 422)=11.53$, $p<.01$, such that ninth graders had higher scores than third and sixth graders. There was also a significant impact of gender on eating disorder symptom level, $F(1, 423)=11.12$, $p<.01$, such that girls had consistently higher scores than boys. Further, there was a marginally significant grade x sex interaction, $F(5, 419)=3.02$, $p=.05$, such that during the third and sixth grades, girls and boys had equal levels of eating disorder symptoms, whereas during ninth grade, girls had higher levels of eating disorder symptoms than boys (see Figure 1).

3. 3. Comorbidity Patterns of EDDS scores with CDI and MASC scores

See Table 2 for correlations between EDDS, CDI, and MASC scores within the full sample and within each grade cohort.

The magnitude of the correlation between eating disorder symptom and anxiety symptom scores stayed similar throughout each grade cohort. However, the magnitude of the

correlation between eating disorder symptom and depressive symptom scores increased as children got older. Using the Fisher *r*-to-*z* transformation, the increase in the correlation between eating disorder symptom scores and depressive symptom scores from third to sixth grade (*z*= −.92, *p*=.25) and from sixth to ninth grade (*z*= −1.06, *p*=.20) was not significant, whereas the increase in the correlation of eating disorder symptom scores and depressive symptom scores from third grade to ninth grade was significant (z= −1.89, *p*=.02).

The pattern of correlations between eating disorder symptom levels and internalizing symptom levels was also examined separately in each sex. For boys, the magnitude of the correlation between eating disorder symptom scores and anxiety symptom scores decreased over time (third grade *r*=.22, *p*=.11; sixth grade *r*=.05, *p*=.69; ninth grade *r*=.02, *p*=.89), although the decrease in correlation was not significant for any grade-based comparison (third to sixth grade *z*=.92, *p*=.18; sixth to ninth grade *z*=.16, *p*=.87). For boys, the magnitude of the correlation between eating disorder symptom scores and depressive symptom scores increased from third to sixth grade, but then remained stable between sixth and ninth grade (third grade *r*= −.07, *p*=.60; sixth grade *r*=.29, *p*=.04; ninth grade *r*=.25, *p*=. 04; third to sixth grade *z*= −1.95, *p*=.01; sixth to ninth grade *z*=.23, *p*=.41).

For girls, the magnitude of the correlation between eating disorder symptom scores and anxiety symptom scores remained stable over time (third grade *r*=.17, *p*=.20; sixth grade *r*=. 25, *p*=.04; ninth grade *r*=.20, *p*=.06; third to sixth grade *z*=−.49, *p*=.31; sixth to ninth grade *z*=.35, *p*=.36). The magnitude of the correlation between eating disorder symptom scores and depressive symptom scores was stable from third to sixth grade, but then increased somewhat between sixth and ninth grade (third grade *r*=.24, *p*=.07; sixth grade *r*=.24, *p*=.04; ninth grade *r*=.42, *p*<.01; third to sixth grade *z*=.01, *p*=.88; sixth to ninth grade *z*= −1.36, *p*=. 07).

4. Discussion

The current study examined developmental trends in subclinical eating disorder symptoms and associated internalizing symptoms, among third, sixth, and ninth grade children. Results suggest that grade and sex significantly interacted to predict subclinical disordered eating. Specifically, levels of disordered eating were similar among boys and girls during the third and sixth grades, but higher among ninth grade girls than boys. This finding suggests that the well documented gender difference for eating disorders emerges somewhere between the ages of 11.7 (i.e., our mean age for the sixth grade cohort) and 14.7 (i.e., our mean age for the ninth grade cohort). Although epidemiological data for boys are lacking, such data for girls suggest there is a linear increase in eating disorder symptoms between 13 and 18 years (Measelle et al., 2006). It is therefore conceivable that the observed gender difference in disordered eating that emerges during adolescence can be explained by increasing symptom levels among girls and stable symptom levels among boys; however, epidemiologic research conducted on a sample of both boys and girls is needed to evaluate this possibility.

The relationships between eating disorder symptoms and internalizing disorder symptoms within each grade cohort and by sex were also examined. Results indicated the relationship between anxious and eating disorder symptoms was small and largely non-significant among

both genders and across age cohorts. For boys, the relationship between depressive and eating disorder symptoms increased between third and sixth grade and then remained stable between sixth grade and ninth grade. The pattern was different among girls. Specifically, the relationship between eating disorder symptoms and depressive symptoms remained stable between third and sixth grade and then increased between sixth and ninth grade.

Our results have implications for the understanding of developmental pathways relevant to disordered eating and associated internalizing disorders. First, results from our sample suggest that there may be heterotypic continuity underlying the observed eating pathology and depressive symptomology among girls. Specifically, the correlation between depressive and eating symptoms increased among girls between the third and ninth grades in our sample (and the correlation has been shown to rise to .57 by late high school (Santos, Richards, & Bleckley, 2007)). The gender differences for subclinical eating pathology in our sample and those found for depression in other samples (Hankin et al., 1998) begin to emerge at similar ages. Moreover, high rates of full syndromal comorbidity between eating disorders and depression are apparent by adulthood (Hudson, Hiripi, Pope, & Kessler, 2007). Taken together, these findings suggest that a common latent construct may account for both the eating-related and mood-related manifestations observed among adolescent girls as they mature into middle and late adolescence.

Second, our results leave open the possibility that there is a bidirectional relationship between eating pathology and depression. For instance, a common underlying mechanism (e.g., a cognitive style defined by high perfectionism and low self-efficacy (Abramson et al., 2006)) may give rise to both depression and eating problems, and such problems may maintain one another over time. Our results are also consistent with the possibility that there could be a causal relationship between depression and eating. Past studies have demonstrated that high rates of negative affect give rise to heightened eating pathology (Stice et al., 2002), and that depression predicts increased eating pathology over time among girls and boys (Gardner, Stark, Freidman, & Jackson, 2000). Further, a study among a community sample of adolescent girls ages 12–19 suggested that initial depression predicted increased eating pathology over time, but not vice versa (Measelle et al., 2006). Clearly, additional longitudinal studies and studies involving boys are needed.

Our results are also relevant to the conceptualization of the relationship between anxious and disordered eating symptoms. Past researchers have shown anxiety disorders and subclinical eating disorders to exist comorbidly among adolescent girls (mean age=16; e.g., Touchette et al., 2011; Zaider, Johnson, & Cockell, 2000); however, we failed to find a significant association between anxious and disordered eating symptoms among boys or girls in our sample. Epidemiologic research indicates that anxiety disorders often emerge during childhood and precede the development of eating disorders (Godart, Flament, Lecrubier, & Jeammet, 2000); therefore, it is possible that the youth we observed had yet to develop a co-occurrence between anxious and disordered eating symptoms. It is also possible that the co-occurrence of anxious and disordered eating symptoms that is often observed during late adolescence may be mediated by depressive symptoms. Finally, our findings might diverge from those of the Zaider et al. (2011) and Touchette et al. (2000) studies because we examined anxious and disordered eating symptoms, whereas the other research teams

examines clinically significant syndromes. Future research should attempt to further clarify the relationship between anxiety and disordered eating among adolescents.

Finally, our results indicate that eating disorder prevention programs should be in place before the ninth grade. Two empirically-based prevention programs for eating disordered attitudes and behaviors have been detailed elsewhere (Stice, Marti, Spoor, Presnell, & Shaw, 2008). The first is a dissonance-based program, in which the thin-ideal internalization is challenged through a variety of tasks aimed at increasing cognitive dissonance. The second is a healthy weight intervention in which participants implement a healthy lifestyle change plan that incorporates nutritious eating and regular physical activity. Although these programs have been shown to prevent the onset of future eating disorders, they have typically been used with female adolescents. As a result, future research is needed to determine whether they can be effectively modified for effective use with boys and with younger populations (i.e., children in the sixth and seventh grades).

Our results additionally suggest prevention programs that simultaneously address disordered eating and depressive symptoms may be of use. One promising approach may be using a transdiagnostic prevention program based on interpersonal psychotherapy (IPT (Klerman, Weissman, Rounsaville, & Chevron, 1984)), as interpersonal psychotherapy is an empirically-based treatment for depression (Elkin et al., 1989; Cuijpers et a., 2011), BN (Agras, Walsh, Fairburn, Wilson, & Kraemer, 2000), and BED (Wilson, Wilfley, Agras, & Bryson, 2010). Further, IPT-based programs have also been shown to effectively prevent depression among adolescents (Young, Mufson, & Gallop, 2010) and weight gain among adolescent girls at risk for becoming obese (Tanofsky-Kraff et al., 2010). Future research should examine the possibility that an IPT-based prevention program could thwart the development of both depressive and disordered eating symptoms among adolescents.

Although it was not a primary goal of the current study, the results of this study add to the literature by describing EDDS (Stice et al., 2000) scores among a community sample of third, sixth, and ninth grade children. To date, normative scores for the EDDS composite have been lacking in the literature. However, unpublished data that we collected using the EDDS from a different sample of sixth through tenth grade girls and boys were strikingly similar to the data obtained from the current sample. Specifically, our past data collection resulted in a mean composite eating disorder score of 1.1 (*SD*=.41) for girls and 1.0 (*SD*=. 30) for boys (Holm-Denoma & Hankin, 2010). Future research is needed to determine whether the EDDS score ranges our research team observed will be replicated among other comparable samples.

Several limitations of the current study should be noted. First, although symptoms of eating, anxiety, and depressive disorders were evaluated using well-validated measures, actual diagnoses were not assessed during the current study. As a result, it is unclear whether developmental trends observed in symptom-level data reflect developmental trends of clinically significant eating, anxiety, and depressive disorders. Despite this fact, it has been well-documented that subclinical eating pathology is associated with poor quality of life (Latner, Vallance, & Buckett, 2008), and that there is a negative correlation between degree of eating pathology and quality of life (Bamford & Sly, 2011).

An additional limitation is that all data were self-reported by children. Biases that occur in self-report measurement methods have been well-documented (Paulhus, 1991); however, past research has demonstrated that self-report dimensional symptom scales predict subsequent, full-threshold diagnoses (Shankman et al., 2009) and psychosocial problems (Gotlib, Lewinsohn, & Seeley, 1995). Future researchers should assess the constructs of interest using a multi-method, multi-informant approach. Finally, as noted above, our cohort design allowed us to assess patterns of symptomatology at different ages; however, longitudinal designs are better suited to evaluate developmental trajectories.

Acknowledgments

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Highlights

- Examined when sex differences for eating disorder and internalizing symptoms emerge

- Used a community sample of 3rd through 6th grade boys and girls

- Gender differences in eating disorder symptoms appear between 9th and 12th grade

- Anxiety and eating disorder symptoms are unrelated

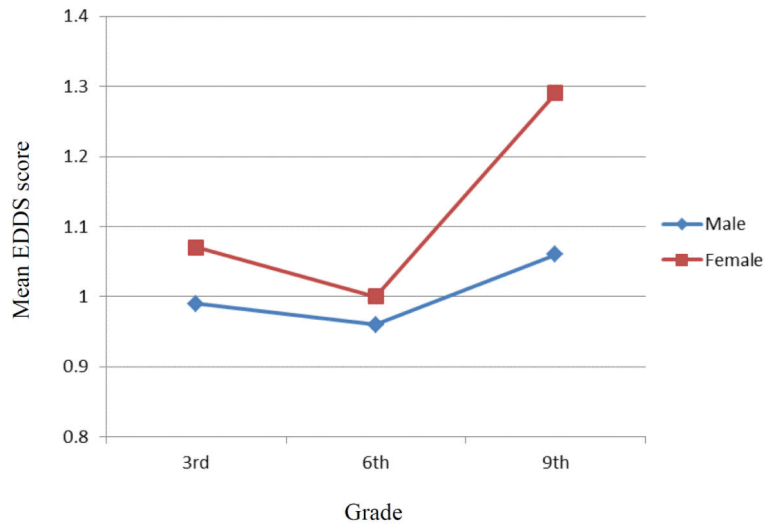- Eating disorder and depressive symptoms increase over the course of development

Figure 1.
Mean Eating Disorder Diagnostic Scale (EDDS) scores by grade and gender.

Table 1

Mean scores and standard deviations for the EDDS, CDI, and MASC

	All Grades			Third Grade			Sixth Grade			Ninth Grade		
	Full Sample	Girls	Boys	Full Sample	Girls	Boys	Full Sample	Girls	Boys	Full Sample	Girls	Boys
EDDS	1.1 (0.4)	1.1 (0.4)	1.0 (0.3)	1.0 (0.4)	1.1 (0.4)	1.0 (0.3)	1.0 (0.3)	1.0 (0.3)	1.0 (0.3)	1.2 (0.5)	1.3 (0.5)	1.1 (0.3)
CDI	7.0 (5.8)	7.2 (5.9)	6.7 (5.7)	6.3 (5.6)	6.8 (6.0)	5.8 (5.2)	5.9 (4.9)	5.9 (4.8)	5.9 (5.1)	8.7 (6.5)	9.0 (6.5)	8.3 (6.5)
MASC	41.6 (15.6)	44.1 (15.4)	38.6 (15.3)	45.1 (16.9)	49.4 (16.9)	40.5 (15.8)	40.1 (13.7)	41.4 (13.9)	38.3 (13.4)	40.4 (16.0)	42.8 (15.0)	37.2 (16.7)

Note: Scores are listed as M (SD). EDDS: Eating Disorder Diagnostic Scale (Stice, Telch, & Rizvi, 2000); CDI: Children's Depression Inventory (Kovacs, 1985); MASC: Multidimensional Anxiety Scale for Children (March, 1997).

Table 2

Correlations between the EDDS, CDI, and MASC

FULL SAMPLE			
	EDDS	CDI	MASC
EDDS		.33**	.18**
CDI			.26**
THIRD GRADE			
	EDDS	CDI	MASC
EDDS		.15	.22*
CDI			33**
SIXTH GRADE			
	EDDS	CDI	MASC
EDDS		.26**	.18*
CDI			27**
NINTH GRADE			
	EDDS	CDI	MASC
EDDS			.18*
CDI			

Notes:

*
$p < .05$;

**
$p < .01$