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Identifying Trajectories of Adolescents' Depressive Phenomena: An Examination of Early Risk Factors

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Abstract

Few studies have examined risk factors of childhood and early adolescent depressive symptomatology trajectories. This study examined self-report depressive symptomatology across a 6-year time period from 2nd to 8th grade to identify latent groups of individuals with similar patterns of depressive phenomena in a sample of 951 children (440 girls, 511 boys). Analyses, using semiparametric group modeling (SGM), identified 5 trajectory groups for girls and boys: low depressed stables, low depressed risers, mildly depressed stables, moderately depressed changers, and moderately depressed risers. Individual risk factors, with the exception of shy/withdrawn behavior, were significantly different across trajectory group membership for boys and girls, as was low-income status for boys. Boys in the low depressed and mildly depressed stable trajectory groups had significantly higher levels of antisocial behavior, attention problems, and lower social competency compared to girls in similar groups. These results suggest that universal prevention programs implemented in early elementary school that target selected risk factors may be helpful in reducing future adolescent mental health problems, specifically depressive symptomatology.

Keywords

Trajectories; Children's Depression; Early Risk Factors

Depression in children and adolescents continues to be a serious problem (Jellinek & Snyder, 1998) and has been a major focus for youth mental health prevention and intervention programs (Lewinsohn, Gotlib, & Seeley, 1995; Reinherz, Giaconia, Carmola Hauf, Wasserman, & Paradis, 2000). The prevalence of major depressive disorder in elementary school children ranges from 2% to 5% (Reynolds & Johnston, 1994) and increases significantly to 15% to 20% among adolescents (Lewinsohn, Clarke, Seeley, & Rohde, 1994). Understanding the early risk factors would be an important first step for developing prevention and intervention programs.

The focus of research on depression is complicated by the lack of a standard definition in using the term “depression” (Compas, Ey, & Grant, 1993), thus making it difficult to compare results of research across studies. One approach to mitigate the confusion has been to use three categories that represent the continuum of depression and/or depressive symptomatology: depressed mood, depressive syndrome, and depressive disorders (Compas et al., 1993; Hammen & Compas, 1994). These categories are not mutually exclusive and have been collectively referred to as depressive phenomena (see Compas et al., 1993 for more detail). For consistency purposes of this literature review, we will refer to depressive categories when they are known, otherwise the terminology of depressive phenomena or depressive symptomatology will be used.

Several studies have identified risk and protective factors related to adolescent depressive symptomatology (Duggal, Carlson, Sroufe, & Egeland, 2001; Lewinsohn et al., 1995; Mazza et al., in press). However, recent research focusing on the episodic versus chronic nature of depressive symptomatology has implications for studying the prediction of adolescent depression. Different developmental trajectories may exist among adolescents and analyses based on a single point-in-time measurement of depressive symptomatology may underestimate the strength of predictors (Heath & Camarena, 2002; Holsen, Kraft, & Vitterso, 2000). While these studies have been important in identifying different stability or episodic patterns of depression during adolescence, childhood risk factors that may be precursors or may differentiate individuals on various developmental depressive phenomena trajectories have not been examined. Thus, the aims of this study are to identify depressive phenomena trajectories for boys and girls and to examine the risk factor levels within and across the identified trajectories groups.

Depressive Symptom Trajectories

Research identifying different developmental trajectories of depressive symptoms in adolescents sheds light on the episodic versus chronic (stability) nature of depression (Heath & Camarena, 2002; Holsen et al., 2000). Heath and Camarena conducted a 3-year longitudinal study with 268 adolescents using six half-yearly measurements starting during the fall of sixth grade, and using quantitative and qualitative methods, identified six separate trajectories. Of the six trajectories, three of them were stable, described as low, medium, and high levels of depressive affect over time. Only one pattern was episodic, while the other two were identified as “decreasers” and “increasers.” In a 6-year longitudinal study of 538 adolescents, Holsen et al. (2000) assessed depressed mood/depressive tendencies at ages 13, 15, 18, and 19, and found relative stability in the four trajectory groups based on their quartile depressed mood score at age 13. In addition, Holsen and colleagues showed that “trait” or stable depressed mood was more prevalent during later adolescence while episodic or “state” depressed mood was more characteristic during early adolescence. In sum, these two studies suggest that heterogeneous depressive trajectories can be identified for groups of individuals during adolescence. We are not aware of any study that has examined childhood risk factor levels within and across these trajectory groups.

Risk Factors and Depression

Individual Risk Factors

Child and adolescent depressive symptomatology are frequently comorbid with other psychological problems such as anxiety, antisocial behavior (e.g., conduct disorder and oppositional disorder), and attention difficulties (Angold & Costello, 1993; Axelson & Birmaher, 2001; Barkley, 2003; Mesman & Koot, 2000). In reviewing epidemiological studies, Angold and Costello reported a high comorbidity rate of child and adolescent depressive disorder with anxiety, ranging from 30% to 75%. Similarly, Axelson and

Birmaher (2001) reported that approximately 25% to 50% of depressed youth have comorbid anxiety disorders while approximately 10% to 15% of anxious youth have depressive disorder. Thus, future research needs to account for the overlap between anxiety and depressive symptomatology.

The comorbidity rate of antisocial problems with child and adolescent depressive disorder is similar to that of anxiety (Angold & Costello, 1993). In research by Angold & Costello (1993), conduct and oppositional defiant disorders had a comorbidity rate with child and adolescent depressive disorders ranging from 21% to 83%. In addition, there is evidence that antisocial problems predict later internalizing problems and depressive symptomatology (Mesman, Bongers, & Koot, 2001). Mesman and colleagues (2001) found that teachers' report of oppositional and aggressive behaviors at ages 2 and 3 was predictive of internalizing problems for girls but not for boys. Mazza and colleagues (in press), in a longitudinal study of first and second graders followed annually through eighth grade, found that a composite rating of teacher, parent, and self-report of antisocial behavior during first and second grade was significantly predictive of adolescent depressive phenomena (self-reported) in eighth grade. The findings from these studies suggest that early antisocial behavior may play an important role in adolescent depressive symptomatology.

The relationship of social skills and social withdrawal in the development of depressive symptoms also has been widely examined (Rudolph, Hammen, & Burge, 1994). Mesman and Koot (2000) reported that preschool teachers' ratings of students' social problems and withdrawn behavior were predictive of preadolescent depression severity 6 years later. In addition, Altmann and Gotlieb (1988) found that depressed youth (based on depressive symptomatology) spent more time alone and viewed themselves as less socially competent than their nondepressed peers. These findings suggest that social behaviors also may play a part in subsequent depressive phenomena.

The relationship of attention difficulties and depressive symptomatology is fairly well established (Cuffe et al., 2001; Faraone & Biederman, 1997; Spencer, Wilens, Biederman, Wozniak, & Harding-Crawford, 2000). Research examining the comorbidity rates of ADHD with mood disorders, namely depression, has estimated the rate to be 20% to 30%. Angold and colleagues (1999) reported that youth who have ADHD have a 5.5 times greater likelihood of having co-occurring depressive disorder compared to non-ADHD peers. However, it should be noted that several researchers have found that the relationship between attention problems and depressive disorder may be accounted for by the fact that ADHD often co-occurs with conduct disorder (Angold et al., 1999; Fischer, Barkley, Smallish, & Fletcher, 2002).

These individual risk factors are important to highlight for the current study because they provide empirical evidence of their relationship to depressive symptomatology in early adolescents. Missing from the current literature is whether these risk factor levels during childhood are related to different patterns of depressive symptomatology. Research is needed which examines the risk factor relationships among girls and boys and highlights the risk factor relationship similarities and differences in adolescent depressive phenomena.

Familial and Parental Risk Factors

Familial and parental risk factors predict adolescent depressive symptomatology (Bond, Toumbourou, Thomas, Catalano, & Patton, 2005; Formoso, Gonzales, & Aiken, 2000). Family conflict, for example, has been found to predict children's depressive symptoms (Bond et al., 2005; Formoso et al., 2000). Lewinsohn and colleagues (1995), in a 14-month longitudinal study of adolescents, found that youth conflict with parents was significantly predictive of adolescents having depressive symptomatology compared to peers. Mazza and

colleagues (in press) found that family and marital conflict at first and second grade were predictive of depressive phenomena 7 years later. Bond and colleagues (2005), in a study of 8,984 students in 7th, 9th, and 11th grade in Australia, reported that family conflict was the strongest correlate of adolescent depressive symptomatology.

Parents' stressful life events also affect child and adolescent mental health (Hammen, 1992). Hammen reported that children exposed to high levels of parental stress are often at greater risk for depressive syndrome than those who are not. One such stressful life event is divorce, which has been identified as one of the critical stressful events that increases depression in adolescents (Aseltine, 1996). Similarly, early maternal stress predicted childhood depressive symptomatology, while later maternal stress predicted depressive syndrome during adolescence (Duggal et al., 2001). These findings suggest that parents' stress levels and parents' relationships with each other impact childhood and adolescent mental health and need to be examined.

Depressive phenomena in parents, and especially maternal depression, is also a significant predictor of child and adolescent depressive symptomatology (Duggal et al., 2001). Cortes and colleagues (2006) found that maternal depressed mood was a significant predictor of children's level of depressive phenomena, and that girls of depressed mothers continued to show elevated levels of depressive phenomena as they entered adolescence, although this was not the case for boys. Weissman and colleagues (1984), in a clinical study of 194 children of parents with major depressive disorder, reported that children with depressed parents were 3 times more likely to receive a diagnosis of depression compared to those children with nondepressed parents. Although the genetic transmission of depression to offspring has been well documented (Weissman et al., 1984), Downey and Coyne (1990) have reported that genetics alone cannot account for the strong relationship between parental and childhood depressive phenomena. Duggal and colleagues (2001) reported that maternal depressive symptomatology was no longer a predictor of childhood depression when early supportive care was entered into the model. Thus, further research into the role of parents' depressed mood or symptomatology in the presence of other risk factors is warranted.

Finally, parents' socioeconomic status (SES) has been found to be a predictor of children's depression in numerous studies, with increased poverty being linked to increased depressive symptomatology (McLeod & Nonnemaker, 2000). However, Barrera and colleagues (2002) argue that this relationship is more a reflection of the financial hardship being exerted through parents and other home environment factors, rather than a direct relationship between SES and youth depressive symptomatology. Thus, future research needs to examine this relationship in the presence of other familial and parental risk factors to determine the contribution of SES on youth depressive phenomena.

The studies cited above highlight the impact of familial and parental risk factors on child mental health, and in particular, depressive symptomatology. In addition, these selected risk factors also provide a measure of the child's home environment, and, thus, including them in the analyses allows the examination of the relationship of home environment to depressive phenomena trajectories.

School Risk Factors

For school-age youth, achievement in school and depressive symptoms show an important longitudinal relationship (Eggert, Thompson, Herting, & Nicholas, 1995; Lewinsohn et al., 1995). Loeber and colleagues (2001) conducted a longitudinal study using overlapping cohorts of 500 boys in first, fourth, and seventh grades. Results from this study showed that low achievement rated by self, parents, and teachers during the 1st year of this study was a strong predictor of depressed mood in all three samples 13 years later. Likewise, Lewinsohn

and colleagues (1995) reported that self-reported dissatisfaction with academic grades predicted adolescent depressive symptomatology 14 months later. In a study of at-risk youth, Eggert and colleagues (1995) found that adolescents who had low GPAs or a high number of absences had higher depressive symptomatology scores than those with higher GPAs. These findings suggest that school achievement is an important longitudinal risk factor that needs to be examined in relation to adolescent depressive symptomatology.

Research regarding academic achievement has focused primarily on adolescents, with the exception of the study by Loeber and colleagues (2001) which examined only boys. Thus, the relationship of childhood school achievement to depressive symptomatology remains minimally studied, especially among girls. Including this risk factor in the current study provides information from another childhood environment and complements the parent- and self-report informant data.

Gender Differences and Risk Factors

Gender has been identified as a significant predictor of adolescent depressive phenomena (Duggal et al., 2001; Meadows, Brown, & Elder, 2006). The prevalence of depressive disorders for children under the age of 10 is approximately equal for males and females (Jellinek & Snyder, 1998). This changes dramatically when youth reach adolescence, with females 3 times more likely to experience depression than males (Heath & Camarena, 2002). There is some evidence that family environment factors, such as emotional support and maternal depressive disorder, may be predictive of childhood depressive symptomatology among females but not males (Cortes et al., 2006; Duggal et al., 2001). Similarly, parent-child involvement, quality of interaction, and household stress were predictive of adolescent depressive symptomatology for boys, while factors associated with personality and attitudinal dimensions were more predictive for girls (Sroufe & Egeland, 1991). Thus, specific environmental factors may have differential relationships with youth depressive phenomena depending on gender.

Current Study

This study has three goals. The first is to model separately for girls and boys in the Raising Healthy Children sample the longitudinal patterns of depressive phenomena during childhood and early adolescence. If different trajectory groups are identified, the second goal is to examine the risk factors associated with group membership within gender. The third goal is to determine if within trajectory groups common to girls and boys there are differences by gender in mean levels of the selected risk factors. Based on the studies cited above, we hypothesize that different trajectory groups will be identified (between four to six) for each gender. In addition, we hypothesize that girls in different trajectory groups will differ on internalizing risk factors (i.e., anxiety, parent depression, and shy/withdrawn); while differences among boy trajectory groups will be on the externalizing risk factors (i.e., attention difficulties and antisocial behavior). Finally, we hypothesize that within trajectory groups common to girls and boys, girls will show mean-level differences on the internalizing risk factors while boys will show mean-level differences on the externalizing risk factors.

Method

Sample

The data used for this study are part of a longitudinal study called Raising Healthy Children (for details see Haggerty, Catalano, Harachi, & Abbott, 1998). Raising Healthy Children (RHC) is a study of the etiology of positive and problem behaviors with a randomized test of a preventive intervention nested within it. The intervention was delivered at five of the

project elementary schools and consisted of instructional staff development for teachers; parenting workshops; social, emotional and cognitive skills training for students in classrooms and a variety of after-school settings; and home-based case management services for high-risk students who exhibited academic or behavioral problems. Additional details regarding the RHC intervention have been reported by Brown, Fleming, Catalano, Abbott, and Haggerty (2005), Catalano et al. (2003), and Haggerty and Cummings (2006).

The sample consisted of students who were enrolled in first and second grade in 10 suburban public elementary schools in a Pacific Northwest school district in 1993. After being matched on variables known to be associated with drug use (low-income status, ethnicity, single-parent family, low reading scores, high absenteeism, and mobility), schools were randomly assigned to either the intervention or control condition. Eligibility criteria for student participation in data collection included: being in first or second grade, attending a mainstream classroom, remaining in the project school from baseline (fall of 1993) through the completion of the first student survey by June 1994, and having a parent who spoke English, Spanish, Korean, or Vietnamese.

The parents of 938 of the 1,239 first- and second-grade students eligible for participation consented to participate. An additional sample was drawn during the 2nd year of the project using the same eligibility criteria, adding 102 students who had enrolled into one of the project schools during the 2nd year, to bring the total sample size to 1,040. Of the original sample who consented to participate in the RHC study, 951 children (440 girls, 511 boys) were included in the analyses based on availability of depression scale scores at second grade and at least three additional time points through eighth grade.

The 951 children included 81% European American, 7.3% Asian/Pacific Islander, 4.3% African American, 4.5% Hispanic, and 2.9% Native American students. Forty-six percent of the students are female. Twenty-nine percent were considered low income based on parental report of receiving public assistance, food stamps, or qualifying for the free/reduced lunch program. The analysis sample did not differ significantly ($p < .05$) from the 89 participants from the original sample who were excluded from the analysis (because they lacked data on depressive symptoms) with respect to ethnic composition, gender, or low-income status. The completion rate for child surveys was 98% at the 2nd year, decreasing slightly each year to 90% in the 8th year. At second grade, parent survey data was available for 94% of the sample and teacher survey data was available for 95% of the sample. Data over the 6 years was collected during the spring of each academic year, thus approximating 1-year intervals between data collection time points. Since the focus of this study is on early risk factors, these variables were measured at second grade, the earliest common grade for all participants.

Procedures

Procedures and data collection were approved by the Human Subjects Committee at the University of Washington. The school principal and the principal investigator contacted eligible families by mail, followed by personal visits from project staff to explain the study and gain written voluntary consent. Telephone interviews with parents were conducted annually by trained interviewers. The student survey was administered annually by staff interviewers at school. As an incentive, parents received \$20 and students received a small gift for completing the surveys.

Measures

Because the sample was in first and second grade when data collection began, we used Grade 2 data as baseline to include everyone at approximately the same grade level and to

be consistent across the sample. Item responses were coded for all measures so that higher scores reflected greater amounts of the indicated construct. Each measure is described in detail below:

Depressive phenomena (self-report)—Students completed a self-report depressive phenomena measure composed of 6 selected items from the 10-item depression scale on the Seattle Personality Questionnaire (SPQ) (Greenberg, 1990). These items assessed depressive symptoms such as sleep difficulties, wanting to be alone, feeling tired, and feeling like crying. Items were scored on yes (1)/no (0) format for ages 6 and 7 due to the developmental age of the participants. The same depression scale was used throughout the study. However, during the third assessment period, the items were scored on a 4-point Likert scale from 1 to 4 to provide a greater range of depressive symptomatology frequency. This measure has been used successfully in other research studies (Cortes et al., 2006; Mazza et al., in press).

Given that the trajectory groups are based on the depressive phenomena measure, thorough psychometric information regarding this scale is provided. The internal consistency reliability for the 6-item scale ranged from $r_\alpha = .66$ (Grade 2) to $r_\alpha = .75$ (Grade 8), compared to $r_\alpha = .74$ for the full 10-item scale on the SPQ (N. Riggs, personal communication, 2003). Content validity was established by examining the content of the six items, which corresponded to similar items on other gold standard child depression self-report measures such as the Child Depression Inventory (Kovacs, 1992) and the Reynolds Child Depression Scale (Reynolds, 1989). Strong concurrent validity was established for this scale by comparing it with the larger 10-item depression scale on the SPQ; the resulting correlation coefficient was $r = .90$ (N. Riggs, personal communication, 2003). Construct validity was also established in prior research (Cortes et al., 2006) with children, showing a moderate correlation to anxiety ($r = .54$) and antisocial behavior ($r = .48$).

Anxiety scale (self-report)—The self-report anxiety measure was composed of four items: feeling afraid a lot of the time, being afraid to try new things, worrying that other kids don't like you, and worrying about being teased. Similar to the depression scale, the item format for this scale was yes/no, with a range of 0 to 1. For the current sample, the Cronbach's alpha at second grade was $r_\alpha = .73$. Prior research (Cortes et al., 2006; Mazza et al., in press) with this measure reported a moderate correlation ($r = .54$) with self-reported depressive phenomena among elementary students.

Peer rejection (self-report)—The peer-rejection measure consisted of two items that were scored as Yes/No. This measure examined the perception of the child's peer alienation at school. The items were "do you have kids in your class to play with" and "do you have friends in your class." The correlation between the two items was $r = .54$.

Antisocial behavior (self-report)—The student self-report antisocial behavior scale consisted of eight items using a yes/no format that measured behaviors such as telling lies, breaking things on purpose, and taking things that are not yours. This antisocial scale has been used in several other research studies examining elementary school behavior (Catalano et al., 2003; Cortes et al., 2006; Hawkins et al., 2003). The internal consistency reliability of the antisocial scale for second grade was $r_\alpha = .69$. Construct validity was established from prior research (Cortes et al., 2006) and indicated a moderate correlation with self-reported depressive phenomena ($r = .48$) and a weak correlation with anxiety ($r = .27$).

Shy/withdrawn (teacher report)—Shy/withdrawn was measured by four items from the teacher-report Child Behavior Checklist (Achenbach, 1991). Students were rated on various aspects of shyness and withdrawal including shy/timid and not getting involved with others. The internal consistency reliability of the shy/withdrawn measure was $r_\alpha = .74$.

Social competency (teacher report)—The social competency measure was composed of nine items on the TOCA-R (Werthamer-Larsson, Kellam, & Ovesen-McGregor, 1990). Item content areas included cooperates with peers, listens to others, shares things, and accepts responsibility for actions. The internal consistency reliability coefficient for the nine-item scale at second grade was $r_{\alpha} = .94$.

Attention problems (teacher report)—Attention problems was measured using five items from the Teacher Observation of Child Adaptation – Revised (Werthamer-Larsson et al., 1990). Items assessed the areas of sitting still, mind wandering, easily distracted, and paying attention. The internal consistency reliability coefficient for the five items was $r_{\alpha} = .69$.

Parent depressive phenomena (parent report)—The parent depression measure consisted of 11 items and was completed by the primary caretaker to examine his/her own depressive symptomatology ($\alpha = .70$). The scale used a time-delineation statement of “within the past 6 months was there a time that lasted for 2 weeks or more when...” Items examined symptomatology such as thought about or attempted suicide, feeling sad or blue, feeling guilty, loss of interest, sleeping difficulties, and concentration difficulties.

Stressful life events (parent report)—The stressful life event measure was an index based on the number of the following stressful events experienced in the prior year: a serious accident, financial difficulties, parent divorce or separation, and major illness.

Family conflict (parent report)—The family conflict scale was composed of eight items adopted from the Moos' Family Environmental Scale (1974) to measure behaviors such as family members showing anger openly, criticizing each other, hitting each other, and fighting a lot. The internal consistency of this eight-item scale was $r_{\alpha} = .70$.

Low income (parent report)—Family income status (low = 1, not low = 0) was assessed by the dichotomous measure of whether the parent reported receiving public assistance in the form of AFDC or food stamps or qualifying for the free/reduced price lunch program.

Academic performance (teacher report)—The academic performance scale consisted of two items and was completed by the second-grade teacher. The two items asked parents to rate their child's performance in math and reading in second grade. Items were scored on a 5-point Likert scale that ranged from 1 (far below average) to 5 (superior). The correlation coefficient between the two items was $r = .72$.

Analysis

Data analyses were conducted using Statistical Package for the Social Sciences (SPSS[®]) 10.0 and SAS 8.02.1 Preliminary t-tests were conducted examining gender differences on the 11 selected risk factors and on measures of depression at second and eighth grades. T-tests examining the selected risk factors and depressive phenomena were based on the Bonferonni method to control for Type I error.

In order to address the first purpose of the study, depressive phenomena trajectory groups were identified using Semiparametric Group Modeling (SGM) (Nagin & Tremblay, 1999;

¹Since some of the students in this sample are part of the program condition in a prevention experiment, preliminary analyses were conducted to examine whether the program affected the predictive relationships among experimental and control groups. The results indicated that the covariance structures were not different between experimental and control groups, nor did depressive symptoms trajectory group membership differ by experimental condition. Based on these results, the data for the experimental and control groups were combined in the subsequent analyses.

Nagin, 1999; Nagin & Land, 1993). SGM models describe heterogeneity in repeated measures data by estimating the probabilities of group membership, where groups are defined by distinct developmental trajectories. As pointed out by Nagin and Tremblay (1999), SGM can be used under the assumption that boundaries between groups are fluid and the population is distributed along a multivariate continuum.

The initial SGM phase determined the number of trajectory groups that best describe the data. SGM takes advantage of the time-ordered nature of the data and is able to include participants who do not have data at all time points, although we required cases to have a minimum of three time points for these analyses. We selected the number of latent classes based on the Bayesian Information Criterion (BIC) (Kass & Raftery, 1995; Raftery, 1995), theory, and findings of prior research (Muthen, 2003). SGM models were run separately for girls and boys. Individual cases were assigned to the trajectory group that best conformed to their observed behavior according to the maximum posterior probability of group membership.²

For the second purpose, one-way ANOVAs (with Bonferonni-adjusted p-values for pairwise comparisons) were conducted to test whether trajectory groups differed on each risk factor for boys and girls separately. This approach is consistent with a risk factor perspective that attempts to establish overall associations as the first step in identifying predictive hypotheses.

Finally, in addressing the third purpose, boys and girls were included within the same analyses and comparisons within common trajectory groups were then used to compare the level of risk factors between girls and boys.

Results

Descriptive Results

The means and standard deviations of the risk factor variables measured at second grade are presented in Table 1. As expected, boys had significantly higher scores on measures of attention problems and antisocial behavior, while girls scored higher on teacher-reported social competency and anxiety. In examining gender differences in depressive symptomatology scores from second through eighth grade, only eighth-grade depression scores were significantly different, $t(908) = 2.71, p < .01$, with eighth-grade girls reporting higher levels of depression severity than eighth-grade boys.

Semi-parametric Group Modeling of Depression Trajectories

We tested SGM models, modeling one to six trajectories, with each group's trajectory described by a second-order polynomial function containing an intercept, linear slope, and quadratic term. For girls, the five-trajectory-group model had the best fit, as indicated by the lowest absolute value for the BIC statistic. We also used the five-trajectory-group model for boys because the distribution of boys in the five-group model was consistent with other research (Kovacs, 1992; Reynolds, 1989) examining childhood depressive symptomatology scores in school-based populations, and the BIC indicated that the five-group model fit the boy's data. The trajectories for the five groups are shown in Figures 1 and 2 for girls and boys, respectively. Because the shape of the corresponding trajectories was similar for girls and boys, we used consistent labels to describe the five groups as "low depressed stables,"

²It should be noted that SGM was also done using Mplus, allowing the slopes to be free rather than fixed (i.e., Nagin, 1999). Results of the Mplus analyses were similar to the Nagin analyses, and given the parsimonious structure of the Nagin method, we choose this methodology.

“low depressed risers,” “mildly depressed stables,” “moderately depressed changers,” and “moderately depressed risers.”

Within-gender Comparisons

The results of the one-way ANOVA comparisons within gender across trajectory group membership are presented in Tables 2 and 3. For girls, five of the six individual domains showed significant differences across trajectory membership, with those in higher depression trajectory groups showing greater levels of severity on the risk factors than girls in the low depression trajectory groups. The one individual risk factor that was not significant was shy/withdrawn. None of the family or school factors were significantly related to trajectory group membership.

Similar findings were reported for boys, and again, only shy/withdrawn was not significant across male depression groups. However, the family risk factor of low income was significant across depression groups, with those in the low depressed trajectory group having significantly higher levels of income compared to the mildly depressed group.

Gender Differences Within Trajectory Membership

Gender differences were found across several different risk factors measured in the second grade. Results showed that girls experienced higher levels of anxiety compared to boys only when they were in the low depressed risers trajectory group, [$F(1, 941) = 10.03, p = .002$]. For attention difficulties, boys experienced higher levels of attention problems for each trajectory group compared to the respective trajectory group for girls. In examining family conflict, boys in Trajectory Group 3 (mildly depressed stables) experienced higher levels of family conflict compared to girls in the same trajectory group, $F(1, 908) = 5.50, p = .019$. For antisocial behavior, boys scored higher than girls in the low depressed risers (Group 2), $F(1, 941) = 9.45, p = .002$, in the mildly depressed stables (Group 3), $F(1, 941) = 12.34, p < .001$, and in the moderately depressed changers (Group 4), $F(1, 941) = 11.39, p = .001$. For social competency, girls were significantly higher than the boys in the same trajectory group except for the moderately depressed risers (Group 5): in the low depressed stables, $F(1, 928) = 8.90, p = .003$, in the low depressed risers, $F(1, 928) = 7.16, p = .008$, in the mildly depressed stables, $F(1, 928) = 22.09, p < .001$, and in the moderately depressed changers, $F(1, 928) = 3.94, p = .047$. For the mildly depressed stable group, boys were more likely than girls to come from a low-income environment, $F(1, 941) = 5.08, p = .024$.

Discussion

The findings of this study help fill in gaps in the literature regarding early risk factors for adolescent depressive phenomena. The identification of similar depressive phenomena trajectory patterns among girls and boys allowed us to further examine the risk factor relationships within each trajectory group as well as within gender. These additional results provided some unexpected findings, especially among girls, that have implications for youth prevention and intervention programs focused on depressive symptomatology. Our findings and their implications are discussed below.

Depressive Phenomena Trajectories

This study identified five distinct groups based on trajectories of depressive phenomena using growth mixture modeling with data from second through eighth grade: low depressed stables, low depressed risers, mildly depressed stables, moderately depressed changers, and moderately depressed risers. For girls and boys, the five-group model provided good fit and was consistent with previous research regarding the distribution of participants in the various groups (Kovacs, 1992).

The pattern of trajectory findings was similar to other results that examined chronic versus episodic depressive symptomatology in middle school and high school adolescents (Heath & Camarena, 2002). The low and medium stable groups in the Heath and Camarena study are consistent with our low depressed stables (Group 1) and mildly depressed stables (Group 3) groups. Similarly, Heath and Camarena's episodic group was similar to our moderately depressed changers group (Group 4), where both girls and boys in our study showed an increase in depression severity in elementary school, but then dropped to baseline levels or lower in middle school. Their "high stable/chronic" group matched well with our moderately depressed risers (Group 5), and our low depressed risers (Group 2) showed a similar pattern to Heath and Camarena's "increasers." Moreover, risk factors of these different trajectory groups were identified, suggesting that several risk variables, i.e., anxiety, antisocial behavior, and attention problems, were significant for boy and girls and are promising targets for mental health prevention and intervention programs as early as second grade.

Gender Differences

Gender differences were found within the five trajectory groups, yet the differences were not consistent across group membership, which was unexpected. For example, boys showed higher levels of antisocial problems, attention difficulties, and lower social competency than girls in both the low depressed risers and the mildly depressed stables. Yet these findings were not present in the lowest or highest trajectory groups. Similarly, anxiety in girls was higher in the mildly depressed risers but not in the other four trajectory groups. These findings suggest that gender differences are more likely to occur in the lower trajectory groups and that intervention programs (for selective/indicative populations) that focus on the higher risk trajectory group members can be implemented similarly for boys and girls.

Implication of Results

For youth—These findings regarding youth are remarkable for several reasons. First, it appears that children at risk for depressive symptomatology as young as second grade can be differentiated from their peers, both within gender and across gender, using teacher, parent, and self-report data. This suggests that early elementary school is a viable time for identifying and implementing prevention programs that focus on mental health needs of children who may be at risk for subsequent depressive phenomena. Furthermore, the measures used in this study are relatively brief, have been developed from existing measures with good reliability and validity, and should be considered as practical assessment tools for school professionals examining mental health needs of children.

From a universal prevention perspective, these results suggest that programs that target social skills, attention difficulties, antisocial behavior, and anxiety may be effective in reducing future depressive symptomatology. Results from Fast Track (Conduct Problems Prevention Research Group, 1999) found that kindergarteners who received the program (PATHS) had better emotion recognition and coping, spent more time in positive interactions with peers, and had less aggressive retaliations by the end of first grade than peers who did not receive the intervention. Similarly, results from the Raising Healthy Children study (Catalano et al., 2003) found that students in the program condition had significantly lower antisocial behavior and higher levels of social competency than peers in the control condition after 1.5 years. Unfortunately, depression was not an outcome in either study, but the results suggest that such programs impact risk factors, which may, in turn, reduce subsequent depression. Further research to examine this hypothesis is warranted.

Second, the gender differences were predominately found among the low depressed risers and mildly depressed stables, rather than in the highest depression trajectory group (moderately depressed risers). Given the consistent finding that early adolescent girls

experience greater levels of depressive symptomatology than boys (Jellinek & Snyder, 1998; Reynolds, 2002), it was expected that the selected risk factors would be elevated in the moderately depressed riser group for girls compared to boys; however, this was not the case. One explanation for these findings may be that second grade is too early to differentiate this group based on gender. Marcotte and colleagues (2002) reported that gender differences in youth depressive symptomatology were more prevalent around puberty. However, these results are consistent with other research showing that problem behaviors, such as physical aggression and antisocial behavior, are more prevalent in boys than girls during elementary grades (Broidy et al., 2003; Nagin & Tremblay, 1999). Again, these results suggest that early elementary universal prevention programs addressing anxiety, antisocial behavior, attention problems, and social competency may have beneficial effects beyond their intended focus, and help reduce the potential for future mental health problems among adolescents.

Third, the finding that parents' depressive symptomatology did not differentiate any of the trajectory groups for girls or for boys was surprising. Given the strong intergenerational and genetic components of depressive phenomena that have been reported elsewhere (Cortes et al., 2006; Jellinek & Snyder, 1998), we expected that parents' depressive symptomatology would be a significant risk factor, especially for girls. In contrast to our findings, research by Duggal and colleagues (2001) found a stronger association between maternal depressive and adolescent depression symptomatology for females than for males. Cortes and colleagues (2006) also reported that increased levels of adolescent depressive phenomena in females were positively associated and sustained by maternal depressive phenomena. One reason for the lack of significance could be that parents' depressive symptomatology was included in the analyses concurrently with self-reported anxiety and antisocial behavior, and thus may not provide enough unique variance beyond these two constructs. A second explanation could be developmental, and would be consistent with Duggal et al. results that parents' (primarily maternal) depressive symptomatology becomes a stronger predictor and differentiating factor once youth reach adolescence, suggesting a time-varying effect rather than an early static effect as modeled here.

For adolescents—The findings from this study also have important implications for research and practice with adolescents. With current research offering new models and/or theories to explain gender differences regarding depressive symptomatology in adolescents, such as stress exposure versus stress reactivity models (Hankin, Mermelstein, & Roesch, 2007), the results from this study support Hankin and colleagues' findings by identifying that there were no gender differences across trajectory groups or overall on risk factors of stressful life events, family conflict, or peer rejection at earlier ages. Thus, the difference in the impact of the stressors and peer relationships across gender appears to happen in later elementary or early middle school. Extrapolating our results to pre-adolescence and adolescence, the trajectory group of most interest appears to be the moderately depressed changers (see Figures 1 & 2), where depressive symptomatology rises during elementary school for girls and boys, but at middle school the levels drop markedly for boys below baseline, while for girls there is an initial drop but then depressive symptomatology remains flat. Further research among this trajectory group, in particular, during late elementary school throughout middle school may be useful in exploring stress exposure versus stress reactivity models as well as the stress generation model (Cole, Nolen-Hoeksema, Girgus, & Paul, 2006).

On the practice, prevention and intervention side, Figures 1 and 2 show that, if depressive symptomatology is going to increase, the increase appears to be in elementary to early middle school. Thus, depression prevention programs aimed at adolescents, especially in high school, are often too late. These results and conclusions are consistent with those of

other researchers (Galambos, Leadbeater, & Barker, 2004; Hankin & Abela, 2005; Hankin et al., 2007) who report that there is little to no change in prevalence or severity of depressive symptoms between 8th and 10th grade. For practitioners and interventionists, assessing youth for depressive symptomatology in later elementary and middle school grades appears to provide the greatest opportunity to intervene on the individual or group (school) level to help reduce depressive symptomatology. Furthermore, based on our findings as well as others (Hankin et al., 2007; Marcotte et al., 2002), to be proactive in preventing and reducing depressive symptomatology, universal prevention programs (with the targets areas specified above) should be implemented in elementary and early middle school.

Limitations of the Study

Several limitations should be noted regarding this study. First, the current study tested the hypothesis that children's early risk factors (second-grade scores) influence later depressive symptomatology regardless of later patterns of risk development. Starting at this time point allowed us to clearly establish time ordering of the risk factors; however, this may miss subsequent changes in risk factor scores as children develop. Future research may profit from the investigation of time-varying measures of these risk and protective factors, especially in pre-adolescence and adolescence developmental periods.

Second, it needs to be acknowledged that there are other risk factors that are related to depressive symptomatology levels that were not examined in this study. For example, the construct of hopelessness was not examined in the current study, but has been reported as an important risk factor among youth (Mazza & Reynolds, 1998). Similarly, risk factors of physical and sexual abuse were not examined. Inclusion of other risk factors may have altered our findings. Thus, the results need to be interpreted cautiously.

Third, the five trajectory groups identified with this data set are a representation of the 951 children sampled in this study. This was a universal sample and predominately Caucasian. A more diverse sample may yield different trajectory groups or a different number of groups. Also, a sample of selected and/or indicated youth may also yield different patterns or number of groups. Thus, the results of this study should be generalized cautiously to other at-risk youth and other ethnic groups.

And fourth, methodological issues limited some of the conclusions that could be made. The mixture models used in this study did not allow for within-trajectory-group variability, although the individuals were classified within trajectory group with high probability. Similarly, the number of students in trajectory groups 4 and 5 were small, and thus power to examine risk factor differences between the two groups was limited. Future research, with exploration of within-trajectory-group variability and larger sample sizes, is warranted and would allow for more comprehensive insight into the relationship of early elementary risk factors to adolescent depressive phenomena.

Summary and Implications

This study identified five distinct trajectory groups for girls and boys over a 6-year period. The patterns of these trajectory groups were more similar than different across gender. There were several risk factors that appeared more predictive for boys than for girls, namely low income, antisocial behavior, social competency, and attention problems in the low depressed risers and mildly depressed trajectory groups. Results from this study, along with other research, suggest that universal prevention programs that target risk factors such as those investigated here may be important in helping to reduce future mental health problems,

especially depressive phenomena. Further research examining the longitudinal impact of these risk factors in relation to adolescent depressive symptoms is warranted.

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Figure 1.
Trajectories of girls' 5 depression groups.

Figure 2.
Trajectories of boys' 5 depression groups.

Table 1

Descriptive Statistics of the Predictor Measures for the Total Sample, Males, and Females at Second Grade Unless Otherwise Noted

Predictors		Total (N = 951)	Boys (n = 511)	Girls (n = 440)	T-statistic Males vs. Females
Individual risk factors					
Anxiety	M	0.36	0.33	0.40	2.90**
	SD	0.34	0.34	0.33	
Peer rejection	M	0.04	0.04	0.04	0.54
	SD	0.16	0.16	0.17	
Antisocial behavior	M	0.13	0.15	0.09	5.52**
	SD	0.19	0.21	0.17	
Shy/withdrawn	M	2.63	2.61	2.65	1.53
	SD	0.40	0.40	0.41	
Social competency	M	3.83	3.70	3.99	5.93**
	SD	0.74	0.74	0.72	
Attention problems	M	1.64	1.74	1.52	6.67**
	SD	0.53	0.52	0.51	
Family and household risk factors					
Parent depression	M	0.18	0.19	0.18	0.28
	SD	0.29	0.29	0.28	
Stressful life events	M	0.10	0.09	0.11	1.36
	SD	0.18	0.18	0.18	
Family conflict	M	1.25	1.26	1.24	1.82
	SD	0.17	0.18	0.16	
Low income	M	0.29	0.29	0.28	.12
	SD	0.45	0.45	0.45	
School risk factors					
Academic performance	M	3.23	3.21	3.26	0.72
	SD	1.21	1.21	1.21	
Dependent measure					
Second-grade depression	M	0.65	0.64	0.67	0.76
	SD	0.56	0.53	0.59	

Predictors	Total (N = 951)		Boys (n = 511)	Girls (n = 440)	T-statistic Males vs. Females
Eighth-grade depression	M	1.01	0.96	1.06	2.71 *
	SD	0.58	0.52	0.64	

* Note: Significant at the $p < .01$ - used for dependent measure.

** $p < .004$ (.05/11 rounded to .004) used for selected risk factors.

Table 2
One-way ANOVA Results With Mean and Standard Deviation of Grade 2 Predictors for Girls' Five Depression Groups

Risk factors	1: Low depressed stables (N = 119, 27.0%)	2: Low depressed risers (N = 100, 22.7%)	3: Mildly depressed stables (N = 122, 27.7%)	4: Moderately depressed changers (N = 48, 11.0%)	5: Moderately depressed risers (N = 51, 11.6%)	F
Individual risk factors						
Anxiety	M 0.21 ^{a,b,c,d} SD 0.24	0.44 ^{d,e,f} 0.32	0.33 ^{c,h} 0.31	0.68 ^{b,f,i} 0.30	0.61 ^{a,e,h,i} 0.35	29.93 ^{***}
Antisocial behavior	M 0.03 ^{a,b,d} SD 0.08	0.11 ^d 0.19	0.06 ^h 0.13	0.14 ^b 0.19	0.19 ^{a,h} 0.25	11.93 ^{***}
Peer rejection	M 0.01 SD 0.09	0.06 0.20	0.02 0.12	0.09 0.25	0.09 0.22	4.09 ^{**}
Shy/withdrawn ^l	M 2.69 SD 0.39	2.70 0.36	2.62 0.46	2.64 0.39	2.56 0.45	1.35
Social competency ^l	M 4.16 ^a SD 0.70	3.99 ^e 0.67	4.02 ^h 0.72	3.87 ^h 0.63	3.61 ^{a,e,h} 0.78	5.74 ^{***}
Attention problems	M 1.42 ^a SD 0.47	1.51 ^e 0.52	1.46 ^h 0.46	1.66 0.52	1.78 ^{a,e,h} 0.54	5.93 ^{***}
Family and household risk factors						
Family conflict	M 1.22 SD 0.14	1.25 0.16	1.22 0.15	1.25 0.15	1.29 0.21	2.33
Stressful life events	M 0.08 SD 0.16	0.11 0.20	0.10 0.17	0.13 0.22	0.16 0.21	2.09
Parent depression	M 0.15 SD 0.27	0.19 0.29	0.18 0.28	0.24 0.31	0.19 0.31	0.95
Low income	M 0.24 SD 0.43	0.27 0.45	0.29 0.45	0.31 0.47	0.39 0.49	1.15
School risk factors						
Academic performance ^l	M 3.42 SD 1.20	3.41 1.17	3.23 1.27	3.08 1.24	2.90 1.11	2.23

*
Note: $p < .05$.

 $p < .01$,

 $p < .001$.

I Note: Predictors are scored in a positive direction higher scores mean more adaptive on that variable.

Note: Means with the same superscript are significantly different from one another ($p < .05$).

Table 3
One-way ANOVA Results With Mean and Standard Deviation of Grade 2 Predictors for Boys' Five Depression Groups

Risk factors		1: Low depressed stables(N = 124, 24.3%)	2: Low depressed risers(N = 190, 37.2%)	3: Mildly depressed stables(N = 104, 20.4%)	4: Moderately depressed changers(N = 57, 11.2%)	5: Moderately depressed risers(N = 36, 7.0%)	F
Individual risk factors							
Anxiety	M	0.16 ^{a,b,c,d}	0.32 ^{d,e,f}	0.35 ^{c,h}	0.53 ^{b,f,i}	0.64 ^{a,e,h,i}	24.01 ^{***}
	SD	0.25	0.32	0.32	0.34	0.39	
Antisocial behavior	M	0.07 ^{a,b,d}	0.17 ^{d,e}	0.15 ^h	0.25 ^b	0.30 ^{a,e,h}	14.17 ^{***}
	SD	0.12	0.22	0.21	0.22	0.27	
Peer rejection	M	0.00 ^a	0.03	0.04	0.06	0.10 ^a	3.02 [*]
	SD	0.04	0.17	0.15	0.21	0.16	
Shy/withdrawn [†]	M	2.63	2.61	2.63	2.59	2.52	0.65
	SD	0.42	0.40	0.36	0.37	0.45	
Social competency [†]	M	3.87 ^c	3.75	3.57 ^c	3.60	3.45	3.97 ^{**}
	SD	0.74	0.70	0.76	0.78	0.71	
Attention problems	M	1.58 ^{a,b,c}	1.73	1.83 ^c	1.86 ^b	1.93 ^a	5.60 ^{***}
	SD	0.56	0.49	0.48	0.52	0.50	
Family and household risk factors							
Family conflict	M	1.25	1.25	1.27	1.26	1.29	0.68
	SD	0.17	0.16	0.19	0.17	0.21	
Parent stressful life event	M	0.08	0.09	0.10	0.09	0.11	0.33
	SD	0.17	0.18	0.17	0.19	0.21	
Parent depression	M	0.13	0.19	0.24	0.21	0.17	2.10
	SD	0.23	0.29	0.33	0.32	0.30	
Low income	M	0.15 ^c	0.29	0.43 ^c	0.35	0.25	6.32 ^{***}
	SD	0.35	0.45	0.50	0.48	0.44	
School risk factors							
Academic performance [†]	M	3.28	3.30	3.09	3.02	3.14	1.00
	SD	1.23	1.21	1.16	1.25	1.22	

* Note: $p < .05$.

 $p < .01$,

 $p < .001$.

I Note: Predictors are scored in a positive direction higher scores mean more adaptive on that variable.

Note: Means with the same superscript are significantly different from one another ($p < .05$).