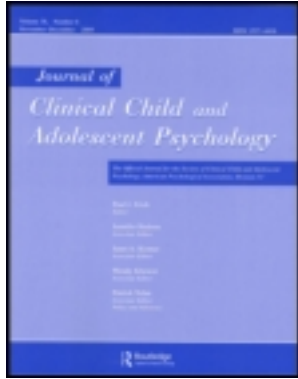


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### Negative Cognitive Style Trajectories in the Transition to Adolescence

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# Negative Cognitive Style Trajectories in the Transition to Adolescence

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The development of negative cognitive style was examined in a longitudinal study of 366 community youth. Cognitive style and depressive symptoms were evaluated at ages 11, 13, and 15. Latent growth mixture modeling identified three unique trajectory patterns of negative cognitive style. The *normative* group (71% of the sample) displayed the least negative cognitive style and lowest depression scores at all assessments. The *increasing* group (22% of the sample) displayed a cognitive style that was comparable to the normative group at age 11 but increased markedly over time; this group displayed the highest depression scores at age 13 and 15, and youth in this group were most likely to have reported clinically significant depressive symptoms during the course of the study. Finally, the *decreasing* group (7% of the sample) displayed the most negative cognitive style at age 11 but an overall decline in negative cognitive style over time. Child sex, child temperament at age 1, observed maternal feedback to child failure at age 11, mothers' cognitive styles at age 11, and total stress from ages 11 to 15 served as predictors of class membership.

Cognitive vulnerability-stress models of depression, such as the hopelessness theory (Abramson, Metalsky, & Alloy, 1989; Abramson, Seligman, & Teasdale, 1978), posit that individuals' characteristic ways of making inferences about the causes, meanings, and consequences of negative events in their lives may confer vulnerability to depression. A *negative cognitive style* is defined as making stable and global inferences about the causes of stressful events (negative attributional style), inferring negative characteristics about the self (negative self-inferences), and anticipating negative consequences as a result of stressful events (negative consequences). Extensive research with adults and older adolescents has demonstrated that a negative cognitive style, in interaction with stressful life events, predicts depression (see Abela & Hankin, 2008 for a review; Alloy et al., 2000; Hankin & Abramson, 2002).

In their recent ABC model of depression, Hyde, Mezulis, and Abramson (2008) asserted that understanding the emergence of negative cognitive style may be highly relevant for understanding both the increase in depression and the emergence of the gender difference in depression in the adolescent period. Extensive research has indicated that levels of depressive symptoms as well as prevalence rates of depressive disorders increase markedly in the transition to adolescence (Cohen et al., 1993; Hankin & Abela, 2005; Kessler, McGonagle, Swartz, Blazer, & Nelson, 1993) and that much of this increase is accounted for by a rise in depression among girls in particular. Although rates of depression between boys and girls are comparable in childhood, a gender difference emerges around age 13, and by age 18 young women are twice as likely as young men to become depressed (Hankin et al., 1998; Kessler et al., 1993; Lucht et al., 2003; Twenge & Nolen-Hoeksema, 2002).

Several researchers have hypothesized that negative cognitive style may be consolidating and stabilizing as

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a meaningful vulnerability factor for depression in early-to-middle adolescence (Cole et al., 2008; Gibb et al., 2006; Mezulis, Hyde, & Abramson, 2006). This proposed developmental trajectory is consistent with the timing of both the rise in depression and the emergent gender difference in depression. Cole and colleagues (2008) provided extensive support for this hypothesis, finding that attributional style became more traitlike from age 7 to 15 and only functioned as a vulnerability factor to depression after age 13. At least two other studies have also found that children's attributional styles become more stable over time, particularly after fifth or sixth grade (or ages 11 to 12; Garber & Flynn, 2001; Nolen-Hoeksema, Girgus, & Seligman, 1992). In a recent review, Abela and Hankin (2008) noted that cognitive style displays moderate traitlike stability as early as sixth grade (about age 12) but that continued change and greater stabilization continues into middle adolescence. By contrast, by late adolescence youth display 1-year test-retest correlations comparable to those observed in adults (Burns & Seligman, 1989; Gotlib, Lewinsohn, Seeley, Rohde, & Redner, 1993). Thus, the transition from late childhood into adolescence may be an important developmental period in which cognitive vulnerability to depression is emerging and consolidating.

However, relatively little research has described or attempted to explain the development of negative cognitive style in late childhood and early adolescence. Mezulis and colleagues proposed an integrated model of the development of negative cognitive style in which negative life events were hypothesized to predict negative cognitive style in the late childhood and early adolescent period, both directly and as moderated by child and parent factors such as temperament, parenting style, and parental feedback to child failure (Mezulis et al., 2006). In the current study we extended this research by describing cognitive style trajectories from age 11 to 15 and by examining both child (gender, temperament, and stressful life events) and parent (maternal feedback to child failure and maternal cognitive style) factors as predictors of change in negative cognitive style.

#### COGNITIVE STYLE IN THE TRANSITION TO ADOLESCENCE: TRAJECTORIES

Relatively few studies have described the emergence of cognitive style during the adolescent transition. A particularly important issue is heterogeneity in the stability of cognitive vulnerability over time. Although a handful of studies have found that cognitive style demonstrates modest mean-level and rank-order stability over time in the early and middle adolescent period (see, e.g.,

Hankin, 2005, 2008; Hankin, Fraley, & Abela, 2005), no studies have examined individual differences in stability trends over time. Of particular interest is whether children who are identified as displaying high cognitive vulnerability during this developmental period continue to display depressogenic cognitions, and therefore remain at elevated risk for depression. Similarly, given the overall rise in depression rates in the transition to adolescence, it may be possible that children previously identified as low in cognitive vulnerability may develop greater cognitive vulnerability over time. Within several domains of research on childhood and adolescent psychopathology, it has proven useful to apply longitudinal data analytic methods to identify heterogeneity in developmental trajectories. For example, recent studies in the fields of childhood aggression and social withdrawal have identified groups of youth who vary in their trajectories of these behaviors (e.g., Booth-LaForce & Oxford, 2008; Campbell, Spieker, Burchinal, Poe, & NICHD Early Child Care Research Network, 2006). There are no comparable studies that have focused on identifying developmental patterns of cognitive vulnerability. The current study aims to fill the gap in this literature by both identifying developmental trajectories of negative cognitive style and examining predictors of these heterogeneous trajectories.

#### Predictors of Cognitive Style Trajectories: Child Factors

Several studies have demonstrated child-specific factors that are associated with the development of greater depression vulnerability in general and more negative cognitive styles in particular. One important child-specific factor is stress exposure. Stressful life events may provide youth with opportunities to make inferences about cause and self, which over time may consolidate into unique cognitive styles (Mezulis et al., 2006). Several studies have indicated that greater reports of major and minor negative life events are associated with prospective increases in depressogenic cognitive styles (Garber & Flynn, 2001; Gibb & Alloy, 2006; Gibb et al., 2001; Rose, Abramson, Hodulik, Halberstadt, & Leff, 1994; Rudolph, Kurlakowsky, & Conley, 2001).

The development of negative cognitive style may also be influenced by temperamental characteristics of the child (Hyde et al., 2008). Children with temperaments high in negative emotionality may be more emotionally reactive to stressful situations and consequently more likely to make depressogenic inferences about the causes, meaning, and consequences of these events. Lengua, Sandler, West, Wolchik, and Curran (1999), for example, found that children's cognitive appraisals of negative events mediated the relationship between negative emotionality and child depression. Mezulis

similarly found evidence for a significant interaction between infant temperament and childhood stressful events in the prediction of childhood cognitive style, such that children with more emotionally reactive temperaments who experienced higher levels of stress displayed the most negative cognitive styles at age 11 (see Mezulis et al., 2006). The longitudinal relationship between early temperament and cognitive style across the transition to adolescence, however, has not previously been examined. Given that this transitional developmental period is one characterized by elevations in stress levels for the majority of youth, having a more emotionally reactive temperament may be particularly salient to the child's development of cognitive vulnerability during this time.

Finally, gender may also be an important predictor of cognitive style trajectories in the transition to adolescence. Research indicates that although girls are no more depressed than boys in childhood (Anderson, Williams, McGee, & Silva, 1987; Cohen et al., 1993; Rutter, 2003), more girls than boys are depressed by ages 13 to 15 (Hankin et al., 1998; Kessler et al., 1993; Twenge & Nolen-Hoeksema, 2002). One potential contribution to this emergent gender difference in depression may be an emergent gender difference in cognitive vulnerability (Hyde et al., 2008). Although there is little evidence of a gender difference in attributional style or cognitive style in childhood, by late adolescence young women report more negative cognitive styles than do young men (Hankin & Abramson, 2002; Nolen-Hoeksema & Girgus, 1994).

### Predictors of Cognitive Style Trajectories: Parenting

Parent-child interactions provide an important medium through which children's own cognitive styles develop. Research has suggested that parents may directly or indirectly provide feedback to children about whether negative events in the child's life are attributable to internal, stable, and global causes; imply negative characteristics about the child; or may lead to negative consequences (Ingram, 2003; Mezulis et al., 2006). Social learning theory suggests that there are several ways in which parenting may contribute to children's development of negative cognitive styles.

One pathway between parenting and child cognitive style may be through *modeling*. Children may observe the inferences parents make about cause, self, and consequences in response to events in the parents' lives and model their own inferential styles after those of their parents. Examinations of the modeling hypothesis have yielded mixed results. Although a few studies find significant correlations between the mother's own attributional or cognitive style and their child's attributional or cognitive style (see, e.g., Kaslow, Rehm, Pollack, &

Siegel, 1988; Seligman et al., 1984), at least as many other studies fail to find such parent-child correlations (Jaenicke, Hammen, Zupan, & Hiroto, 1987; Turk & Bry, 1992).

An additional pathway is via *coaching*, which is defined as direct suggestions parents may give about how to appraise and cope with stressful events (see, e.g., Kliever, Sandler, & Wolchik, 1994). Joiner and Wagner (1996) reviewed several studies and concluded that parental attributions for child events, conveyed both directly through verbal feedback and indirectly through parental affect and attitudes, were strongly related to children's own attributional styles. Mezulis and colleagues (2006) similarly found that maternal negative attributions for child failure and expressed anger following child failure both contributed to greater child cognitive vulnerability.

In the current study, we further extend this research by testing both the modeling and coaching hypotheses of the relationship between parenting and child cognitive style. Mothers reported on their own cognitive style. We also examined observed maternal coaching of stress appraisal and coping at age 11 through mother-child interactions videotaped and coded for verbal inferential feedback and affective reactions following a child failure task.

## OVERVIEW OF THE PRESENT STUDY

In the current study, we used data from the longitudinal Wisconsin Study of Families and Work to examine the internal consistency and stability of negative cognitive style in the transition to adolescence. Our first aim was to examine mean-level stability in cognitive style over time (i.e., the amount of change in cognitive style on average), from ages 11 to 15. To this end, we examined change over time in cognitive style using hierarchical linear modeling. Our second aim was to identify and understand heterogeneity in trajectories of cognitive style from age 11 to 15 and to evaluate both child and parenting predictors of those trajectories. To this end, we used latent growth mixture modeling to identify classes of youth with similar longitudinal trajectories that were distinct from the trajectories displayed by individuals in other classes. Based upon epidemiological studies finding an increase in depressive symptoms in the transition to adolescence, we expected to identify at least two groups, a normative group with low to moderate negative cognitive style and an at-risk group with higher or increasing cognitive style. Our final aim was to examine correlates and predictors of cognitive style trajectories. We expected that trajectories marked by higher or increasing negative cognitive style would be associated with greater depressive symptoms among youth.

We further hypothesized that stressful life events, child temperament, and parenting would be especially potent predictors of more negative cognitive styles over time. Finally, we investigated gender as a predictor of cognitive style trajectories as well, hypothesizing that girls may be more likely to display a trajectory of increasingly negative cognitive style in the transition to adolescence.

## METHOD

### Participants

Participants were 366 youth who have participated in a longitudinal study of child development and family well-being since birth. Mothers were recruited during pregnancy for participation in the Wisconsin Maternity Leave and Health Project, now named the Wisconsin Study of Families and Work (Hyde, Klein, Essex, & Clark, 1995). Approximately 78% of the sample was recruited from the Milwaukee area and the remaining 22% came from the Madison area. Ninety percent of youth were White, 3.5% were African American, 1.4% were Hispanic, 1.6% were Asian American, and 3.3% were Native American.

The current study included all participants from the original sample who participated in the relevant assessments in the summers following fifth, seventh, and/or ninth grades (mean ages at time of assessment were 11.2, 13.2, and 15.2 years, respectively). We had 313 youth participate at age 11 (162 girls), 366 at age 13 (185 girls), and 317 at age 15 (164 girls). Variations in participation rates across time reflected both funding constraints and elective participation at each time point. Of the 366 youth in the full sample from fifth through ninth grades, 287 youth completed all three assessments and 312 completed at least two of three assessments. Of the 366 youth in the full sample, 159 youth were videotaped, in interaction with their mothers, following a stressful failure experience as part of the fifth-grade assessment. Funding and time constraints restricted our ability to administer and videotape the stress induction task to all fifth-grade participants; families within a driving radius of the study center were randomly selected from the larger sample for participation. Multivariate analyses of variance (ANOVAs) indicated that the 159 youth who participated in the failure task and the other 154 youth participating at the fifth-grade assessment did not significantly differ on any study variables.

### Procedure

As part of the ongoing Wisconsin Study of Families and Work project, youth and mothers completed questionnaires on laptop computers during in-home assessments. Mother-child dyads participating in the stress induction

task were videotaped in their homes following completion of the questionnaires. This project was approved by the University of Wisconsin–Madison Institutional Review Board. Parents provided consent and children assent for their participation.

### Measures

**Negative cognitive style.** Negative cognitive style was assessed at ages 11, 13, and 15 with the Children's Cognitive Style Questionnaire (CCSQ; Mezulis et al., 2006). The CCSQ provides children with hypothetical scenarios to which they are asked to agree with statements regarding the internality, stability, and globality of attributions for the event (3 items per scenario); self-inferences (1 item); and anticipated consequences (1 item). Children indicate agreement with each item on a 5-point scale from 1 (*don't agree at all*) to 5 (*agree a lot*). Children respond to six scenarios in total, four negative and two positive. Of the four negative scenarios, two represent achievement events (doing poorly on an exam; not understanding a reading assignment) and two represent interpersonal events (not being allowed to join a game; conflict with best friend). Children's responses to the negative event items (20 items) are averaged for a negative cognitive style composite score. Higher scores on the CCSQ negative cognitive style composite indicate greater endorsement of internal, stable, global attributions, negative self-inferences, and negative inferred consequences in response to negative events. Construct validity was reported by Mezulis et al. Internal consistency for the negative cognitive style composite in the current sample was high ( $\alpha > .80$  at all assessments).

**Depressive symptoms.** Youth depressive symptoms were assessed at ages 11, 13, and 15 with the Children's Depression Inventory (CDI; Kovacs, 1985). The CDI is a 27-item self-report inventory that inquires about the presence of depressive symptoms in the previous 2 weeks. The CDI was designed for use with children between ages 8 and 17; several studies have documented its reliability and validity (Kovacs, 1981, 1985). Total scores on the CDI can range from 0 to 54, with higher scores indicating more severe symptom levels. In the current study, given that assessments were conducted in summer, we omitted three items which referenced school. Participants' scores on the remaining 24 items were averaged and then multiplied by 27 to create a total score that is comparable to the complete 27-item CDI. The CDI has repeatedly demonstrated excellent internal consistency, test-retest reliability, and predictive and construct validity, especially in community samples (e.g., Blumberg & Izard, 1986). Internal

consistency reliabilities in the current sample were .80 or greater at all assessments.

**Stressful life events.** Stressful life events were assessed using a shortened version of the young adolescent version of the Adolescent Perceived Events Scale (Compas, Davis, Forsythe, & Wagner, 1987). Youth were administered 59 items representing both major (e.g., “Parents got divorced”) and daily life events (e.g., “Problems or arguments with friends”) at each of the three assessments. Participants indicated for each event whether it had occurred in the past year. We created a total score representing the total count of stressful life events reported summed across all three assessments.

**Temperament.** Child temperament at 12 months was assessed using the Infant Behavior Questionnaire (Rothbart, 1981, 1986). Mothers completed this structured parent report, which consists of 94 items assessing various components of infant temperament. Mothers reported on each item for the previous two weeks on a 1 (*never*) to 7 (*always*) scale. The Infant Behavior Questionnaire yields seven subscales: Activity Level, Smiling and Laughter, Fear/Distress to Novelty, Distress to Limitations, Soothability, Duration of Orienting, and Startle. From these scales, summary scales were developed. In the current study, we used the Withdrawal Negativity summary scale, which is a composite of Fear/Distress to Novelty and Startle. In the current sample, alpha for Withdrawal Negativity was .73.

**Maternal cognitive style.** Mothers’ negative cognitive styles were assessed with the Inferential Style Questionnaire (ISQ; Peterson, 1982). The ISQ is based on the hopelessness theory of depression and is similar in format to the CCSQ used with children. The full ISQ contains 12 scenarios; in the current study, we administered 10 scenarios, of which 6 were negative scenarios used for computing the negative cognitive style composite. For each scenario, respondents rated 5 items tapping the internality, stability, and globality of attributions (3 items); the anticipation of negative consequences (1 item); and negative self-inferences (1 item). A composite negative cognitive style score is computed by averaging all 5 items across the 6 negative scenarios (30 items total). The composite negative score had an internal consistency of .84.

**Maternal responses to child failure: Verbal feedback.** To directly assess maternal negative feedback to their children following a stressful failure event, 159 of the children and their mothers participated in an observed failure situation when the children were 11.

This behavioral task was administered and videotaped in the family’s home. Mothers watched while children completed a difficult math task on a laptop computer. Regardless of their actual performance, all children received a score of 2 stars out of a possible 7. Following the problem set, mother–child pairs were given 2 min to “discuss the child’s score and why he/she received the score he/she did.” This period was videotaped, transcribed, and coded for mothers’ verbal statements to the child. Coders identified all relevant codable statements and scored them as follows:

1. *Negative attributions.* Statements by the mother that included a causal explanation for the child’s score or performance, for example, “You got 2 stars because you weren’t paying attention.” Attributions were coded on three dimensions, internality (0 = external, 1 = internal), stability (0 = unstable, 1 = stable), and globality (0 = specific, 1 = global). These three dimensions were then summed for a total attributional score, which ranged from 0 to 3. Attributions with a combined score of 2 or 3 were then coded as “negative,” whereas attributions with a combined score of 0 or 1 were then coded as “not negative.” We then computed a total count of negative attributions.
2. *Negative inferences.* Statements by the mother that contained generalized negative or critical information about the child’s strengths or weaknesses as a person, for example, “You have a hard time with directions.” Mothers were given a total count of negative inferences.
3. *Negative consequences.* Statements by the mother that stated or inferred negative consequences as a result of the child’s score or performance in the task, for example, “If you don’t master multiplication, you’re going to do poorly at school next year.” Mothers were given a total count of negative consequences statements.

More than 50% of all videotaped interactions were dual-coded for interrater reliability. Interrater reliability scores for verbal statement coding ranged from .92 to .98.

**Maternal responses to child failure: Affective reactions.** Mothers’ emotional reactions to the child’s failure were coded using a coding system derived from Gottman’s Specific Affect Coding System (Gottman, 1993; see also Mezulis et al., 2006). The 2-min discussion period was divided into 10-s intervals, and coders identified the mother’s dominant affective state during each discrete time interval based on gestures, tone of voice, language, and body positioning. Affect states were uncertainty, tension, frustration, positive interest,

affection, and joy. Incidences of tension and frustration were summed for a total Negative Externalizing Emotionality score. Other affective state scores were not used in the current study. Interrater reliability for affect coding was .86.

Data Analysis

To describe cognitive style over time, we reported means, standard deviations, and Cronbach’s alphas for each component of cognitive style at each assessment. To describe mean-level stability in cognitive style over time, we utilized HLM 6.04 to model variation in cognitive style as a function of time.

To identify heterogeneity in the patterns of negative cognitive style over time, we performed growth mixture modeling using Mplus 5.0 (Muthen & Muthen, 2007). The number of latent trajectories was examined iteratively, starting with the null hypothesis of only one latent class and specifying an increasing number of classes. Evaluation of the output for each subsequent iteration included interpretability of the results, meaningfulness of the classes, and relevant model fit statistics. We jointly examined the Bayesian Information Criterion and the Akaike Information Criterion, for which lower values typically indicate better fitting models. We also used the Lo-Mendell-Rubin adjusted likelihood ratio test (Lo-Mendell-Rubin Adjusted LRT) of model fit, which compares the estimated model with a model with one fewer class (Lo, Mendell, & Rubin, 2001). The Lo-Mendell-Rubin Adjusted LRT yields a *p* value that reflects whether the current model fits the data significantly better than a model with one less class. Finally, we also examined model entropy, which is a measure of classification accuracy with values closer to 1 (range = 0–1) indicating greater precision of classification accuracy.

Finally, we examined predictors of trajectory class membership using multinomial logistic regression in SPSS 15.0. Predictors were entered as continuous variables for all variables excepting child sex, which was a categorical predictor. Significant interactions were interpreted by examining the data at one standard deviation above and below the mean of each independent variable in the interaction, and then the distribution of class membership within each quadrant.

RESULTS

Internal Consistency

Our first goal was to examine age-related changes in the degree to which youth’s inferences about cause, self, and consequences were internally consistent. We computed Cronbach’s alphas for each of the components of

cognitive style, namely, inferences about cause, self, and consequences. We also computed alpha for the composite negative cognitive style score at each assessment (see Table 1). For all three components, alphas were moderate, ranging from .73 to .80 for inferences about cause, .74 to .83 for inferences about the self, and .80 to .84 for inferences about consequences. Alphas for the composite score ranged from .82 to .87. We used Feldt’s (1980) method for comparing alphas from dependent samples to test for age-related changes and to accommodate the large number of comparisons, we set alpha to *p* < .01. All three components, as well as the composite score, demonstrated modest declines in alpha from age 11 to 13 (significant at *p* < .01 for inferences about cause and self, and for the cognitive style composite), followed by smaller and typically nonsignificant increases in alpha from age 13 to 15. Comparing age 11 to age 15, there were no significant age related changes in inferences about cause or consequences, or for cognitive style as a whole, and a modest decline (.83 to .76, *p* = .04) in alpha for inferences about self. In sum, there was little evidence of age-related change in internal consistency in any cognitive style dimension from age 11 to age 15. At age 11, internal consistencies were in the moderate to high range and remained that way through the duration of the study.

Mean-Level Stability of Negative Cognitive Style

To examine mean-level stability in negative cognitive style, we utilized hierarchical linear modeling to describe cognitive style. At Level 1, a regression equation was constructed to model the variation in cognitive style as a function of age (where age 11 was coded as 0, age 13 as 1, and age 15 as 2). Gender was included as a Level 2 moderator of Level 1 intercept and slope. All analyses included intercept, linear slope, and random error.

Results indicated that negative cognitive style in the entire sample did not demonstrate significant change over time (slope coefficient = -.02, *t* = 1.37, *p* = .17). However, the Level 2 analysis suggested that both intercept and slope varied as a function of gender (intercept coefficient = -.09, *t* = 2.46, *p* = .011, and slope coefficient = .05, *t* = 2.48, *p* = .011). The negative value for

TABLE 1  
Means, Standard Deviations, and Alphas by Age

Component	Age 11			Age 13			Age 15		
	<i>M</i>	<i>SD</i>	$\alpha$	<i>M</i>	<i>SD</i>	$\alpha$	<i>M</i>	<i>SD</i>	$\alpha$
Cause	2.23	.57	.80	2.15	.51	.73	2.12	.51	.75
Self	1.28	.51	.83	1.27	.45	.74	1.28	.47	.76
Consequence	1.38	.56	.84	1.36	.51	.80	1.33	.53	.84
Cognitive Style	1.87	.46	.87	1.82	.41	.82	1.82	.46	.85

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the intercept coefficient in the Level 2 analysis indicates that boys had the greater initial level of negative cognitive style, whereas the positive value for the slope coefficient indicates that girls demonstrated a more positive slope of change in negative cognitive style over time than did boys. In addition, the slope variance component indicated that there was significant unexplained variance in both intercept,  $\chi^2(364)=196.73$ ,  $p < .001$ , and slope,  $\chi^2(364)=258.62$ ,  $p < .001$ , which led us to examine whether there were individual differences in trajectory patterns over time.

### Patterns of Negative Cognitive Style

To identify heterogeneity in the patterns of negative cognitive style over time, we performed growth mixture modeling using Mplus 5.0 (Muthen & Muthen, 2007). Missing data were managed with a maximum likelihood estimation in Mplus 5.0 (Muthen & Muthen, 2007). Cases were included if they had at least 1 data point in the trajectory, yielding an analysis sample of  $n = 366$ . Evaluation of the model statistics indicated that a three-class model provided the best fit to the data (see Table 2). Both Akaike Information Criterion and Bayesian Information Criterion decreased from the two-class model to the three-class model but increased again at the four-class model. There was no decrement in classification accuracy (indexed by entropy) in the three-class model compared to the two-class model, and the Lo-Mendell-Rubin Adjusted LRT indicated that the three-class model was a significantly better fit to the data than the two-class model.

Figure 1 depicts the three class trajectories, with the lines representing the estimated means of the negative cognitive style composite from age 11 to age 15. Youth were placed into classes based upon most likely class membership statistics, and all subsequent analyses were based on most likely class membership. Average latent class probability for most likely class membership ranged from .80 to .94. We labeled the majority class (71% of the sample) the *normative* class. These children had moderately low negative cognitive style consistently

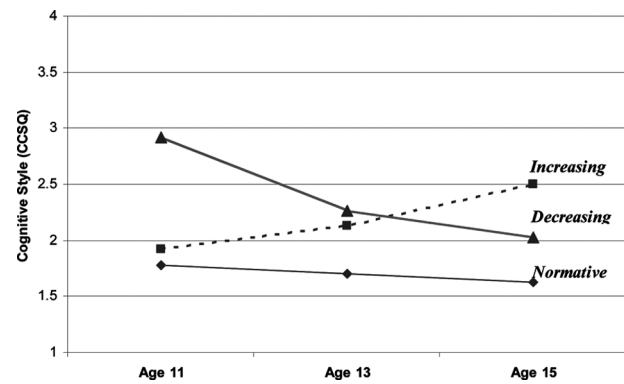


FIGURE 1 Negative cognitive style trajectory classes.

over time. We labeled the second class the *increasing* class; it represents 22% of the sample. This class had moderately low negative cognitive style at age 11 that increased consistently over time to result in the highest level of cognitive vulnerability by age 15. Finally, we labeled the third class the *decreasing* class. This smallest class, representing just 7% of the sample, started the study at age 11 with the most negative cognitive style. Although negative cognitive style in this class decreased over time, it remained more negative than the *normative* group at every assessment.

To further compare the trajectory classes, we performed one-way univariate ANOVAs by class on the cognitive style scores at each time point, to determine whether the visually observable differences were statistically significant. Descriptive statistics and ANOVA results, including post hoc least significant difference comparisons, are shown in Table 3. These analyses indicated that at age 11, the normative and increasing classes had comparable negative cognitive style scores, whereas the decreasing class had a significantly higher initial score. At age 13, the increasing and decreasing classes had significantly higher cognitive style scores than the normative class, but comparable to each other. At age 15, the increasing and decreasing classes continued to both have significantly higher scores than the normative class, but the increasing class also had significantly higher scores than the decreasing class.

Given the role of cognitive style as a vulnerability factor to depression, the trajectory classes were also compared on child-reported depressive symptoms at each assessment point. Although such concurrent analyses cannot yield evidence of a causal relationship between cognitive style and depression, they do help further characterize the classes in terms of a salient, measurable, and clinically significant correlate. Depression scores by class are also shown in Table 3 and compared using one-way ANOVAs. As expected, depression scores differed significantly among the three groups. The normative and increasing groups had

TABLE 2  
Latent Growth Mixture Model Statistics

No. of Classes	AIC	BIC	Entropy	LMR Adjusted LRT
1	1080.02	1100.16	.89	—
2	1041.39	1073.62	.80	42.29 ( $p = .092$ )
3	<b>1001.49</b>	<b>1057.89</b>	<b>.80</b>	<b>24.94</b> ( $p = .047$ )
4	1021.82	1066.13	.73	19.32 ( $p = .665$ )

Note: AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; LMR = Lo-Mendell-Rubin; LRT = likelihood ratio test.

The best-fitting model is indicated in bold italics.



TABLE 3  
Means, (Standard Deviations), and ANOVA Statistics for Negative Cognitive Style and Depressive Symptoms by Trajectory Class

	Age	<i>M (SD)</i>				<i>ANOVA</i>	
		<i>Total<sup>a</sup></i>	<i>N<sup>b</sup></i>	<i>I<sup>c</sup></i>	<i>D<sup>d</sup></i>	<i>F</i>	<i>Comparison</i>
Cognitive Style	11	1.87 (.46)	1.78 (.34)	1.90 (.37)	2.92 (.51)	92.90**	(N = I) < D
	13	1.82 (.41)	1.70 (.34)	2.13 (.42)	2.25 (.39)	55.97**	N < (I = D)
	15	1.82 (.46)	1.63 (.29)	2.50 (.32)	2.03 (.31)	215.96**	N < D < I
Depression	11	3.73 (4.15)	3.14 (3.18)	4.55 (4.34)	6.98 (8.41)	12.90**	(N = I) < D
	13	4.31 (4.79)	3.44 (3.48)	7.03 (6.96)	4.83 (5.08)	17.94**	(N = D) < I
	15	4.97 (5.54)	3.62 (4.04)	9.39 (7.49)	6.61 (5.89)	32.30**	N < D < I

Note: ANOVA = analysis of variance; N = normative; I = increasing; D = decreasing..

<sup>a</sup>*N* = 366.

<sup>b</sup>*n* = 260.

<sup>c</sup>*n* = 81.

<sup>d</sup>*n* = 25.

\*\**p* < .01.

comparable CDI scores at age 11, but at ages 13 and 15 the increasing group reported significantly more depressive symptoms than the normative group. The decreasing group reported more depressive symptoms than the other two groups at age 11, comparable scores to the normative group at age 13, and scores significantly higher than the normative group but significantly lower than the increasing group at age 15.

Another way of considering the relationship between class membership and depression is to examine the percentage of each class that reported clinically significant levels of depression symptoms, using the CDI cutoff of 13 to indicate elevated symptomatology (Kovacs, 1985). Here the contrast is striking. Although only 7% of the normative class reported clinically elevated symptoms at any point from age 11 to 15, 28% of the increasing and 21% of the decreasing class at some point reported clinically elevated depressive symptoms across the study period.

### Predictors of Class Membership

Means and standard deviations of all study variables by class are shown in Table 4. SPSS 15.0 was utilized to conduct multinomial logistic regressions to examine child sex, child stress, child temperament, maternal cognitive style, and maternal feedback to child failure as predictors of class membership. Two separate regressions were run. In the first, we modeled child sex, child stress, child temperament, and maternal cognitive style, as well as the hypothesized Stress × Temperament interaction, as predictors of class membership for the entire sample (Model 1; *n* = 366). In the second, we modeled child sex, child stress, and observed maternal feedback to child failure, as well as the hypothesized Stress × Parenting interactions, as predictors of class membership for the subsample who participated in the observational task (Model 2; *n* = 159). In all regressions, the normative group served as the reference category and

TABLE 4  
Means and (Standard Deviations) for Predictors by Trajectory Class

<i>Predictor</i>	<i>Total</i>	<i>Normative</i>	<i>Increasing</i>	<i>Decreasing</i>
Negative Emotionality	2.88 (.63)	2.83 (.65)	2.98 (.53)	3.14 (.76)
Total Stress	16.64 (1.07)	15.88 (1.20)	17.44 (2.40)	15.19 (4.20)
Maternal Cognitive Style	3.82 (.66)	3.78 (.64)	3.91 (.71)	3.94 (.63)
Maternal Tension/Frustration	2.33 (3.54)	1.98 (3.35)	3.64 (3.94)	1.14 (1.38)
Maternal Negative Attributions	.73 (1.24)	.72 (1.25)	1.26 (.98)	1.66 (1.87)
Maternal Negative Inferences	.12 (.48)	.12 (.49)	.15 (.48)	.11 (.33)
Maternal Negative Consequences	.08 (.32)	.10 (.36)	.08 (.26)	.00 (.00)
Child Sex				
% male	49.2%	50.2%	37.7%	76.0%
% female	50.8%	49.8%	62.3%	24.0%

Note: Cognitive style, depression, negative emotionality, and maternal cognitive style scores all represent scale means computed per scale instructions (see Methods section). Maternal tension/frustration, negative attributions, negative inferences, and negative consequences represent average counts of the number of incidences of each behavior/statement observed during the observation period.

baseline (age 11) depression scores were entered as a control variable. Regression results are presented in Table 5.

Across the entire sample, child sex, stressful events, and temperament were all significant predictors of class membership. Greater negative emotionality predicted membership in both the increasing and decreasing classes relative to the normative class, suggesting that child temperament is a significant risk factor for the development of greater cognitive vulnerability to depression. Child sex also predicted class membership. Girls were significantly more likely to be in the increasing class relative to the normative class, whereas boys were more likely to be in the decreasing class relative to the normative class. Child stress was also a significant predictor, indicating that youth who reported greater total stress from ages 11 to 15 were more likely to belong to the increasing relative to the normative class.

TABLE 5  
Multinomial Logistic Regressions Predicting Class Membership

Ratio Model	Class	Predictor	Wald Test Statistic	Odds Exp(B)
Model 1 <sup>a</sup>	Increasing	Child sex	3.982*	1.322
		NE	3.750*	1.556
		SLE	9.137**	1.033
		Maternal cognitive style	.70	.982
	Decreasing	NE × SLE	3.093*	1.041
		Child sex	3.558*	1.753
		NE	3.285 <sup>†</sup>	1.459
		SLE	.208	1.009
		Maternal cognitive style	.105	1.042
		NE × SLE	.677	1.023
Model 2 <sup>b</sup>	Increasing	Maternal TF	5.965*	1.139
		Maternal AS	2.873*	1.280
		Maternal IN	.289	.672
		Maternal CN	.288	1.202
		SLE	7.883**	1.083
		TF × SLE	3.178*	1.092
		AS × SLE	1.406	.979
		IN × SLE	.684	1.032
	Decreasing	CN × SLE	6.475*	1.176
		Maternal TF	1.426	.232
		Maternal AS	.254	.728
		Maternal IN	.122	1.206
		Maternal CN	.573	.728
		SLE	1.904	1.006
		TF × SLE	.020	.990
		AS × SLE	1.693	.974
IN × SLE	.040	.901		
CN × SLE	.063	1.028		

Note: NE = negative emotionality; SLE = stressful life events; TF = tension/frustration; AS = negative attributions; IN = negative inferences; CN = negative consequences.

<sup>a</sup> $N = 366$ ,  $\chi^2 = 36.06^{**}$ .

<sup>b</sup> $N = 159$ ,  $\chi^2 = 37.26^{**}$ .

<sup>†</sup> $p < .10$ . \* $p < .05$ . \*\* $p < .01$ .

Consistent with hypotheses, the relationship between stress and class membership was moderated by child temperament such that youth with greater negative emotionality in infancy, when faced with greater stress levels in adolescence, had the greatest likelihood of belonging to the increasing class. Maternal cognitive style was unrelated to class membership.

Among the subsample participating in the parent-child task, we also examined observed parenting as predictors of children's cognitive style trajectories. Again, stress was associated with greater likelihood of belonging to the increasing class relative to the normative class. Greater maternal expressed tension and frustration and more negative attributions in response to child failure at age 11 were predictive of membership in the increasing class relative to the normative class. It is important to note that maternal behaviors in response to child stress predicted children's cognitive style trajectories over time, although children in both the normative and increasing groups had comparable cognitive styles at age 11 when the parenting constructs were assessed. There were also two significant interactions between stress and parenting. The relationship between stress and membership in the increasing class was strongest for youth whose mothers expressed greater tension and frustration and for youth whose mothers made more negative statements about consequences.

There were no parenting variables that significantly distinguished membership in the decreasing class from membership in the normative class. Although mothers of children in the decreasing class made more negative attributions than mothers of children in both the normative and increasing classes, maternal attributions were not a significant predictor of membership in the decreasing class relative to the normative class. This failure to observe a statistically significant relationship is likely attributable to poor power due to the smaller sample size in the observation task combined with the relatively small size of the decreasing class.

## DISCUSSION

The current study takes a novel approach to understanding the development of cognitive vulnerability to depression by examining whether mean-level stability in cognitive style across a large sample in the transition to adolescence may mask underlying heterogeneity in cognitive style trajectories during that period. We further examined multiple predictors of changes in cognitive style over time, including testing competing theories of socialization of cognitive vulnerability (e.g., parental modeling vs. coaching) as well as several child individual difference characteristics. These questions were examined in a large community sample across a

4-year period covering the transition to adolescence using a multiwave design and self-report, parental report, and observational measures.

### Is There Heterogeneity in Youths' Cognitive Style Trajectories in the Transition to Adolescence?

Similar to other prospective and longitudinal studies of cognitive vulnerability to depression, we found little evidence of mean-level change in cognitive style scores from ages 11 to 15 (Hankin, 2005, 2008; Hankin et al., 2005). Across the sample as a whole, the slope of change was nearly zero. However, our descriptive analyses indicated evidence of significant unexplained variance in youths' cognitive style intercepts and slopes over time. We hypothesized that there may be latent groups within our sample with unique cognitive style trajectories over time.

Latent growth mixture modeling confirmed our hypothesis that there are unique classes of individuals within our sample with significantly different cognitive style trajectories over time. We found evidence for three unique classes. The sample was dominated by what we labeled a normative class; 71% of youth displayed a pattern of consistently low negative cognitive style from age 11 to 15. This class displayed little change in their cognitive style over time and had the lowest depressive symptoms at each assessment. The next largest class was labeled an increasing class and represented 22% of the sample. Youth in this class had low negative cognitive style at age 11—in fact, no different than the normative class—but displayed a marked increase in negative cognitive style over time such that by age 15 they reported the most negative cognitive style of any class. At ages 13 and 15, youth in the increasing class reported greater depressive symptoms than youth in the normative class. Finally, we identified a small group of youth (7%) with a very different trajectory altogether. Youth in the decreasing class had the most negative cognitive styles at age 11 but showed steady decline in cognitive vulnerability in the transition to adolescence, although they reported more negative cognitive styles than the normative group at every assessment.

### The Role of Temperament in Predicting Cognitive Style in Adolescence

Based on prior theory and research, we hypothesized that cognitive style develops in part through children's experiences with negative life events as well as factors that may contribute to their interpretation of those events and incorporation of these events into their habitual patterns for evaluation of self and causality. Not surprisingly, we found that the total number of stressful life events reported by youth between ages 11 and 15 differentiated the normative from the increasing classes

in particular. However, we assessed negative life events from ages 11 to 15, which is the same period in which our cognitive style trajectory classes were identified, making it impossible to infer causality between stress exposure and class membership. Absent a measure of childhood life events prior to the assessments upon which class membership was based, the significant relationship between stress and class membership is merely correlational.

However, we did find support for our hypothesis that child negative emotionality would predict more negative cognitive style trajectories over time. Very few studies have examined prospective relationships between temperament and cognitive style. However, research with adults has indicated that negative emotionality is associated with several cognitive processes that we hypothesize may operate developmentally to contribute to individuals' habitual ways of making inferences in the face of stressful events. Negative emotionality is associated with greater attention to negative stimuli, greater rumination and self-focused attention, more negative subjective appraisals, and more negative future expectancies (Costa, Somerfield, & McCrae, 1996; Derryberry & Reed, 1994; Pyszczynski, Holt, & Greenberg, 1987; Takano & Tanno, 2010). Consistent with our previous findings that maternal reports of greater negative emotionality in infancy were associated with more negative cognitive styles at age 11 (see Mezulis et al., 2006), we found that maternal ratings of infant temperament also predicted being in both the increasing and decreasing classes relative to the normative class from ages 11 to 15. The association between early temperament and membership in the increasing class is particularly interesting because, although emotionality was predicting trajectory over time, there was no significant difference between the increasing and normative classes' cognitive styles at age 11. The significant interaction between infancy temperament and stressful events in predicting membership in the increasing class supports our hypothesis that as these highly emotionally reactive youth encounter stressful life events, they are particularly likely to make negative inferences about the cause and consequences of those events which, over time, contribute to a more negative cognitive style and greater depression vulnerability. These data contribute to a small but growing body of literature suggesting a relationship between trait emotionality and cognitive risk for depression (Lakdawalla & Hankin, 2008; Lengua et al., 1999; Mezulis et al., 2006).

### The Role of Parenting in Predicting Cognitive Style in Adolescence

Early developmental theories of cognitive style emphasized the role of parenting processes in the development

of cognitive vulnerability to depression. Utilizing social learning theory as a reference point, researchers have hypothesized that children would develop their cognitive style in part through interactions with their parents. One way in which parenting may contribute to a more negative cognitive style is by the child modeling his or her own cognitive style after the parent's cognitive style. However, numerous attempts to find support for the modeling hypothesis have failed and our study is no different (see, e.g., Garber & Flynn, 2001; Kaslow et al., 1988; Turk & Bry, 1992). We found no association between mothers' own cognitive styles and youths' cognitive styles.

However, others have suggested that parenting behaviors that convey information to the child about the child and about events in the child's own life may be more salient for the child's development of cognitive style (see, e.g., Bruce et al., 2006; Mezulis et al., 2006). In particular, parental coaching about how to appraise and respond to stressful events may have a strong influence on children's development of their own coping styles. Although several studies have found associations between general measures of parental warmth or criticism and child cognitive vulnerability, few have examined parental feedback directly through parent-child observations in which specific inferential information was coded and virtually none have examined the relationship between parental feedback in response to a child stressful event and cognitive vulnerability over time (see Alloy et al., 2001; Bruce et al., 2006; Garber & Flynn, 2001).

We found that when faced with a stressful event maternal emotional and verbal feedback was associated with children's cognitive style trajectories over time. Mothers who displayed more overt tension and frustration in response to the child's failure, and who made more negative attributions for the child's failure, had youth who later developed more negative cognitive styles. It is important to emphasize here that the parenting differences between youth in the increasing and normative classes were observed at a time (age 11) when there was no concurrent difference between the two groups in cognitive style. Thus, the association of more negative maternal feedback to child failure and children's own cognitive styles cannot be explained by the child's own cognitive style. These parenting variables prospectively predicted youths' cognitive style trajectories and suggest that maternal coaching about how to respond to stressful events, rather than maternal modeling of their own responses, may be an especially strong contributor to the development of cognitive style.

### Gender and Cognitive Style Trajectories

Our two high-risk groups, the increasing and decreasing classes, were distinguished by markedly different

proportions of boys and girls. Boys were significantly more likely to belong to the small decreasing class. In fact, more than 75% of this class was male. Boys entered adolescence with elevated cognitive vulnerability, which, although it diminished somewhat over time, remained elevated relative to the normative class. This may help researchers understand why some studies have found small gender differences in cognitive style in childhood, with boys displaying the more cognitive style (see, e.g., Nolen-Hoeksema & Girgus, 1994). In contrast, the increasing group was dominated by girls (62%). Although the current analyses do not allow us to make predictive inferences about the relationship between gender differences in cognitive style and gender differences in depressive symptoms, the finding that girls are more likely to be on a trajectory of increasingly negative cognitive style continues to implicate cognitive vulnerability in the emergence of the gender difference in depression in middle adolescence.

These findings also highlight the importance of examining mean-level changes and gender differences in cognitive vulnerability from a variety of data analytic approaches. Given the pattern of gender findings as well as the presence of small increasing and decreasing classes relative to a large stable class, it is easy to see why prior studies have suggested little or no mean-level changes in cognitive style in the transition to adolescence and/or few significant gender differences. However, our analyses suggest that although the majority of youth maintain a stable level of moderately low cognitive vulnerability across the adolescent transition, there are discrete classes of youth displaying marked changes in their cognitive vulnerability. The ability to identify youth on these diverse trajectories may assist researchers and clinicians in early intervention efforts.

### Limitations

Our findings indicate support for an integrated developmental model of cognitive vulnerability to depression in which multiple child and parenting factors play critical roles in contributing to cognitive vulnerability. However, some limitations should be noted. First, the study was conducted with a community sample with reliance on single-informant, self-report methodology for assessing cognitive style, and not all youth participated in the behavioral task. Developmental trends and processes contributing to cognitive vulnerability may differ among high-risk samples. For example, major negative life events in childhood (such as abuse) may be associated with cognitive style trajectories that are more negative earlier in development or present more consistently across the adolescent transition. In addition, future studies should gather data from multiple informants and

consider alternatives to self-report measures. Second, we modeled cognitive style trajectories across the same developmental period in which depression rates are rising and the gender difference is emerging, making temporal sequencing of the relationship between cognitive style and depression impossible to evaluate. Also, we were only able to model linear trajectories given our three time points. Future studies should examine whether membership in the increasing and decreasing classes identified in the current study does in fact predict onset of depressive disorders in middle to late adolescence or whether cognitive style varies in nonlinear ways over time. Finally, it is important to note that there are undoubtedly multiple pathways to depression in adolescence, and the negative cognitive style vulnerability factor examined in this study represents just one of many such pathways (Hyde et al., 2008). There is likely to be a role for genetics, hormonal processes, other cognitive vulnerabilities, and contextual factors not examined here in understanding depression in the transition to adolescence. Pathways to depression may also vary by gender, age, race, or ethnicity as well (Kessler et al., 1993).

#### Implications for Research, Policy, and Practice

Results from the present study have several important research and clinical implications. First, future studies should examine whether membership in the increasing and decreasing classes identified in the current study does in fact predict onset of depressive disorders in middle to late adolescence.

Our analyses also suggest that although the majority of youth maintain a stable level of moderately low cognitive vulnerability across the adolescent transition, there are discrete classes of youth displaying marked changes in their cognitive vulnerability that may place them at risk for depression in adolescence. The ability to identify youth on these diverse trajectories may assist researchers and clinicians in early intervention efforts. Continued evidence suggesting that individual differences in negative emotionality significantly contribute to individual differences in cognitive vulnerability suggest that interventions designed to reduce individuals' negative affect may be helpful in treating or preventing depression as well. Relaxation training may be effective in attenuating youths' automatic and intense negative affective responses, and a growing body of research suggests that mindfulness-based interventions may improve emotion regulation through improving the individual's ability to respond to stressful situations reflectively rather than automatically (e.g., Goldin & Gross, 2010; Jain et al., 2007; Segal, Williams, & Teasdale, 2002).

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