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A Longitudinal Look at the Relation Between Depression and Anxiety in Children and Adolescents

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Elementary school students (n = 330) and their parents (n = 228) participated in a 3-year longitudinal study of the temporal relation between anxiety and depressive symptoms in children. Every 6 months, children and parents completed depression and anxiety questionnaires for a total of 6 waves. Structural equation modeling revealed that individual differences on all measures were remarkably stable over time. Nevertheless, high levels of anxiety symptoms at 1 point in time predicted high levels of depressive symptoms at subsequent points in time even after controlling for prior levels of depression symptoms. These findings were consistent across self- and parent reports. Results support the temporal hypothesis that anxiety leads to depression in children and adolescents.

The existence of a strong relation between depression and anxiety in children and adolescence is beyond dispute. Equally clear, however, is the existence of noteworthy differences between these disorders (or dimensions), especially with regard to age of onset, duration, and associated features (Brady & Kendall, 1992; Kendall & Brady, 1995; Stavrakaki & Vargo, 1986). According to Brady and Kendall (1992), "children with both anxiety and depression tend to be older than their anxious only or depressed only counterparts. They also seem to be more symptomatic, with the anxiety symptoms typically predating the depressive symptoms" (p. 253). Given this preliminary evidence, researchers have cautiously speculated that a temporal, if not causal, relation may exist between anxiety and depression (Dobson, 1985; Kendall & Brady, 1995). Nevertheless, the studies that support this position are open to multiple interpretations; indeed, some of the evidence is consistent with the opposite hypothesis.

One source of evidence derives from studies showing that the mean age of children with anxiety disorders is younger than that for children with depressive disorders. Hershberg, Carlson, Cantwell, and Strober (1982) noted that anxious children tended to be younger than depressed children (although the results were nonsignificant) and were more likely to be treated as outpatients. In a sample of clinic-referred children and adolescents, Stavrakaki, Vargo, Boodoosingh, and Roberts (1987) found that individuals with depressive disorders were significantly older and were more apt to be admitted for inpatient treatment than were children with anxiety disorders. Although these findings are consistent with the hypothesis that anxiety precedes depression, they are by no means conclusive. Anxiety disorders may simply be more prevalent in younger populations. Furthermore, age differences between individuals imply nothing about the sequence of disorders or symptoms within individuals.

A second type of evidence supporting the temporal sequence hypothesis derives from within-subject studies. Such studies sometimes report the relative age of onset for depression and anxiety in samples in whom symptoms of both disorders have occurred. Kovacs, Gatsonis, Paulauskas, and Richards (1989) found that of children with comorbid depression and anxiety, two thirds became anxious before they became depressed. Furthermore, children with comorbid depression and anxiety were younger when they became depressed, compared with children with depression only. Similar results have emerged for adolescents. Orvaschel, Lewinsohn, and Seeley (1995) noted that nearly two thirds (64.5%) of adolescents with a primary diagnosis of anxiety disorder later developed a second diagnosis of major depressive disorder. Conversely, only 6.5% of adolescents who first manifested major depression later developed an anxiety disorder. In other studies of children with comorbid depression and anxiety, children with both disorders tended to be older than children with anxiety alone (Strauss, Last, Hersen, & Kazdin, 1988; Strauss, Lease, Last, & Francis, 1988). The relative onsets of depression and anxiety in comorbid populations certainly represent relevant information; however, such findings must be qualified. Clinic-referred populations often have unusually high rates of comorbidity. Furthermore, depressed children are more apt to be referred for and receive treatment than are anxious children. Taken together, these factors could by themselves account for the apparent earlier onset of anxiety in comorbid, clinic-referred populations.

The third type of evidence derives from studies designed to predict change in one dimension (or disorder) from prior information about the other disorder. In a longitudinal study

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involving a community sample of children and adolescents, Reinherz et al. (1989) found that self-reported symptoms of anxiety at age 9 predicted self-reported symptoms of depression at age 15. Indeed, early symptoms of anxiety more than doubled the likelihood of later depressive symptoms. Similar results emerged between ages 15 and 18 at a later stage of the same study (Reinherz et al., 1993). Lewinsohn, Gotlib, and Seeley (1995) found similar results in a community sample of adolescents. Having had any of several anxiety disorders at one point in time significantly increased the likelihood of a major depressive episode in the next 5 years. Unfortunately, in both Reinherz et al.'s and Lewinsohn et al.'s studies, the analyses that led to these conclusions did not control for prior levels of depressive symptoms. Consequently, the apparent longitudinal relation may be partially a function of the well-established, strong contemporaneous relation between anxiety and depression. In a study of consecutive adolescent referrals to psychiatric clinics, Sanford et al. (1995) noted that depression at outcome (1 year later) was significantly predicted by prior symptoms of anxiety. Conversely, almost half of the teenagers with major depressive disorder at Time 1 manifested an anxiety disorder 1 year later. As in the previous study, however, the analytic strategy did not involve controls for the correlation between depression and anxiety at Time 1. In only one study were such controls clearly implemented. In an unpublished account, Cohen, Stavrakaki, Kerazynski, and Williams (1995) reported the results of a 5-year longitudinal investigation of depression and anxiety in children and adolescents. Using only self-report measures, they found that Time 1 anxiety scores marginally predicted Time 2 depression scores after controlling for Time 1 depression scores ($p < .10$). No evidence emerged supporting the reverse relation (depression predicting change in anxiety).

The primary goal of the current longitudinal study was to examine the predictive relation between symptoms of anxiety and depression in youth. In undertaking this task, we implemented several strategies. First, we sampled a community population, so as to avoid overrepresenting children with comorbid or highly complex problems (Caron & Rutter, 1991). Second, we obtained six waves of data over a 3-year period on a fairly large, highly diverse sample of children, in order to increase the reliability and generalizability of our longitudinal estimates. Third, so that we could examine not only the effects of anxiety on depression, but also the reciprocal effects of depression on anxiety, we assessed symptoms of depression and anxiety at every wave. Fourth, we obtained information from two sources (parents and children) in order to avoid problems with monooperation and monomethod bias that can arise when only one kind of information is available (Epkins, 1994; Frick, Silverthorn, & Evans, 1994). Fifth, we used latent-variable modeling to control for the attenuating effects of measurement error on our parameter estimates. Finally, to control for item overlap (i.e., anxiety questions on the depression measures and depression questions on the anxiety measures), we eliminated similar content items and reanalyzed the data.

A second goal of the study concerned the stability of depressive and anxiety symptoms. Longitudinal studies of diagnosed depressive and anxiety disorders tend to focus on the onset and remission of discrete episodes of the disorders (Kovacs et al., 1989). Depressive and anxiety symptomatology, however, may be much more stable than the results of such analyses might imply, especially when relatively slight variations in symptom intensity occur near the diagnostic threshold (Kendall, Cantwell, & Kazdin, 1989). If depression and anxiety are highly stable constructs, then the prediction of one from the other becomes an extremely difficult enterprise. In the present study, we attempted to assess the relative stability of self-reported and parent-reported symptoms of depression and anxiety in youth.

The third goal of the study was to compare the results that derive from parent reports and self-reports. Although self-reports provide valuable information about the phenomenological course of mood disorders, they are open to various response sets and social desirability confounds. Parent reports about children's symptoms provide an alternative perspective, which is nevertheless open to a different set of biases and potential confounds. Although moderate levels of convergence have been reported between parent and child reports of internalizing disorders, noteworthy discrepancies are also commonplace (Achenbach, McConaughy, & Howell, 1987). Given these differences, convergence between conclusions based on parent and self-reports would suggest that our estimates are not mere measurement artifacts.

Method

Participants

At the beginning of the study, participants were third and sixth graders from nine public elementary schools in a midsize, midwestern city. Initially, 494 students participated in the study. Of these, 84 withdrew by the end of the 1st year, and 80 more withdrew by the end of the 2nd. Most (92%) of the attrition was the result of students' moving out of the school district. The rest was due to student or parent refusal at one or more of the subsequent time points. We retained 330 children for whom we had complete self-report data and 228 children for whom we had complete parent data. In separate analyses, we compared each of these subgroups to the subgroups from whom complete data were not available. All tests were nonsignificant with regard to race, gender, age, family size, family income, and scores on the instruments administered at the beginning of the study ($ps > .15$). The final sample evenly represented girls (49.1%) and boys (50.9%). The sample was also racially heterogeneous, including students who were Caucasian (65.1%), African American (30.7%), Hispanic (1.5%), multiethnic (1.9%), and other (.8%). The average age of the students at the onset of the study was 9.8 years ($SD = 1.6$). Family size (i.e., number of people living at home) ranged from 2 to 11, with a mean of 4.3 ($SD = 1.2$). Approximately 37.9% of the children had at least one parent with a previous divorce. Parent education level ranged from 4 to more than 20 years ($M = 12.9$, $SD = 2.6$). Annual family income ranged from less than $10,000 to more than $90,000 ($Mdn = $38,600).

Measures

Depressive symptoms. We assessed symptoms of depression in youth with two forms of the Children's Depression Inventory (CDI; Kovacs, 1981), one for administration to children about themselves and a parent form for use by parents about their children (CDI–PF). The original CDI is a 27-item, self-report instrument that assesses affective, cognitive, and behavioral symptoms of depression. Each item consists of three statements scores in order of increasing severity from 0 to 2. Children select one sentence from each group that best describes themselves for the previous 2 weeks. The CDI has relatively high levels of

internal consistency, retest reliability, and convergent validity (Blumberg & Izard, 1986; Kovacs, 1985). In the present study, the suicide item was dropped because of concern expressed by the school administration. This 26-item questionnaire had a high degree of internal consistency in previous research (Cronbach's α = .89; Jordan & Cole, 1996) and in the present study (α = .91).

Previous research on the CDI suggests that a score of 13 represents moderate levels of depression and that a score of 19 can be used as a cutoff for severe depression (Kazdin, 1989; Smucker, Craighead, Craighead, & Green, 1986). By these standards, 19% of our sample (i.e., the point prevalence rate) met the criteria for moderate depression and 8% met the criteria for severe depression at any given wave of the study. These rates are similar to those reported for other community samples (e.g., Finch, Saylor, & Edwards, 1985; Smucker et al., 1986).

Each item of the CDI was reworded to form the CDI–PF for use by parents rating their children. Parents were instructed to choose the sentence from each group that best fit their children's behavior over the previous 2 weeks. The CDI–PF was found to have good internal consistency and retest reliability in a clinical sample of children (Kazdin, French, Unis, & Esveldt-Dawson, 1983). In nonclinic samples (Cole, Truglio, & Peeke, 1997; Wierzbicki, 1987), a parent form of the CDI also manifested evidence of convergent validity, retest reliability (r = .75 over 1 month and .71 over 6 months), and internal consistency (Cronbach's α = .85 and .88, respectively). Using cutoffs similar to those used with the CDI, we found that 17% of the scores were above the 1–standard deviation cutoff, and 7% were above the 2–standard deviation criterion. In the present study, the correlation between the child and parent forms ranged from .22 to .29 (values very similar to those reported by Achenbach et al., 1987, for cross-informant agreement). Cronbach's alpha was .89.

Anxiety symptoms. Symptoms of anxiety were assessed using two forms of the Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978). One was a child form for use by children about themselves; the other was a parent form for use by parents about their children (RCMAS–PF; Cole et al., 1997). The RCMAS is a 37-item, self-report measure of the frequency and severity of anxiety symptoms in children. The measure also contains nine social desirability items not used in the present study. In the present study, to create a response format comparable with that of the self-report depression measure, we gave the children three response options for each question instead of the customary true–false options. Response options were "yes" if the sentence was true, "sort of" if the item was partially true, and "no" if the sentence was not true about the respondent. Responses were scored on 3-point scales. Research on the RCMAS reveals significant levels of convergent and construct validity (Cole et al., 1997; Reynolds & Richmond, 1985; Wolfe et al., 1987) in child and adolescent populations. In the present study, Cronbach's alpha was .86.

Research on the RCMAS suggests that a score 1 standard deviation above the normative mean (i.e., a T score > 60) provides a relatively sensitive cutoff for identifying children with clinically diagnosable anxiety disorders (Hodges, 1990; Mattison & Bagnato, 1987; Reynolds & Richmond, 1985). In the present study, 18% scored above a comparable cutoff based on the current data, and 6% scored above a higher cutoff (2 standard deviations above the mean) at any given wave of the study, indicating that anxiety-related symptoms were a problem for a considerable portion of our sample.

We created a parent form of the RCMAS (RCMAS–PF; Cole et al., 1997) by rewording items for use by parents about their children. The same 3-point rating scale used in the children's form was used in the parent version. Previous research with this instrument revealed evidence of substantial construct validity in multitrait–multimethod confirmatory factor analyses of third and sixth graders (Cole et al., 1997). The instrument was also highly reliable (r = .76 over 6 months) and internally consistent (α = .92). In the present study, 16% of the youth scored more than 1 standard deviation above the mean, and 5% scored more than 2 standard deviations above the mean. Correlations between the child and parent forms of the RCMAS ranged from .20 to .26 in the present study (similar to other cross-informant correlations; Achenbach et al., 1987). Cronbach's alpha for the parent form was .91.

Procedure

Before the onset of the study, parents signed informed-consent statements and completed brief demographic questionnaires as part of a larger longitudinal study. Participating students and parents completed questionnaire packets every 6 months (once in the fall semester and once in the spring) for 3 years, yielding a total of six waves of data over 3 school years. Fall assessments occurred approximately 6–8 weeks after the beginning of the school year. Spring assessments occurred 6–8 weeks before the end of the school year. Doctoral psychology students and advanced undergraduates administered the CDI and the RCMAS (and other instruments not pertinent to the present study) to participating students one class at a time during the regular school day. Research assistants read each item aloud to the class, requiring all students to proceed at the same pace, irrespective of their reading abilities. We presented the questionnaires in random order by classroom, to minimize the effects of order and fatigue on any particular instrument. Two or more additional research assistants circulated among the students to answer questions before, during, and after questionnaire administration. At approximately the same time, parent questionnaires were mailed home with printed instructions and self-addressed return envelopes. Parents were prompted by postcard and by phone if they did not return the questionnaires. Parents received $10 each time they participated in the study.

Results

Preliminary Analyses

To facilitate the comparison of our results with those from other studies, we first computed means and standard deviations for, and intercorrelations between, all measures in all six waves. As shown in Table 1, all correlations were statistically significant ($ps < .001$). Contemporaneous correlations between the children's forms of the CDI and the RCMAS ranged from .65 to .80, similar to those reported in previous studies (e.g., Epkins & Meyers, 1994). Contemporaneous correlations between the parent forms of the CDI and the RCMAS ranged from .69 to .81, similar to those reported by Cole et al. (1997). Autocorrelations of each measure with itself over time varied with the duration of the interwave interval. Median values for the 6-month autocorrelations were .76 for the CDI, .79 for the RCMAS, .64 for the CDI–PF, and .72 for the RCMAS–PF. These values diminished to .33, .47, .46, and .55, respectively, over the 30-month interval.

Stability of the Underlying Constructs

The Pearson correlations (see Table 1) represent the stability estimates of only the manifest measures, not the underlying latent variables. To estimate the stability of individual differences on the underlying constructs of interest, we tested a series of longitudinal structural equation models. Each variable (e.g., the CDI and the RCMAS) was examined in a separate test of an autoregressive model, described by Jöreskog and Sörbom (1993) and depicted in Figure 1.

Table 1
Correlations, Means, and Standard Deviations for Children's Self-Report (n = 330) and Parent Report (n = 228) Measures

Measure	1	2	3	4	5	6	7	8	9	10	11	12	*M*	*SD*
Wave 1														
1. CDI	—	.78	.79	.62	.64	.57	.60	.52	.54	.49	.46	.41	5.18	5.73
2. RCMAS	.70	—	.76	.75	.57	.68	.61	.65	.51	.61	.46	.55	11.93	8.30
Wave 2														
3. CDI	.72	.58	—	.76	.61	.58	.65	.58	.57	.55	.53	.53	4.79	4.76
4. RCMAS	.59	.73	.71	—	.57	.68	.55	.65	.54	.66	.47	.63	11.52	7.63
Wave 3														
5. CDI	.69	.57	.76	.66	—	.80	.69	.59	.62	.55	.53	.52	4.78	5.24
6. RCMAS	.61	.70	.66	.79	.78	—	.65	.72	.57	.66	.49	.69	10.86	7.66
Wave 4														
7. CDI	.59	.50	.65	.58	.79	.64	—	.81	.64	.58	.59	.58	5.16	5.34
8. RCMAS	.58	.64	.62	.76	.73	.82	.80	—	.55	.68	.53	.70	11.24	7.50
Wave 5														
9. CDI	.45	.43	.53	.54	.65	.59	.71	.67	—	.71	.59	.56	5.23	5.47
10. RCMAS	.44	.57	.50	.65	.58	.72	.62	.77	.74	—	.59	.79	10.90	7.89
Wave 6														
11. CDI	.33	.29	.40	.39	.54	.44	.63	.52	.66	.54	—	.69	5.06	5.52
12. RCMAS	.34	.47	.39	.56	.49	.65	.58	.71	.60	.78	.65	—	10.77	7.47
M	7.38	19.79	6.64	17.08	6.71	15.56	6.29	14.64	6.18	13.18	6.62	13.01		
SD	7.80	11.85	8.22	12.09	8.01	11.90	7.48	11.76	7.23	10.50	8.06	10.90		

Note. Correlations among children's self-report measures are below the diagonal; correlations among parent report measures are above the diagonal. CDI = Children's Depression Inventory; RCMAS = Revised Children's Manifest Anxiety Scale.

In this model, x_i represents a particular manifest variable obtained at Time *i*. The term e_i represents the error (or disturbance) term for the manifest variable. The symbol X_i represents the latent variable on to which the manifest variable loads. The path coefficients of greatest interest in this model are the autoregressive estimates, labeled β_i. These are beta weights from the regression of X_{i+1} on to X_i. Because X_i represents a set of latent variables (not manifest variables), these beta weights constitute stability coefficients for the underlying construct and are not attenuated by the effects of measurement error. The terms labeled ϵ_i represent the residuals from these regressions. For the model to be identified, Jöreskog and Sörbom (1993) recommended that (a) the unstandardized factor loadings be set equal to 1, while the variances of the latent variable be free; (b) the variances of e_i all be constrained to be equal (i.e., $e_1 = e_2 = \cdots = e_i = e$); and (c) the unstandardized autoregressive

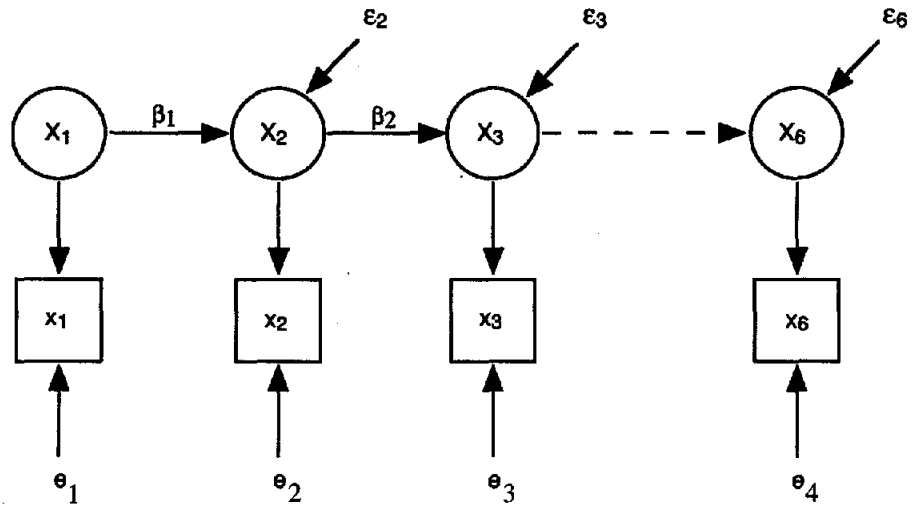

Figure 1. Path diagram for the autoregressive model of construct stability. x_1–x_6 represent manifest variables obtained at Times 1–6; X_1–X_6 represent the latent variables on to which the manifest variables load; e_1–e_4 represent the error terms for the manifest variable; β_1 and β_2 are the autoregressive estimates; ϵ_2, ϵ_3, and ϵ_6 represent the residuals from these regressions.

Table 2
Goodness-of-Fit Indices for the Autoregressive Models

Model	$\chi^2(18)$	p	GFI	AGFI	NFI	RFI
CDI	54.48[a]	.001	.95	.94	.96	.97
RCMAS	46.39[a]	.001	.95	.95	.99	.98
CDI–PF	63.04[b]	.001	.93	.92	.95	.94
RCMAS–PF	38.95[b]	.001	.95	.94	.96	.97

Note. CDI = Children's Depression Inventory; RCMAS = Revised Children's Manifest Anxiety Scale; PF = parent form; GFI = goodness-of-fit index; AGFI = adjusted GFI; NFI = normed fit index; RFI = relative fit index.
[a] $n = 330$. [b] $n = 228$.

coefficients all be constrained to be equal (i.e., $\beta_1 = \beta_2 = \cdots = \beta_i = \beta$).

We tested this model four times, once for each construct: children's perception of depression, children's perception of anxiety, parents' perception of children's depression, and parents' perception of children's anxiety. In each test, the chi-square goodness-of-fit index was statistically significant (see Table 2). Like most inferential statistics, however, the chi-square is sensitive to sample size. For relatively large samples, the chi-square can suggest a poor fit to the data when discrepancies between the model and the data are quite small. Examination of alternative goodness-of-fit indices that are not affected by sample size revealed that the model provided a good fit to the data in all four cases (see Table 2). In every case, the goodness-of-fit index (GFI), the normed fit index (NFI), and the relative fit index (RFI) were higher than the recommended cutoff of .90. These indices are analogous to an R^2 in multiple regression in that they can be interpreted as measures of the proportion of variance (and covariance) in the data that has been explained by the data. These estimates can be inflated, however, by overfitting the data (i.e., including a large number of parameters to be estimated). The adjusted GFI includes a correction for the number of estimated parameters (much like the adjusted R^2 in regression). In all four models, the adjusted GFIs were also greater than .90.

Parameter estimates from the four autoregressive models appear in Table 3. In each model, the loadings of the manifest variables on to the latent variables were all quite large and significantly greater than 0 ($ps < .001$), suggesting that each of the measures represented the underlying construct quite well. The autoregressive beta weights (β) were also very large and significantly greater than 0 ($ps < .001$), suggesting that individual differences between children were extremely stable. Of course, stability estimates varied with the duration of the interwave interval. For children's perceptions of their depressive symptoms, stability estimates ranged from .87 (for 6 months) to .49 (for 30 months). For children's perceptions of their anxiety symptoms, stability estimates ranged from .90 (for 6 months) to .59 (for 30 months). For parents' perceptions of children's depressive symptoms, stability estimates ranged from .92 (for 6 months) to .67 (for 30 months); for parents' perceptions of children's anxiety symptoms, stability estimates ranged from .94 (for 6 months) to .74 (for 30 months).

Reciprocal Predictive Relationships

To assess the degree to which one construct at one point in time predicted the other at a subsequent point in time, we adopted the two-variable, cross-lag model described by Jöreskog and Sörbom (1993). This model (see Figure 2) contains two autoregressive models, one for the depression construct and one for the anxiety construct. Both halves of the model are identical to the autoregressive models described above, including identical patterns of constraints on parameter estimates. As recommended by Jöreskog and Sörbom, we added three new features. First, we added Paths *a* and *b* to represent the reciprocal predictive relations of each construct on the other across adjacent waves. Second, we included Path *c* to represent the preexisting covariation between the two constructs at Wave 1. Third, we added paths to represent the covariation between the residuals of the two constructs at each subsequent wave (not depicted in Figure 2). All paths labeled with the same coefficient were constrained to be equal.

We conducted two tests of this model, one for the children's self-report measures and one for the parent report measures. Although the chi-square tests for both of these models were statistically significant, all of the other indices revealed an excellent fit to the data (see Table 4). The GFI, adjusted GFI, NFI, and RFI were all higher than .90 for both models. Furthermore, for each model the standardized root mean square of the residuals was less than .05, and the 90% confidence interval around the root mean square error of approximation contained .05,

Table 3
Parameter Estimates and Stability Coefficients for Autoregressive Models

	Parameter estimates			Construct stability coefficients				
Model	λ	β	Θ_ϵ	6 mos	12 mos	18 mos	24 mos	30 mos
CDI	.91	.87	.17	.87	.75	.65	.57	.49
RCMAS	.91	.90	.17	.90	.81	.73	.65	.59
CDI–PF	.83	.92	.30	.92	.85	.79	.73	.67
RCMAS–PF	.87	.94	.25	.94	.89	.83	.79	.74

Note. CDI = Children's Depression Inventory; RCMAS = Revised Children's Manifest Anxiety Scale; PF = parent form; mos = months. λ = factor loading; β = standardized regression weight; Θ_ϵ = measurement error variance.

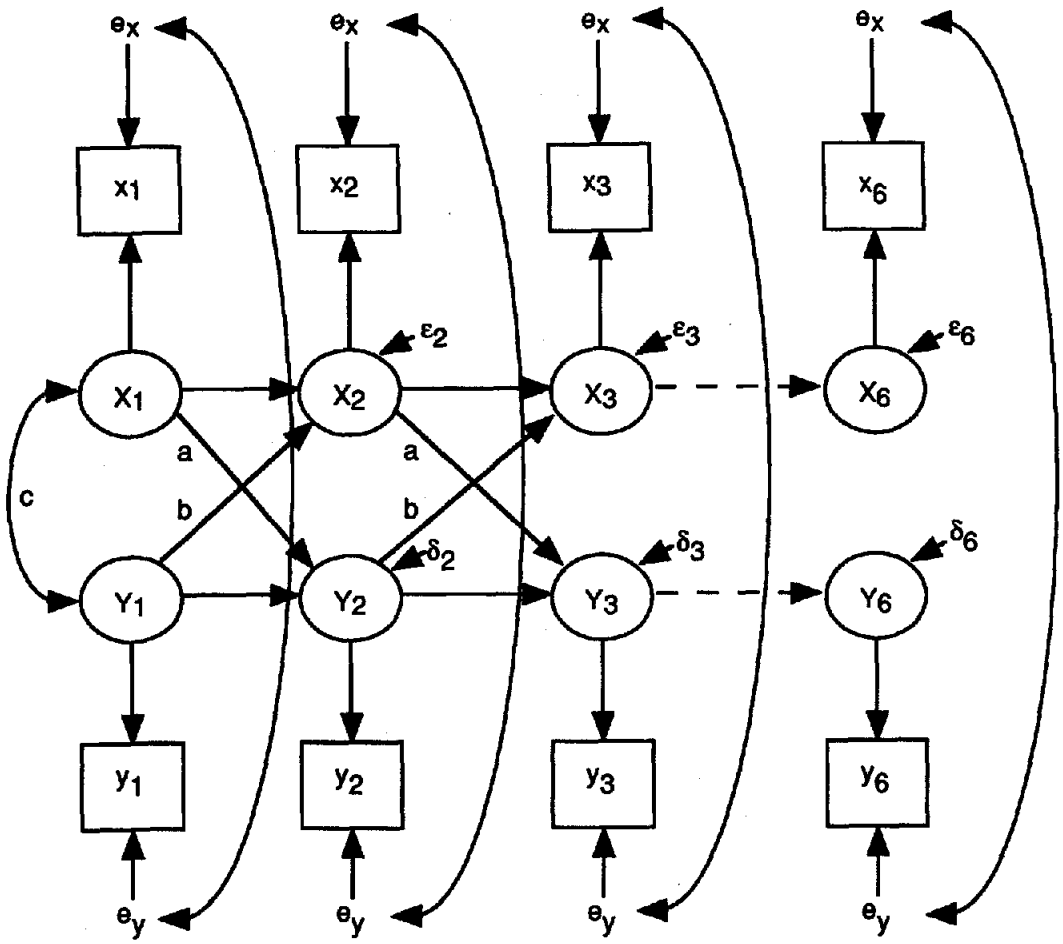

Figure 2. Path diagram for the two-variable longitudinal model. X_1–X_6 = six manifest measures of depression (one at each wave); X_1–X_6 = six latent measures of depression; y_1–y_6 = six manifest measures of anxiety; Y_1–Y_6 = six latent measures of anxiety; e_x = error in the depression measures; e_y = error in the anxiety measures; ϵ_2–ϵ_6 = residuals of depression; δ_2–δ_6 = residuals of anxiety; a = the effect of x on y; b = the effect of y on x; c = the correlation between x_1 and y_1.

suggesting that the absolute magnitude of the discrepancies between the models and the data was small.

The cross-lag path coefficients from anxiety to depression (and from depression to anxiety) are reported in Table 5. Despite the high levels of construct stability, we found evidence of small but significant effects in both models. In the self-report model, the path from self-reported anxiety to self-reported depression was significant ($\beta = .09$, $p < .01$), suggesting that a higher level of self-reported anxiety at one time point predicted an increase in self-reported depression 6 months later. In the parent report model, both cross-lag path coefficients were significant. First (and almost exactly like the finding in the children's self-report model), we found a small but significant cross-lag path from parent-reported anxiety to parent-reported depression ($\beta = .10$, $p < .05$). In addition, and somewhat unexpectedly, we found a significant negative effect of parent-perceived depression on subsequent parent-perceived anxiety ($\beta = -.12$, $p < .01$). In other words, parents who perceived higher levels of depression in their children at one point in time were apt to report diminished levels of anxiety in their child at a subsequent point in time.

Gender and Cohort Differences

Previous studies have documented the emergence of gender differences in depression during adolescence. In childhood, boys and girls manifest similar rates of depressive illness and exhibit similar scores on depression inventories. In early to middle adolescence, however, the mean of girls' scores on depression inventories exceeds that of boys', and girls experience depressive illness at about twice the rate of boys (Brooks-Gunn & Petersen, 1991; Nolen-Hoeksema, 1990). The analyses in the present study were based on the variances and covariances of our measures and not on their means. Consequently, we compared the variance–covariance matrices of our older and younger boys and girls. Discovering age or gender differences in these matrices would require testing our covariance model separately for different groups (with the inevitably smaller sam-

Table 4
Goodness-of-Fit Statistics for Two-Variable Models

Model	$\chi^2(53)$	p	rmsea	p	rmr	GFI	AGFI	NFI	RMI
Analysis of original scales									
Children's self-report	118.10	.001	.061	.10	.048	.95	.92	.97	.96
Parent report	108.22	.001	.065	.08	.047	.93	.90	.96	.95
Analysis of scales with overlapping items deleted									
Children's self-report	112.80	.001	.059	.17	.048	.95	.92	.97	.96
Parent report	84.04	.01	.051	.45	.042	.95	.92	.96	.95

Note. For children's self-report, $n = 330$; for parent report, $n = 228$. rmsea = root mean square error of approximation; rmr = standardized root mean square of the residuals; GFI = goodness-of-fit index; AGFI = adjusted GFI; NFI = normed fit index; RFI = relative fit index.

ple sizes and reduced power). An absence of gender or cohort differences in the covariance matrices would obviate the need for separate analyses.

Using Box's test, we examined the homogeneity of covariance matrices for younger boys, younger girls, older boys, and older girls. We conducted this test twice, once for the children's self-report measures and then for the parent reports. Box's test of homogeneity across all four groups was nonsignificant both for the self-report measures, $\chi^2(234, N = 330) = 246.70$, $p > .05$, and for the parent reports, $\chi^2(234, N = 228) = 239.97$, $p > .05$. In both analyses, differences between the matrices were relatively small (i.e., the standardized root mean square of the residuals were .06 and .04, respectively), indicating that discrepancies between the groups were neither practically nor statistically significant.[1]

Reanalysis Controlling for Item Overlap

Brady and Kendall (1992) noted that correlations between rating scales of depressive and anxiety symptoms may overestimate the actual relation between depression and anxiety, because of the existence of overlapping items on such inventories. For example, the item "I am tired all the time" appears on the CDI, and the item "I am tired a lot" appears on the RCMAS. Consequently, we deleted such problematic items and repeated the previous analyses.

Four judges examined randomly sorted lists of items from the CDI and the RCMAS and classified items as overlapping in content with other listed items. Two kinds of overlap emerged (Cole et al., 1997). One was one-to-one overlap, in which two items from different instruments appeared to ask the same question (e.g., "I cannot make up my mind about things" appears on the CDI, and "I have trouble making up my mind" appears on the RCMAS). The other type was one-to-many overlap, in which an item from one instrument was similar to several items from the other instrument (e.g., "Other children are happier than I" appears in the RCMAS, and "I am sad all the time" and "Nothing is fun at all" appear on the CDI.) When judges agreed on an instance of one-to-one overlap, we deleted the items from both inventories. When judges agreed on instances of one-to-many overlap, we deleted the single item from the one inventory.

We repeated the preceding tests of the two-variable, cross-lag model with the modified scales. Both the self-report model and the parent report model provided good fits to the data, as shown in the lower portion of Table 4. Parameter estimates derived from these models were essentially identical to those derived from the original models, as shown in Table 5. Deleting overlapping items from the CDI and the RCMAS had essentially no effect on the results.

Table 5
Parameter Estimates for Two-Variable Models

Model	β	B	z
Children's self-report			
Anxiety → Depression	.06	.09	2.90**
Depression → Anxiety	.01	.01	0.21
Parent report			
Anxiety → Depression	.07	.10	2.11*
Depression → Anxiety	−.18	−.12	−2.84**
Children's self-report[a]			
Anxiety → Depression	.05	.07	1.98*
Depression → Anxiety	.00	.00	0.10
Parent report[a]			
Anxiety → Depression	.05	.09	2.13*
Depression → Anxiety	−.16	−.10	−2.98**

Note. Unstandardized betas (Bs) were constrained to be equal across all waves; standardized betas (βs) were not constrained. The βs reported above are median values; actual values were within ±1 of these values.
[a] Overlapping items deleted.
* $p < .05$. ** $p < .01$.

Clinical Significance

The preceding analyses involved predictive relations between continuous variables derived from paper-and-pencil inventories. Of greater clinical importance, however, would be information

[1] Despite these results, we also examined the structural equation models separately for older and younger boys and girls. Parameter estimates were all within ±.02 of those reported in Tables 4 and 5. Unfortunately, the smaller sample sizes in these analyses led to out-of-range estimates of several other parameters. For this reason, only the results of the combined-groups analyses are reported here.

about the "caseness" of depression and anxiety disorders over time. In other words, how likely is it that a child with anxiety (but not depression) at one point in time will manifest symptoms of depression at a subsequent point in time? This probability can be compared with the likelihood that a child without anxiety (and without depression) at one point in time will manifest signs of depression at a subsequent point in time. The analyses described below yielded such information; however, they were based on cutoff scores, not formal diagnostic information. We offer these descriptive results to qualify, not supplant, the more rigorous structural equation analyses.

First, we chose cutoff scores approximately 1 standard deviation above the normative means for the CDI and the RCMAS. As mentioned earlier, these cutoffs have been recommended as indicators of moderate levels of depression and anxiety, respectively. At each wave, we categorized children as moderately depressed or anxious according to these cutoffs. At Wave i, we extracted a subsample of children who scored below the cutoff on the CDI. In the subsample, we compared two conditional probabilities: one was the probability that the $CDI_{(i+1)}$ was greater than the cutoff, given that the $RCMAS_{(i)}$ was less than its cutoff; the other was the probability that the $CDI_{(i+1)}$ was greater than the cutoff, given that the $RCMAS_{(i)}$ was greater than its cutoff. The probability of developing depressive symptoms after manifesting symptoms of anxiety was .31 on average (.18 in the younger cohort and .33 in the older cohort), whereas the probability of developing depressive symptoms without previous symptoms of anxiety was only .085 on average (.06 in the younger cohort and .11 in the older cohort). This represents a threefold increase in the likelihood of depressive symptoms being due to prior symptoms of anxiety. The chi-square values were statistically significant at every wave in both cohorts ($p < .01$).

Discussion

Three major findings emerged from the present study. First, individual differences in our depression and anxiety constructs were remarkably stable over time. Second, high levels of children's self-reported and of parent-reported anxiety predicted increases in self- and parent-reported depression (respectively) over time. Third, high levels of self- and parent-reported depression in children did not predict increases in anxiety over time—indeed, partial evidence emerged in the opposite direction. These findings have important implications for future research and practice involving anxiety and depression in young people.

Our results revealed that the stability of self- and parent-reported depression and anxiety was very high. Over a 6-month interval, the stability of these latent variables (not the manifest variables) ranged from .87 to .94. Naturally, these estimates diminished in magnitude as the interval increased in duration. Over a 30-month period, the stability ranged from .49 to .74. Such high levels of stability do not necessarily mean, however, that individuals' levels of depression or anxiety do not change over time. They simply mean that each individual's position relative to others in the sample (i.e., his or her rank order) stays nearly the same from one time point to another.

The discovery of such high levels of stability has implications for future attempts to identify potential predictors of depression or anxiety. To the extent that anxiety and depression are highly stable constructs, relatively little change occurs in individual differences. When little change occurs, predictors of change will be extremely difficult to identify. Because the stability of these constructs diminishes over longer time intervals, future research might involve longer term longitudinal designs to allow potential causes of depression more time to have their effect.

A second implication of high stability pertains to the interpretation of clinical diagnoses. Children with anxiety and depressive disorders have a relatively high likelihood of receiving another (or similar) diagnosis later in life (Kovacs et al., 1989; Sanford et al., 1995). To regard such individuals as relatively symptom free between episodes may be unwise. The present study suggests that (at least without systematic treatment or intervention) children's underlying level of depression or anxiety remains fairly constant over time. The possibility therefore exists that children with depressive or anxiety disorders may move back and forth across the diagnostic threshold without manifesting huge personal increases or decreases in the underlying condition. If a child were identified as depressed or anxious during intake or screening, but did not meet diagnostic criteria at a later time (perhaps at the onset of therapy), then a significant level of the underlying condition could still exist that requires careful attention.

Both self- and parent reports of anxiety symptoms predicted small but significant increases in reports of depressive symptoms in children over time. Given that these results derive from six waves of longitudinal data gathered from a diverse and representative sample, that we were able to control statistically for prior levels of depression, and that we replicated the results of the self-report with the parent report data, we believe that these findings complement and significantly extend previous research on the relation between anxiety and depression. Hershberg et al. (1982) and Stavrakaki et al. (1987) noted that anxious children tended to be younger than depressed children. Focusing on children with comorbid depression and anxiety, Kovacs et al. (1989) found that the onset of the first anxiety episode tended to precede the onset of depression. Finally, Reinherz et al. (1989, 1993) found that prior levels of anxiety predicted subsequent depression. The present study reveals that higher levels of self-reported and parent-reported anxiety at one point in time actually predicted change in reported depression 6 months later, controlling for previous depression. This study supports the results of Cohen et al.'s (1995) longitudinal investigation. Unfortunately, their results were unpublished and only marginally significant. Unlike many of the previous studies, our results cannot be explained by developmental effects, selection bias, or the existence of a strong contemporaneous relation between depression and anxiety.

Like many previous studies, however, our research focused attention on anxiety as a precursor to depression (e.g., Dobson, 1985). Relatively few children are referred for treatment of depression in elementary school. Indeed, only about 2–3% of children and adolescents even meet diagnostic criteria for a major depressive episode (Kashani et al., 1983; Lewinsohn, Hops, Roberts, Seeley, & Andrews, 1993; Roberts, Lewinsohn, & Seeley, 1995). Conversely, anxiety disorders often come quickly to the attention to teachers and school counselors (e.g., Bernstein & Garfinkel, 1986). Epidemiological prevalence esti-

mates of overanxious or generalized anxiety disorder in adolescents range from 3.7% to 17.1% (*Mdn* = 7.8%; Clark, Smith, Neighbors, Skerlec, & Randall, 1994). Given the prognostic value of anxiety as an early sign of depression, clinicians would be wise to provide early intervention or depression prevention counseling to children and young adolescents who present signs of anxiety.

High levels of self- and parent-reported depression did not predict increases in children's anxiety symptoms. Indeed, the only significant effect of depression on anxiety was in the opposite direction and involved only the parent measures. In other words, children who were perceived by their parents as more depressed at one time appeared to be less anxious at a subsequent time. Such results may imply a second component of the depression–anxiety relation: Not only does anxiety give rise to depression, but such increases in depression harbinger a reduction in anxiety symptoms. Parent reports may be particularly sensitive to overt signs of anxiety, which may be suppressed by depression. In other words, a model in which depression replaces anxiety over time would be compatible with these data. We must emphasize, however, that this result was unexpected and was limited to the parent report data. This finding clearly requires replication to rule out the possibility of its being a Type I error.

A natural next step is to examine possible mechanisms whereby anxiety serves as a precursor to depression in young people. One possibility is that depression and anxiety are actually distinct processes but the experience of anxiety at one age predisposes the individual for later depression. For example, separation anxiety, social phobia, avoidant disorder, and agoraphobia can impair social and academic functioning. Children with such anxieties are less apt to experience the rewards of social or academic success at a time critical to self-concept development. Such competencies (and the perception of such competencies) have been implicated in depression (Cole, 1991; Cole, Martin, Powers, & Truglio, 1996). Similarly, low self-esteem, poor social support, and low rates of reward have also been associated with depression in children (e.g., Kaslow, Rehm, & Siegel, 1984).

A second possibility is biological. Dubovsky (1990) described a model whereby stress and the perception of threat lead to the dysregulation of limbic, autonomic, and vegetative systems; heightened arrousal; and increased withdrawal. Repeated dysregulation of these systems leads to emotional reactions such as depression. This model is consistent with Bellodi, Gambini, and Brancato's (1987) research on the psychobiological response to threat and with Friedman, Clark, and Gershon's (1992) review of the behavioral inhibition system and the effects of antidepressant medication.

Finally, several shortcomings of our project suggest possibilities for future research. First, measurement in the present study was limited to children's self-reports and parent reports. Just as each of these instruments contributes to the assessment of anxiety and depression, so might other sources of information. Teachers may be particularly good sources of information about anxieties triggered by separation from parents or by academic evaluation (e.g., Epkins, 1995). Peers may be especially good informants about interpersonal withdrawal and social anxiety (e.g., Epkins, 1994). Future research should integrate information from multiple informants to represent both depression and anxiety more completely. Second, the limited age range of our sample prevented our examination of developmental shifts in the relation between anxiety and depression. Research suggests that depression and anxiety may be more distinguishable in older children than in younger children (Cole et al., 1997). Longitudinal studies of multiple cohorts are needed to examine developmental differences in the causal relation between these two dimensions.

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