ORIGINAL ARTICLE

The Risk for Early-Adulthood Anxiety and Depressive Disorders in Adolescents With Anxiety and Depressive Disorders

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Background: Various studies find relationships among anxiety and depressive disorders of adolescence and adulthood. This study prospectively examines the magnitude of longitudinal associations between adolescent and adult anxiety or depressive disorders.

Methods: An epidemiologically selected sample of 776 young people living in upstate New York received *DSM*-based psychiatric assessments in 1983, 1985, and 1992 using structured interviews. The magnitude of the association between adolescent and adult anxiety or depressive disorders was quantified using odds ratios generated from logistic regression analyses and from a set of latent Markov analyses. We focus on longitudinal associations among narrowly defined *DSM* anxiety or depressive disorders.

Results: In simple logistic models, adolescent anxiety or depressive disorders predicted an approximate 2- to 3–fold increased risk for adulthood anxiety or depressive disorders. There was evidence of specificity in the course of simple and social phobia but less specificity in the course of other disorders. Results from the analyses using latent variables suggested that while most adolescent disorders were no longer present in young adulthood, most adult disorders were preceded by adolescent disorders.

Conclusions: An anxiety or depressive disorder during adolescence confers a strong risk for recurrent anxiety or depressive disorders during early adulthood. Most anxiety and depressive disorders in young adults may be preceded by anxiety or depression in adolescence.

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BECAUSE ANXIETY and depressive disorders are some of the most common psychiatric conditions afflicting adolescents,[1-6] it is important to study relationships between anxiety and depressive disorders in adolescents and adults. Such relationships have been explored from various perspectives, including family-based,[7,8] biological,[9,10] pharmacologic,[11-13] and longitudinal approaches.[14-22] Only longitudinal research directly quantifies the risk for adult anxiety or depressive disorders faced by adolescents with anxiety or depression.

This report addresses 2 limitations in longitudinal research on the associations between adolescent and adult anxiety or depressive disorders. First, few studies have quantified the magnitude of such associations by prospectively observing adolescents as they transition into adulthood, and much of the available research is in clinical[14-18] rather than epidemiological[19-22] samples. Because referral biases limit the generalizability of clinic-based studies, prospective studies in epidemiological samples may better characterize the course of adolescent disorders.[23,24] Second, most prospective studies focus on the course of depressive disorders[14-17] or broadly defined "internalizing" disorders, including various anxiety or depressive disorders.[19-22] Beyond one study of obsessive-compulsive disorder,[18] virtually no prospective studies document adult outcomes of adolescents with narrowly defined *DSM-III* or *DSM-III-R* anxiety disorders.

This study uses epidemiological data to address these 2 limitations. While prior reports on the sample discussed the cross-sectional relationships among disorders[25] and the stability of disorders across adolescence,[26] this report examines relationships between adolescent and early adult anxiety or depressive disorders. The main goal of the report is to test 4 hypotheses on the nature of associations among adolescent and adult disorders. First, family studies[27] and the low rate of clinical impairment in children with simple phobia[28] suggest that adolescent simple phobia will predict simple phobia but not other adult anxiety or depressive disorders. Second, extensive research reviewed elsewhere[6,29,30] suggests that separation anxi-

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SUBJECTS AND METHODS

SAMPLE

This study is based on a cohort of 776 subjects who received initial psychiatric assessments in 1983 (time 1) when they were between age 9 and age 18 years. The original sample was randomly selected in 1975 from 1141 households in 2 semirural upstate New York counties using complete enumeration.[1,25,26] We refer to 1983 data as time 1, as the sample first received *DSM*-based interviews in 1983. At time 1, the sample was supplemented with 54 families to replace losses from low-income strata between 1975 and 1983. Subjects were reassessed in 1985 (time 2) and in 1992 (time 3). The sample remained representative of the area from which it was selected.

ASSESSMENT OF PSYCHOPATHOLOGIC CHARACTERISTICS

We considered 5 adolescent anxiety or depressive disorders from times 1 and 2: simple phobia, social phobia, major depression, separation anxiety, and overanxious disorder. We considered 5 adult disorders from time 3: simple phobia, social phobia, major depression, panic disorder, and generalized anxiety disorder. At time 3, separation anxiety disorder was not diagnosed, and generalized anxiety disorder was diagnosed in lieu of overanxious disorder.[6] We did assess a subset of overanxious disorder symptoms at time 3 but did not have sufficient data to derive diagnoses. Time 3 overanxious and generalized anxiety disorder symptom scales were moderately correlated (r=0.48, P<.001), despite no overlap in scale items.

We did not examine associations with dysthymia because virtually all subjects with adolescent dysthymia also met the criteria for major depression. We did not examine associations with adolescent obsessive-compulsive disorder because of the difficulties in diagnosing this condition accurately in epidemiological settings.[33] While we found no cases of panic disorder at time 1 or 2, episodes of brief, spontaneous, crescendo anxiety were common. Because these episodes did not always meet the *DSM* criteria for panic attacks, we use the term "fearful spell" to describe such episodes. Based on prior research,[31] we examined the course of adolescent spells and the predictors of adult spells.

Although this report focuses on anxiety and depression, other research finds internalizing disorders to be associated with behavior disorders, cross-sectionally and over time.[2-7,19-22] Therefore, beyond relationships among internalizing disorders, we also examined associations between adolescent conduct disorder or attention deficit hyperactivity disorder and adulthood anxiety or depressive disorders. Oppositional-defiant disorder was considered redundant with conduct disorder.

At times 1 and 2, parent and child interviews assessed symptoms from *DSM-III* (time 1) or *DSM-III-R* (time 2) using modifications of the highly structured Diagnostic Interview Schedule for Children (DISC).[34] At time 3, only young adults, but not their parents, provided diagnostic information. All disorders were diagnosed without exclusionary criteria and required the presence of impairment. Only diagnoses present during the previous year were considered. Symptoms present during the previous year were rated, providing "snapshots" of symptom profiles over the preceding 12 months.

Each DISC interview was conducted by 1 of 15 trained lay interviewers. After 1 week of training, each interviewer conducted supervised live interviewers and was required to meet preset criteria for appropriate administration. In the field, each interview was reviewed with project staff shortly after completion.

The DISC was modified at each wave to integrate current practices for maximizing the reliability and validity of epidemiological assessments. The time 1 DISC was adapted from the original DISC[34] by adding 1 to 2 items for each diagnosis on functional impairment, removing skips from the interview, and rewriting the major depression section to more precisely date the timing of symptoms. The time 2 DISC was adapted from the time 1 DISC by integrating the proposed *DSM-III-R* criteria and by adding 3 to 5 more impairment items for each diagnosis. These items inquired about the degree of interference in school and social activities, the degree of distress, and the desire for help with symptoms. Times 2 and 3 interviews were the same except for changes due to differences in nosologic features for child and adult disorders. Parental informants were not interviewed with the DISC at time 3. Psychopathologic characteristics were assessed dichotomously, using *DSM* criteria, and continuously, using disorder-specific symptom or impairment scales. Symptom or impairment scales were derived by summing positive responses on symptom and impairment questions for each disorder.

Continued on next page

ety disorder will relate to panic disorder but not to other disorders. Third, prior longitudinal research among adults[31] suggests that episodes of spontaneous panic in adolescence will predict the onset of panic disorder in adulthood. Fourth, family studies[6-8,32] and cross-sectional data[25] suggest that adolescent major depression, overanxious disorder, and social phobia will exhibit broad associations with adult major depression, generalized anxiety disorder, and social phobia. While the main goal of this study is to test these 4 hypotheses, we also provide data that can be compared with data from other prospective epidemiological studies. Hence, we examine the course of broadly defined internalizing disorders, and we consider the effects of age, sex, and comorbidity on course.

RESULTS

SAMPLE CHARACTERISTICS

Table 1 displays the characteristics of the sample. Although information on 776 persons was collected at each time point, complete psychiatric data were not available for all cases. Detailed discussions of data unavailable for follow-up are found elsewhere.[1,25,26,29,39] The sample remained demographically representative of the population from which it was selected.

Table 1 shows that internalizing disorders were more common among women, while behavior disorders were more common in men. The rates of social phobia and fearful spells declined, while the rates of simple phobia and

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Because cross-informant agreement is usually poor,[35,36] we considered various methods for combining information from parent and child interviews at times 1 and 2 before examining the stability of disorders. This involved analyses considering adolescent diagnoses to be present if criteria were met based on symptom endorsement from either informant or endorsement from both informants, as well as analyses examining stability using only one informant. After considering the many possibilities, we combined parental and child interviews by requiring subjects with a positive diagnosis to: (1) meet *DSM* criteria, based on symptom endorsements from either subjects or informants; and (2) exhibit a symptom or impairment score for that disorder of at least 1 SD above the sample mean. We chose to combine data in this manner because the sensitivity and specificity were maximized.[1,25,26] Because only one informant was interviewed at time 3, time 3 diagnoses were based on *DSM* criteria without additional symptom or impairment score criteria.

Changes to the interview and diagnostic algorithms are likely to affect prevalence estimates across waves, particularly for disorders such as simple phobia that are sensitive to changes in impairment thresholds.[28] Nevertheless, because the preponderance of interview questions was the same at each wave, additions to the assessment may be less likely to affect estimates of across-wave stability than estimates of overall prevalence.

The reliability of the DISC has been extensively studied.[1,26,34,35,37-42] The 2- to 4-week test-retest reliability is comparable with other instruments, although reliability for anxiety and depressive disorders tends to be poor across instruments (κ values in the 0.25-0.50 range).[35,41,42] We estimated the test-retest reliability for anxiety disorders in the current sample using κ values across times 1 and 2. The κ values were comparable with those in recent shorter-term reliability studies[35,41,42] (simple phobia=0.24, social phobia=0.26, separation anxiety disorder=0.43, and overanxious disorder=0.30). The validity of the DISC in this sample is supported by the fact that it predicted clinicians' ratings of psychopathologic characteristics[37] and various external validators.[29,38,39,43-45]

DATA ANALYSIS

We used logistic regression analyses to examine the associations between adolescent and adult disorders. We considered the odds of a disorder at time 3, given a disorder at time 1 or 2. While we focus on our 4 a priori hypotheses, we present results for all adolescent and adult disorders to facilitate replication.

We examined univariate associations in the entire sample, in each of 2 age strata constructed by dichotomizing the sample at the median age, and in each sex. We then fit logistic models to examine specificity in course while controlling for age, sex, ethnicity, social class, and comorbidity. We included all adolescent internalizing disorders, attention deficit hyperactivity disorder, and conduct disorder in these models, using a forward stepwise approach. Age, sex, ethnicity, and social class were forced into the model. We also fit models to examine the stability of broadly defined internalizing disorders, comprising major depression and the 4 anxiety disorders considered in this report, while considering the influence of age, sex, and comorbidity on course. The influence of comorbidity among internalizing disorders was examined using 2 coding schemes: number of disorders or dummy variables. Because these analyses generated similar results, we present the analysis using the first scheme. These analyses use 2-tailed tests with $\alpha=.05$. We leave multiple comparisons unprotected because we entered the study with explicit hypotheses for each test and wanted to minimize type II errors.

Because of measurement error, odds ratios in logistic regression analyses may underestimate the magnitude of across-time associations. Recent studies of externalizing disorders use latent Markov techniques to estimate across-time associations while modeling measurement error.[46,47] This assumes observed stability to reflect (1) the relationship between the observed and latent diagnosis and (2) the stability of the latent diagnosis.

Markov models describe stability by estimating transition probabilities from one state to another. Latent Markov models estimate probabilities for latent rather than observed variables. The theory behind this approach and its application to childhood psychopathologic characteristics is summarized by Fergusson et al.[47] We fit latent Markov models with software created by Graham et al[48] and Collins and Wugalter,[49] fitting a total of 8 models: 5 simple models for individual internalizing disorders and 3 more complicated models, based on hypothesized nonspecificity in the course of overanxious disorder, social phobia, and major depression. For the 3 more complicated models, one used social phobia and overanxious disorder as indicators of the latent diagnosis, another used overanxious disorder and major depression as indicators, and the third used all 3 diagnoses as indicators.

major depression increased, across waves, particularly among women. Changes to the DISC probably played a role in some of these changes. For example, decreases in prevalence from time 1 to 2, particularly for simple phobia, might partially result from the increased emphasis on impairment in time 2 diagnoses. The prevalence of simple phobia at time 2 in the younger third of the sample (5.2%; average [±SD] age, 13.5±4.2 years) was still less than half the prevalence in the full sample at time 1 (11.6%). Because these 2 rates are in groups at similar ages, changes to the DISC probably contributed to the decrease in prevalence from time 1 to 2. Similarly, the increase in simple phobia at time 3 may be partially due to the use of *DSM* criteria, irrespective of symptom or impairment score.

UNIVARIATE ASSOCIATIONS

Table 2 provides the odds ratios for associations between each adolescent and adult internalizing disorder in the entire sample. The table shows the number of cases in the analyses, which is smaller than that given in Table 1 because of the cases that were unavailable for follow-up or because of missing data.

The results in Table 2 supported 3 of the hypotheses on course. First, adolescent simple phobia predicted primarily adult simple phobia. Second, although time 1 separation anxiety disorder was positively related to adult panic disorder, the 95% confidence interval for the odds ratio included 1.0. Time 1 separation anxiety disorder did predict time 3 fearful spells, but there

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were no statistically significant associations between time 2 separation anxiety disorder and either panic disorder or fearful spells at time 3. Third, fearful spells predicted adult panic disorder, as well as adult generalized anxiety and major depressive disorder. Finally, as hypothesized, there were broad associations among major depression, overanxious disorder, and social phobia. Time 1 major depression predicted time 3 major depression, but time 2 major depression predicted time 3 generalized anxiety disorder. Overanxious disorder predicted time 3 social phobia, major depression, and generalized anxiety disorder, as well as panic disorder. There was more specificity than anticipated in the course of adolescent social phobia, which predicted only social or simple phobia at time 3.

The associations in Table 2 were reexamined in each of 2 age strata, dichotomized at the sample median age (data not shown). While there were no statistically significant age-by-stability interactions, there is minimal power on these tests. In general, longitudinal associations were consistently larger, by as much as 2-fold, in the older relative to the younger stratum. Similarly, we examined odds ratios in each sex (data not shown). Point estimates actually tended to be larger in men, but SEs were large and there were no consistent sex-by-stability interactions.

MULTIVARIATE ASSOCIATIONS

We examined the specificity of associations among adolescent and adult disorders using forward stepwise logistic regression analyses. These analyses included adolescent conduct disorder and attention deficit hyperactivity disorder. For univariate odds ratios, time 1 conduct disorder was related to time 3 major depression (odds ratio, 2.54; 95% confidence interval, 1.24-5.19), simple phobia (odds ratio, 1.82; 95% confidence interval, 1.05-3.13), and generalized anxiety disorder (odds ratio, 3.31; 95% confidence interval, 1.42-7.68). Time 2 conduct disorder was related to time 3 major depression (odds ratio, 2.38; 95% confidence interval, 1.10-5.16). Attention deficit hyperactivity disorder showed no relationships with time 3 internalizing disorders. Models did not include comorbid adult disorders as predictors because there were strong associations among most adult disorders. Including adult disorders as predictors limits statistical power to consider the full range of associations between adolescent and adult disorders.

The main purpose of these analyses was to consider specificity in the course of adolescent disorders while controlling for comorbidity in adolescence. Because of strong cross-sectional associations among adolescent disorders,[1,25] we attempted to stabilize our results by maximizing sample sizes and case numbers discordant on correlated disorders. Thus, we use all 712 cases with data from time 3 and either time 1 or 2. Given the temporal proximity of times 1 and 2, relative to time 3, data from times 1 and 2 were combined. Subjects positive for diagnoses at time 1 or 2 are considered affected; subjects negative at times 1 and 2 are considered unaffected. All 712 cases are included by recoding missing diagnostic data as "no diagnosis." However, similar point estimates for odds ratios are obtained if these analyses are restricted to the 652 cases with complete diagnostic data.

Table 1. Characteristics of the Sample*

Characteristic	Time 1 (1983)	Time 2 (1985)	Time 3 (1992)
No. of subjects studied†	776	760	716
Age, y			
Mean	13.7	16.4	22.1
Range	9-18	11-20	17-26
Whites, %	90	90	91
Males, %	50	50	50
Major depression			
F	16 (4.7)	16 (4.2)	41 (11.5)
M	9 (2.3)	6 (1.6)	18 (5.0)
Simple phobia			
F	60 (17.8)	31 (8.2)	116 (32.1)
M	30 (7.7)	14 (3.7)	43 (12.0)
Social phobia			
F	39 (10.1)	48 (12.6)	34 (9.5)
M	26 (6.7)	26 (6.8)	6 (1.7)
OAD or GAD‡			
F	70 (18.0)	39 (10.3)	28 (7.8)
M	41 (3.6)	22 (5.8)	8 (2.2)
Fearful spells§			
F	92 (23.7)	69 (18.2)	9 (2.5)
M	74 (19.1)	28 (7.4)	3 (0.8)
Separation anxiety			
F	37 (9.5)	14 (3.7)	. . .
M	30 (7.7)	14 (3.7)	
ADHD			
F	32 (6.3)	21 (4.1)	. . .
M	61 (11.7)	35 (7.3)	
Conduct disorder			
F	28 (5.5)	22 (4.3)	. . .
M	61 (11.7)	48 (9.2)	

*All data are given as the number (percentage) of patients in that sex group unless otherwise specified. OAD indicates overanxious disorder; GAD, generalized anxiety disorder; ADHD, attention deficit hyperactivity disorder; and ellipses, data not available.

†Seven hundred thirty-three subjects had complete data from times 1 and 2, 675 had complete data from times 1 and 3, 682 had complete data from times 2 and 3, 652 had complete data from all 3 assessments, and 712 had complete data from time 3 and either time 1 or 2.

‡Overanxious disorder, but not GAD, was diagnosed in 1983 and 1985. Generalized anxiety disorder, but not OAD, was diagnosed in 1992.

§No subjects met the criteria for panic disorder at either time 1 or 2. Seven subjects, 6 women and 1 man, met the criteria for panic disorder at time 3.

Table 3 shows the results for these models. For adult major depression, adolescent overanxious disorder and conduct disorder entered the model. Although adolescent major depression was related to adult major depression net of the demographic covariates (odds ratio, 3.02; 95% confidence interval, 1.35-6.76), it did not enter the final equation. This might result from the fact that adolescent depression was strongly related to conduct disorder (odds ratio, 9.80; 95% confidence interval, 4.14-23.22) and overanxious disorder (odds ratio, 4.00; 95% confidence interval, 2.08-7.63), the 2 of which were less strongly related (odds ratio, 2.17; 95% confidence interval, 1.19-3.94). For adult simple phobia, only simple phobia entered the model. For adult social phobia, social phobia and overanxious disorder entered the model. For generalized anxiety disorder, major depression, overanxious disorder, and fearful spells all entered the model. Because every case of adult panic disorder or fearful spells was preceded by adoles-

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Table 2. Associations Between Adolescent and Adult Disorders Narrowly Defined*

Adolescent Diagnosis	No. of Cases†	Adult Diagnosis at Time 3 (1992): Major Depression (56 Cases)	Simple Phobia (151 Cases)	Social Phobia (38 Cases)	Generalized Anxiety (32 Cases)
				Time 1 (1983)	
Major depression	23	4.36 (1.65-11.57)‡	2.79 (1.20-6.49)§	1.73 (0.39-7.69)	3.22 (0.91-11.46)‖
Simple phobia	78	1.57 (0.74-3.35)	3.69 (2.26-6.03)¶	1.27 (0.48-3.37)	1.12 (0.38-3.28)
Social phobia	58	1.64 (0.71-3.81)	1.64 (0.91-2.95)	3.37 (1.46-7.77)‡	2.06 (0.76-5.58)
Overanxious disorder	100	2.92 (1.57-5.44)¶	2.55 (1.62-4.02)¶	3.63 (1.77-7.44)¶	3.31 (1.54-7.10)‡
Fearful spells	142	1.59 (0.86-2.95)	1.54 (1.02-2.36)§	2.37 (1.16-4.86)§	3.03 (1.46-6.25)‡
Separation anxiety	59	1.32 (0.54-3.22)	3.75 (2.16-6.51)¶	0.97 (0.29-3.25)	1.11 (0.33-3.75)
				Time 2 (1985)	
Major depression	19	2.17 (0.61-7.71)	3.36 (1.34-8.43)‡	2.05 (0.46-9.21)	10.87 (3.84-30.79)¶
Simple phobia	41	1.20 (0.41-3.50)	8.20 (4.18-16.11)¶	1.37 (0.40-4.65)	3.05 (1.11-8.36)§
Social phobia	67	0.89 (0.34-2.30)	2.19 (1.28-3.74)‡	4.94 (2.36-10.34)¶	1.69 (0.63-4.54)
Overanxious disorder	58	2.23 (1.03-4.81)§	2.20 (1.24-3.89)‡	6.92 (3.32-14.44)¶	3.16 (1.31-7.64)‡
Fearful spells	85	2.73 (1.45-5.15)‡	2.19 (1.34-3.57)‡	3.41 (1.66-6.98)¶	6.68 (3.23-13.83)¶
Separation anxiety	27	0.69 (0.20-1.35)	2.18 (0.98-4.88)‖	1.56 (0.21-11.79)	NE

*All data are given as univariate odds ratios (95% confidence intervals). NE indicates that odds ratios were considered not estimable when the 2×2 contingency table contained an empty cell. No statistically significant associations between disorders were found in any 2×2 table with an empty cell.

†Number of cases in adolescence.

‡P<.01.

§P<.05.

‖P<.10.

¶P<.001.

Table 3. Adjusted Associations Between Adolescent and Adult Disorders in 712 Subjects Seen in 1983 or 1985 and 1992*

Variable	Adult Diagnosis at Time 3 (1992): Major Depression	Simple Phobia	Social Phobia	Generalized Anxiety
		Covariates†		
Age	0.95 (0.85-1.10)	1.02 (0.95-1.10)	1.08 (0.88-1.15)	1.25 (1.08-1.46)‡
Ethnicity	1.17 (0.38-3.59)	0.49 (0.24-0.98)§	NE	NE
Social class	0.83 (0.60-1.15)	0.70 (0.56-0.88)‖	1.02 (0.69-1.44)	1.25 (0.83-1.89)
Sex	2.06 (1.02-3.86)§	3.30 (2.11-5.14)‖	4.22 (1.70-10.52)‡	1.98 (0.82-4.77)
		Adolescent Diagnosis¶		
Major depression (n=41)	. . .	. . .	. . .	4.84 (1.91-12.29)‡
Simple phobia (n=103)	. . .	3.79 (2.37-6.05)‖	. . .	. . .
Social phobia (n=105)	. . .	. . .	3.29 (1.52-7.10)‡	. . .
Overanxious disorder (n=129)	2.29 (1.26-4.16)‡	. . .	2.27 (1.06-7.10)§	2.48 (1.11-5.50)§
Separation anxiety (n=111)	. . .	. . .	. . .	. . .
Fearful spells (n=191)	. . .	. . .	. . .	3.39 (1.56-7.33)‡
Conduct disorder (n=98)	2.20 (1.12-4.31)§	. . .	. . .	. . .
ADHD (n=97)	. . .	. . .	. . .	. . .

*All variables are included in the model. All associations are given as odds ratios (95% confidence intervals) adjusted for all variables included in the model. Demographic covariates are forced into the model. NE indicates that odds ratios were considered not estimable when the 2×2 contingency table contained an empty cell; ADHD, attention deficit hyperactivity disorder; and ellipses, the predictor did not meet the criteria for entry into regression analysis using a forward stepwise approach.

†Age is entered as a continuous variable, and the odds ratio is given for a 1-year difference in age; ethnicity is entered as a dichotomous variable for white (1) and nonwhite (0); social class is entered as a z score for a scale that combines indexes of parents' educational level, occupation, and income (see reference 1 for a full description), and the odds ratio is given for a 1-SD increase in social class; and sex is entered as a dichotomous variable for male (0) or female (1).

‡P<.01.

§P<.05.

‖P<.001.

¶Diagnoses are considered positive if subjects met the criteria at either time 1 or 2.

cent fearful spells, models contained empty cells, precluding estimation.

PERSISTENCE OF INTERNALIZING DISORDERS

Table 4 provides the results using broad classification schemes, including estimates for age–by–adolescent disorder and sex–by–adolescent disorder interactions. Because similar associations were seen between times 1 and 3 disorders as between times 2 and 3 disorders, we only present data between times 1 and 3. The results in Table 4 reveal no evidence that associations varied by age or sex. For comorbidity, among 217 adolescents with at least 1 time 1 internalizing disorder, 124 (57%) had 1, 55 (25%)

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Panic Disorder (7 Cases)	Fearful Spells (12 Cases)
4.91 (0.57-42.58)	2.66 (0.33-21.53)
NE	0.70 (0.20-5.47)
4.41 (0.83-23.21)‖	2.18 (0.47-10.21)
4.44 (1.00-20.17)§	2.97 (0.88-10.07)‖
9.34 (1.79-48.70)‡	2.64 (0.83-8.46)‖
1.76 (0.21-14.89)	3.63 (1.00-13.80)§
6.13 (0.70-53.56)‖	7.74 (1.57-38.06)‡
6.41 (1.21-34.08)§	3.18 (0.67-15.00)
1.53 (0.18-12.87)	0.83 (0.40-6.51)
NE	NE
18.87 (3.61-98.81)¶	5.35 (1.66-17.25)‡
NE	NE

had 2, and 38 (18%) had 3 or more disorders. Adjusting for age, sex, ethnicity, and social class, the number of time 1 internalizing disorders predicted risk for any time 3 internalizing (B=0.49±0.10 [mean {±SE} of the unstandardized regression coefficient], χ^2=23.2, $P<.001$) or anxiety (B=0.48±0.10 [mean {±SE} of the unstandardized regression coefficient], χ^2=21.9, $P<.001$) disorder. Similar results were found for comorbidity among only adolescent anxiety disorders.

LATENT MARKOV ANALYSIS

Transition probabilities were estimated using the latent Markov models in **Table 5**, as the results previously described do not model measurement error.

Eight parameters are estimated for each model (Table 5). Sensitivity and specificity pertain to associations between observed indicators and latent diagnosis. The prevalence of latent diagnoses at each wave appears in subsequent columns. The major results of interest appear in columns presenting transition probabilities, disattenuated for measurement error. In general, the results suggest that most adult disorders were preceded by adolescent disorders, although there was variability in persistence across disorders.

For illustrative purposes, we discuss the matrix for the most complicated model, contained in the bottom row of Table 5. Models in the first 8 rows can be similarly interpreted. We focus on the far right 2×2 table, showing estimates of transition probabilities from times 2 to 3 for the latent diagnosis indicated by overanxious disorder, major depression, and social phobia. The LC20-LC31 cell defines the probability of time 3 affected status, conditional on being unaffected at time 2. As with all models, the low probability in this cell, .05, suggests that few early adult disorders develop in the absence of a previous adolescent disorder. Conversely, the LC21-LC31 cell defines stability, the probability of time 3 affected status, conditional on being affected at time 2. Hence, the probability in this cell, .42, suggests that approximately 40% of adolescents with the latent disorder at time 2 still have the latent disorder at time 3. (LC20, LC21, and LC31 are further defined in the first footnote of Table 5.)

Table 5 also shows the odds ratio for associations of latent constructs across time 2 to 3, providing estimates disattenuated for measurement error to be compared with estimates in Table 2. Many goodness-of-fit statistics for models in Table 5 were large, but the adequacy of the fit for most models remains an open question, as significance tests rest on the assumption of a χ^2 distribution. This is unlikely to hold in our data because of the sparseness in contingency tables.[48]

COMMENT

SUMMARY

The results from this study reveal evidence for specificity and nonspecificity in the course of adolescent anxiety and depressive syndromes. Adolescent simple phobia predicted primarily simple phobia in adulthood, while social phobia predicted primarily social phobia. In contrast, there were broad associations among overanxious, generalized anxiety, panic, and major depressive disorders. For example, the association between adolescent overanxious disorder and adult depression was comparable in size with the association between adolescent and adult depression, while the association between adolescent depression and adult generalized anxiety disorder was particularly strong.

The results from latent Markov analyses suggest that logistic regression may underestimate stability in some cases. For the more complicated Markov models, odds ratios between adolescent and adult disorders were generally greater than 10.0. The transition probabilities from Markov models were also of interest. These suggested that while most adolescent disorders are no longer present in adulthood, most adult disorders are preceded by an internalizing disorder in adolescence.

PREVIOUS RESEARCH

The prevalence of anxiety disorders varied across waves in this study. While the prevalence of adult anxiety disorders was similar to prevalences given in recent epidemiological studies,[50-54] the prevalence of adolescent disorders was somewhat higher than in prior studies.[2-6] Methodological factors in this study are likely to contribute to the high prevalences as well as the changes in prevalence across assessments. High prevalences for adolescent disorders, in turn, might contribute to the finding in latent Markov analyses suggesting that most adult disorders are preceded by adolescent disorders.

Our prospective data can be compared with data from 3 prior epidemiological studies[19-22] and a fourth study[5] yet to be published. Although the geographic location, length of follow-up, and assessment techniques varied across studies, all 4 found stability for broadly defined

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Table 4. Associations Between Anxiety or Depressive Disorders Broadly Defined in Adolescence and Adulthood

	Adult Diagnosis at Time 3 (1992)*			
	Any Anxiety or Depressive Disorder		Any Anxiety Disorder	
Predictors	Strength of the Association†	Wald χ^2	Strength of the Association†	Wald χ^2
Confounders‡				
Age	1.04 (0.96-1.72)	1.2	1.08 (0.97-1.12)	1.4
Ethnicity	0.89 (0.52-1.51)	0.2	0.94 (0.49-1.79)	0.0
Social class	0.73 (0.61-0.86)	9.9§	0.73 (0.59-0.89)	9.5§
Sex	3.19 (2.20-4.62)	37.8‖	3.46 (2.32-5.10)	39.1‖
Time 1 (1983)				
Any anxiety	2.89 (1.97-4.23)	29.4‖	2.86 (1.93-4.23)	27.2‖
Any anxiety or depression	2.81 (1.93-4.10)	28.7‖	2.72 (1.85-4.00)	25.7‖
Sex by anxiety	B=0.35±0.40¶	0.7	B=0.60±0.42¶	2.1
Age by anxiety	B=0.02±0.07¶	0.1	B=0.02±0.09¶	0.1

**All models were fit with the set of 5 covariates and a single psychiatric predictor, with and without interaction terms in the model.*

†For univariate associations, the strength of the association is given as an odds ratio (95% confidence interval). For interactions, the strength of the association is given as the unstandardized regression coefficient. As all interactions were nonsignificant, the odds ratios given do not include interaction terms. Similar nonsignificant results for interactions are found for the category of "Any Anxiety or Depression" as opposed to "Any Anxiety."

‡Age is entered as a continuous variable, and the odds ratio is given for a 1-year difference in age; ethnicity is entered as a dichotomous variable for white (1) and nonwhite (0); social class is entered as a z score that combines maternal and paternal educational level, occupational status, and family income, and the odds ratio is given for a 1-SD increase in social class; and sex is entered as a dichotomous variable for male (0) and female (1).

§P<.01.

‖P<.001.

¶Data are given as the mean (±SE) of the unstandardized regression coefficient.

internalizing disorders comparable with the stability in this study.

The main inconsistency between prior studies and this study relates to sex differences in course. Three studies[5,20,22] suggested that internalizing disorders are more stable in girls. The absence of sex differences in our study could relate to sample age. One study finding a sex difference in persistence between age 11 and age 15 years[20] found no such difference between age 15 and age 18 years[19] at reassessment. Prior studies also suggested that internalizing disorders are more stable from late adolescence to adulthood than from early through late adolescence.[19,20] While we found no age-by-stability interactions, our study possessed limited power to detect such interactions. Moreover, consistent with prior studies, there were clear trends for internalizing disorders to be more stable when they were present in late as opposed to early adolescence. Compared with younger adolescents, older adolescents were approximately twice as likely to have an internalizing disorder as adults. Given the importance of identifying predictors of adult depressive and anxiety disorders, future studies possessing more statistical power should compare the stability of disorders in younger adolescents with that in older adolescents.

There is minimal epidemiological data on the course of narrowly defined adolescent anxiety disorders. The Dunedin Multidisciplinary Health and Development Study from New Zealand[2,19,20] is probably the study most similar to this study, but differences in classification schemes preclude across-study comparisons for disorders besides simple phobia.[19] Both studies suggest that adolescent simple phobia exhibits weak associations with adult disorders besides simple phobia.

Finally, there are at least 2 explanations for the relationships in this study among nosologically distinct disorders, such as overanxious and major depressive disorders. Adolescent anxiety and depressive disorders may be less discriminable in the community than in the clinic.[23,34-37,55] Alternatively, depressive and anxiety disorders could share an etiologic base.[32,56-61]

LIMITATIONS

Our results should be interpreted in light of 3 limitations. First, the test-retest reliability for the assessment of anxiety remains moderate at best for epidemiological instruments,[34-37,41,42] placing an upper bound on our estimates of stability and specificity. This limitation may be partially addressed by modeling measurement error through latent variable techniques. The development of new "interviewer-based" semistructured interviews also holds the promise of addressing this limitation, as there are data to suggest good to excellent test-retest reliability for anxiety and depressive disorders with at least one such interview.[62] Second, we adopted the categorical approach to psychopathologic characteristics. Because some standardized instruments may fail to accurately detect the boundaries among overt disorders, subclinical disorders, and mental health,[36,63] it is unclear if diagnoses in this study fully captured valid clinical phenomena. Third, because few patients in epidemiological samples seek treatment, it is unclear if our results apply to clinical cases.[1-6,23,37]

It is important to consider these limitations' effect on our findings. Because most would tend to diminish statistical power,[64] our data may underestimate the true risk for adult disorders faced by adolescents with anxiety or depressive disorders. Because our results suggest that adolescent anxiety and depressive disorders carry a relatively high risk for serious disorders in

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Table 5. Markov Models for the Course of Latent Anxiety or Depressive Disorder Constructs*

	Measurement Estimation		Prevalence of Latent Construct			Estimation of T1 to T2 Transition Probability			Estimation of T2 to T3 Transition Probability				
Model	Sensitivity	Specificity	T1	T2	T3	Transition Probability	LC20	LC21	Transition Prabability	LC30	LC31	Odds Ratio†	Goodness of Fit
MDD	0.997	0.997	0.03	0.02	0.08	LC10 LC11	.98 .96	.02 .04	LC20 LC21	.92 .88	.08 .12	1.61	8.3 (*df*=1)
SiPH	0.994	0.994	0.11	0.05	0.22	LC10 LC11	.97 .74	.03 .23	LC20 LC21	.81 .29	.19 .71	10.61	12.7 (*df*=1)
SoPH	1.000	1.000	0.08	0.09	0.05	LC10 LC11	.93 .62	.07 .38	LC20 LC21	.96 .82	.04 .18	5.64	4.0 (*df*=1)
OAX	0.980	0.980	0.13	0.06	0.03	LC10 LC11	.98 .65	.02 .35	LC20 LC21	.98 .91	.02 .09	4.99	5.7 (*df*=1)
SAD Spells‡	0.155 0.990	0.898 1.000	0.09	0.10	0.02	LC10 LC11	<.001 .37	1.00 .06	LC20 LC21	.95 .98	.05 .02	0.36	301.4 (*df*=111)
Spells	0.990	0.990	0.21	0.12	0.01	LC10 LC11	.93 .71	.07 .29	LC20 LC21	1.00 .94	<.001 .06	76.96	0.7 (*df*=1)
OAX SoPH§	0.440 0.540	0.980 0.980	0.20	0.15	0.07	LC10 LC11	.98 .35	.02 .65	LC20 LC21	.98 .64	.02 .36	24.52	85.9 (*df*=28)
OAX MDD‖	0.140 0.550	0.970 1.000	0.26	0.15	0.09	LC10 LC11	1.00 .42	<.001 .58	LC20 LC21	.94 .69	.06 .31	8.24	90.5 (*df*=23)
OAX MDD SoPH¶	0.150 0.510 0.380	0.980 1.000 0.990	0.24	0.17	0.11	LC10 LC11	.97 .39	.03 .61	LC20 LC21	.95 .58	.05 .42	15.35	249.4 (*df*=62)

**T1 indicates time 1; T2, time 2; T3, time 3; MDD, major depressive disorder; SiPH, simple phobia; SoPH, social phobia; OAX, overanxious disorder; SAD, separation anxiety disorder; spells, fearful spells (fearful spells was used instead of panic disorder because of the lower prevalence of panic disorder); LC10, probability of being negative for the latent construct at T1; LC11, probability of being positive for the latent construct at T1; LC20, probability of being negative for the latent construct at T2; LC21, probability of being positive for the latent construct at T2; LC30, probability of being negative for the latent construct at T3; and LC31, probability of being positive for the latent construct at T3.*

†Data are given for the association of the latent construct from T2 to T3, calculated from transition probabilities.

‡A latent construct indicated by SAD or spells is modeled.

§A latent construct indicated by OAX or SoPH is modeled.

‖A latent construct indicated by OAX or MDD is modeled.

¶A latent construct indicated by OAX, MDD, or SoPH is modeled.

adulthood, the true risk for adult disorders may be disturbingly high.

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