Developmental Trajectories of Adolescent Anxiety Disorder Symptoms: A 5-Year Prospective Community Study

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ABSTRACT

Objective: This study prospectively examined the developmental trajectories of anxiety disorder symptoms in a large sample of adolescents from the general population. **Method:** Two cohorts of early and middle adolescents (1,318 junior high and high school students) completed the Screen for Child Anxiety Related Emotional Disorders during 5 consecutive years. The Screen for Child Anxiety Related Emotional Disorders is a questionnaire that measures self-rated child and adolescent anxiety symptoms that map onto *DSM-IV-TR* anxiety disorders. At the first wave of measurement, the early and middle adolescent cohorts were an average of 12 and 16 years of age, respectively. Age and sex differences in the developmental trajectories of adolescent anxiety disorder symptoms over time were examined by means of latent growth modeling. **Results:** Over the course of 5 years, there was a slight decrease in the panic disorder, school anxiety, and separation anxiety disorder symptoms for all of the adolescents, with the exception of social phobia symptoms, which remained fairly stable over time. Adolescent girls showed a slight increase of generalized anxiety disorder symptoms over time, whereas these symptoms decreased among adolescent boys. **Conclusions:** This study replicates and extends earlier findings on the developmental trajectories of anxiety symptoms during adolescence. By using individually focused, trajectory-based analyses rather than group score differences, this study extends earlier findings and advances our understanding of age and sex differences in the development of adolescent anxiety symptoms. *J. Am. Acad. Child Adolesc. Psychiatry,* 2008;47(5):556–564. **Key Words:** anxiety, developmental trajectories, latent growth modeling, prospective study.

Although it may appear that anxiety symptoms in children and adolescents are only reserved for clinical populations, this is far from the case. Fear and anxiety are prevalent phenomena among youths from the general population.[1] Research has indicated that children and adolescents reported an average of 14 fears,[2] and studies have found that childhood fears reflect significant underlying anxiety problems in more than 20% of healthy school children.[3]

Several researchers have noted that referral bias may limit the generalizability of research findings from clinical samples to the general community[4–6] and that studies of the general community may better reflect the developmental course of adolescent anxiety disorders.[7] It is for these reasons that research on the developmental course of anxiety symptoms in children and adolescents from the general community is necessary and has recently received greater recognition.

Many of the previous studies on the developmental course of anxiety in children and adolescents have used broad definitions of anxiety, such as internalizing disorders,[8] making it difficult to be able to distinguish the exact anxiety disorders that are studied. One reason for this is that many of the older childhood anxiety

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questionnaires are global and one-dimensional in scope.[9] To help specify child and adolescent anxiety disorder symptoms, modern, multidimensional questionnaires have been developed with factors that are directly related to the *DSM-IV-TR*[10] anxiety disorder symptoms. After a comprehensive review of the literature, Myers and Winters[11] concluded that the Screen for Child Anxiety Related Emotional Disorders (SCARED) and the Multidimensional Anxiety Scale for Children (MASC)[12] are two of the best multidimensional anxiety disorder symptom questionnaires for children and adolescents. Research by Muris et al.[9,13] has demonstrated that the *DSM-IV-TR* anxiety factors of the SCARED and the MASC are highly correlated.

The developmental course of adolescent anxiety has been studied in the past,[14] but research has just begun to address developmental trends in the phenomenology of other types of adolescent disorders (i.e., depression).[15] No study was identified, however, that examined adolescent developmental trajectories of anxiety disorder symptoms in a longitudinal design to prospectively document the rise and fall of anxiety disorder symptoms in adolescents from the general population.

A primarily reason for this lack of research is because the commonly used classic statistical methods such as analysis of variance and regression analysis only study group mean score differences and group score predictions, respectively. The relatively recent adoption of modern statistical analysis methods, such as latent growth modeling (LGM), make it possible to study differences in the individual trajectories of development over time. Trajectories are defined in terms of intercepts (i.e., the initial status of the studied variable) and slopes (i.e., the growth of the studied variable). With these growth functions, both linear and nonlinear shapes of development can be specified and tested. In other words, with LGM, it becomes possible to study the shape of a developmental trajectory over time.[16]

LGM also allows for the analysis of different cohorts within a studied population. In terms of adolescent anxiety, the findings of previous studies have indicated that there are clear developmental patterns in the prevalence of anxiety disorder symptoms. For example, separation anxiety disorder (SAD) symptoms have been found typically to decrease from early to middle adolescence,[17] whereas symptoms of other anxiety disorders such as social phobia (SP) and generalized anxiety disorder (GAD) tend to increase from early to middle adolescence.[18] Previous research has also demonstrated clear-cut sex differences in the prevalence of anxiety emergence during childhood.[19,20] Specifically, girls display a gradual increase in risk for developing this type of psychopathology, whereas in boys, the risk remains fairly stable.[21] Thus, when studying developmental patterns in anxiety symptomatology of youths, it is important to take age and sex differences into consideration.

The present study investigated the developmental trajectories of the five adolescent anxiety disorder symptoms scales of the SCARED in early and middle adolescent boys and girls selected from the general community. Four of the five factors of the SCARED (GAD, panic disorder [PD], SAD, and SP) are clearly related to *DSM-IV-TR* anxiety disorders (the school anxiety [SA] or school refusal factor is not a *DSM-IV-TR* anxiety disorder). The analysis of developmental trajectories was conducted by LGM. An important reason for the choice of LGM is because it provides goodness-of-fit statistics (i.e., is the growth model itself statistically significant?), whereas some of the other growth model analyses provide only relative fit statistics (i.e., is the growth model statistically simply better than another growth model?).[16]

METHOD

Subjects

Data for this study were collected as part of a five-wave longitudinal research project entitled CONAMORE (CONflict And Management Of RElationships), with a 1-year interval between each of the waves. In the first wave, 1,521 students participated. These students came from 12 different Dutch junior high and high schools in the Utrecht province of the Netherlands. Utrecht is one of the largest provinces of the Netherlands and the composition of the province closely mirrors that of the Dutch population as a whole.[22]

Of the initial 1,521 students included, 181 (12%) turned in (almost) blank questionnaires and hence were excluded from further analyses. Twenty-two other students (1%) withdrew from the study after the first wave. The excluded group (n = 203; 13%) did not differ significantly from the final research sample (1,318 students) in terms of age or sex. Sample attrition was 1.2% across waves: in waves 1, 2, 3, 4, and 5, the number of participants was 1,318, 1,313, 1,293, 1,292, and 1,275, respectively. Incidental missing values were estimated in SPSS, using the EM procedure.

The final longitudinal sample of 1,318 participants was divided into an early adolescent cohort (n = 939; 71.2%), which was of an average age of 12 years (SD 0.57, range 10 to 15), and a middle adolescent cohort (n = 379, 28.8%) which was of an average age of 16.6 years (SD 0.65, range 16 to 18) at the first wave of measurement. The early adolescent cohort consisted of 475 boys (50.6%) and

464 girls (49.4%), and the middle adolescent cohort consisted of 164 boys (43.3%) and 215 girls (56.7%).

Instrument

The original 38-item SCARED[4,5] was used in this study. The SCARED is a self-report questionnaire that measures five anxiety disorder symptoms in children and adolescents: GAD, PD, SA (or school refusal), SAD, and SP. Apart from SA, the other four symptom dimensions are clearly related to *DSM-IV-TR* anxiety disorders. In addition to the initial studies in clinical populations,[4,5] these five symptom dimensions have generally shown satisfactory sensitivity and specificity when compared to *DSM-IV-TR* anxiety disorder diagnoses as measured by the Diagnostic Interview Schedule for Children.[3] Furthermore, the factor structure of the SCARED has also been studied in samples of children and adolescents from the general population.[6,13] Confirmatory factor analyses demonstrated that the SCARED possesses the same five-factor structure in nonclinical youths as originally observed in clinically referred children and adolescents.[6]

Participants rated each symptom item on a 3-point scale: 0 (almost never), 1 (sometimes), and 2 (often). The range of the scores for the various SCARED factors was GAD (range 0–18), PD (range 0–26), SA (range 0–8), SAD (range 0–16), and SP (range 0–8). The ranges of the internal consistency coefficients (Cronbach α) of the SCARED factors for each wave of the study were, respectively, GAD (.82–.86), PD (.81–.90), SA (.64–.74), SAD (.68–.77), and SP (.85–.88).

Data Collection Procedures

Students who participated in this study completed the SCARED, which takes approximately 15 minutes, during the adolescents' homeroom study period at school. Before the study, the student and his or her parents received written information and, if the student agreed to participate, provided written informed consent. Less than 1% elected not to participate. Consent was also obtained from all of the participating schools. This study and its assent and consent documents were approved by the institutional review board. Verbal instructions were given just before the testing sessions to complement the written instructions ("A number of statements that refer to being afraid are given below. Read each statement and indicate how frequently you have that symptom: almost never, sometimes, or often. There are no right or wrong answers. Honestly say how you generally feel. Please don't skip any statements.") printed above each questionnaire. At the end of the homeroom study period, the questionnaires were collected by the research assistant and returned to the researchers.

Data Analysis

Developmental trajectories of adolescent anxiety disorder symptoms were examined using LGM within AMOS (maximum likelihood estimation in AMOS 7).[23] LGM allows for the simultaneous estimation of multiple and interrelated relations between independent and dependent variables. Compared to traditional (multiple) regression techniques, LGM is able to simultaneously estimate relations between variables that act as an independent variable in one relation and as a dependent variable in another relation.[24] Moreover, the variables in these relations may be represented by both observed and unobserved (latent) variables. As such, LGM incorporates factor analytic techniques into regression analysis, which also enables for the correction of measurement error in the estimation of the relationships between variables.[16]

In this study, the LGM analysis of the development of adolescent anxiety symptoms is defined by latent growth factors, which are indicated by the repeated measurement of the SCARED scores. The factor loadings of the SCARED scores can be parameterized in such a way that separate growth factors represent intercept (i.e., initial anxiety symptom score) and slope (i.e., change in anxiety symptom score), respectively. Given enough time points, LGM is able to examine several growth forms by defining additional slope factors with factor loadings that correspond to specific growth functions (i.e., linear, quadratic, cubic).

The separation of intercept and slope factors also distinguishes LGM from the traditional repeated-measures analysis of variance approach, in which it is impossible to separately analyze the effects and influences of intercept and slope factors.[16] Using LGM, we are able in this study to analyze the differences between adolescent cohorts regarding both the intercept and slope in the development of anxiety symptoms. Therefore, LGM offers the opportunity not only to study different trajectories of development for different cohorts but also to test the adequacy of these latent trajectories in terms of the fit between the latent and observed variable relations of the model. However, a disadvantage of the LGM approach is that this technique presupposes large samples and enough measurement moments to reliably estimate the model parameters (growth factors).[25]

Before examining possible differences between the early and middle adolescent boy and girl cohorts, several models (i.e., linear and nonlinear) differing in the parameterization of development were tested for the total sample, with respect to the five anxiety disorder symptom factors of the SCARED. Among these models, those representing development in a straight linear manner consistently exhibited the best overall fit. Additional quadratic and cubic terms were not statistically different from zero. We therefore tested possible cohort differences within this linear growth model.

We then performed a multigroup analysis for the early and middle adolescent boy and girl cohorts. Within the multigroup analysis, several models were consecutively tested. First, a model was tested in which all the model parameters were constrained to be equal across the four cohorts (model 1: constrained). In this quasi-null model, it was hypothesized that no differences exist in the value of the model parameters between the four age- and sex-defined cohorts. In the second model (model 2: error variances free), the four cohorts are allowed to differ regarding the error variances across the five yearly measurements. To allow for the test of the net differences in growth parameters, this model needs to precede the models in which these growth parameters are freely estimated. The third step in the analysis consisted of testing two separate models: one model that additionally allows for age cohort differences in growth parameters (i.e., means, variances, and covariance of intercept and slope) and one model that allows for sex differences in these growth parameters (model 3a: age free, model 3b: sex free). Finally, a model is tested in which both age and sex cohort differences may occur simultaneously (model 4: sex and age free).

For evaluating the fit of the model, several goodness-of-fit indices were used: the χ^2 to *df* ratio (χ^2/df), for which values <5 and <3 are considered to represent, respectively, an acceptable and good fit; the comparative fit index, with values >0.90 being indicative of a satisfactory fit and values >0.95 demonstrating a good fit; the root mean square error of approximation, with values of ≤0.08 indicating an acceptable fit and values of ≤0.05 indicating a good fit; the 90% confidence interval of root mean square error of approximation. The

TABLE 1
Model Fit Statistics for the Linear Growth Model of the Adolescent Anxiety Disorder Symptom Factors

	Model Fit Statistics						
Factor	χ^2	*df*	*p*	χ^2/df	CFI	RMSEA	CI of RMSEA
GAD	40.3	10	<.001	4.03	0.99	0.057	0.039–0.076
PD	29.78	10	.001	2.98	0.98	0.046	0.028–0.066
SA	42.89	10	<.001	4.29	0.97	0.06	0.042–0.078
SAD	31.73	10	<.001	3.17	0.98	0.048	0.030–0.068
SP	39.87	10	<.001	3.99	0.98	0.057	0.039–0.076

Note: CFI = comparative fit index, RMSEA = root mean square error of approximation, CI of RMSEA = 90% confidence interval of root mean square error of approximation. GAD = generalized anxiety disorder, PD = panic disorder, SA = school anxiety, SAD = separation anxiety disorder, SP = social phobia.

comparative fit of various models was tested using the difference in χ^2 values between models ($\Delta\chi^2$) and Akaike's information criterion, with the lowest value representing the best fitting model.[24,25]

RESULTS

The model fit statistics of the linear growth model for the total sample are reported in Table 1. Acceptable fit statistics are obtained for all five developmental trajectories of adolescent anxiety disorder symptoms factors. Inspection of the intraclass correlation coefficients revealed that only a minor part of the total variance in adolescent anxiety disorder symptom factors could be attributed to the school level (i.e., a mean percentage of <2%). Therefore, the school level was not included in further analyses.

Table 2 reports the model fit statistics of the multigroup analyses, including the comparative fit statistics of the consecutive models for each developmental trajectory of the adolescent anxiety disorder symptom factors. The results in the table clearly indicate the significance of the age and sex cohorts for the development of scores on the five adolescent anxiety disorder symptom factors. The models, which allow for both sex and age cohort differences, not only demonstrated a good fit but also represent statistically significant improvements compared to previous models that partly or completely ignore these differences.

Next, we analyzed which growth parameters differed for the four cohorts. This analysis was focused on the means of the intercepts and slopes and their standardized covariance (i.e., disregarding possible differences in the variances of intercept and slope). The covariance term in the LGM model expresses the relationship between individual intercepts and slopes. The results are reported in Table 3.

For the GAD factor, middle adolescent girls displayed significantly higher initial symptom scores (LGM intercepts) compared to the other cohorts. Over time, early and middle adolescent boys both showed a significant decrease in GAD scores (LGM slopes), whereas early adolescent girls displayed a significant increase and middle adolescent girls maintained their (higher) level of GAD scores. For the early adolescent boys, the decrease in GAD scores was greater when the initial level of GAD was higher (standardized covariance).

With regard to the scores on the PD factor, middle adolescents generally scored lower (although the difference between the early and middle adolescent girls was only marginally significant, $p = .06$). Over time, the scores of all of the cohorts decreased, but this decrease was greatest for early adolescent boys. Again, the decrease in PD scores of early adolescent boys was greater when their initial symptom level was higher.

No significant differences existed between the intercept of the SA factor for the four adolescent age and sex cohorts. However, the slope of SA decreased most markedly for the adolescent boys and the middle adolescent girls. In general, the decrease was most pronounced for those adolescents with the highest initial levels (intercepts) of SA.

For the SAD factor, early adolescent boys and girls both started with significantly higher intercepts than the middle adolescence age cohorts. SAD slopes significantly decrease over time, but this decrease was significantly stronger for the early adolescent cohorts, especially for those who initially showed a high level of separation anxiety.

The initial level of the SP factor was significantly higher among adolescent girls than among adolescent boys, irrespective of age cohort. In addition, the middle adolescent girls started with significantly higher levels (intercepts) of SP than the early adolescent girls. Finally, SP symptoms appeared to be relatively stable (slopes) across time.

DISCUSSION

In this 5-year prospective community study, it was found that the developmental trajectories of the five adolescent anxiety disorder symptoms demonstrated

TABLE 2
Multigroup Analysis of the Age and Sex Cohorts: (Comparative) Model Fit Statistics

	Model Fit Statistics						Comparison with Previous Model			
Factor/Model	χ^2	*df*	*p*	χ^2/df	CFI	RMSEA	AIC	$\Delta\chi^2$	*df*	*p*
GAD										
1. Constrained	316.99	70	<.001	4.53	0.87	0.062	336.99			
	269.45	55	<.001	4.90	0.89	0.065	319.46		15	<.001
2. Error variances free	228.76	50	<.001	4.58	0.91	0.062	288.76	47.52	5	<.001
	123.68	50	<.001	2.47	0.96	0.040	183.68		5	<.001
3a. Age free	84.86	40	<.001	2.12	0.98	0.035	164.86	40.71	10	<.001
3b. Sex free									10	<.001
4. Sex and age free								145.78		
								3a. 143.90		
								3b. 38.83		
PD										
1. Constrained	339.82	70	<.001	4.86	0.79	0.065	359.82			
	185.04	55	<.001	3.36	0.90	0.051	235.04		15	<.001
2. Error variances free	156.87	50	<.001	3.14	0.92	0.048	216.87	154.78	5	<.001
	131.21	50	<.001	2.62	0.94	0.042	191.21		5	<.001
3a. Age free	79.13	40	<.001	1.98	0.97	0.033	159.13	28.17	10	<.001
3b. Sex free									10	<.001
4. Sex and age free								53.83		
								3a. 77.74		
								3b. 52.07		
SA										
1. Constrained	284.40	70	<.001	4.07	0.80	0.058	304.40			
	207.60	55	<.001	3.78	0.86	0.055	257.60		15	<.001
2. Error variances free	162.89	50	<.001	3.26	0.90	0.049	222.89	76.80	5	<.001
	185.35	50	<.001	3.71	0.88	0.054	245.35		5	<.001
3a. Age free	127.42	40	<.001	3.19	0.92	0.049	207.42	44.71	10	<.001
3b. Sex free									10	<.001
4. Sex and age free								22.26		
								3a. 35.47		
								3b. 57.92		
SAD										
1. Constrained	330.93	70	<.001	4.73	0.78	0.064	350.93			
	202.63	55	<.001	3.68	0.87	0.054	252.63		15	<.001
2. Error variances free	167.05	50	<.001	3.34	0.90	0.050	227.05	128.30	5	<.001
	145.59	50	<.001	2.91	0.92	0.045	205.59		5	<.001
3a. Age free	96.76	40	<.001	2.42	0.95	0.039	176.76	35.59	10	<.001
3b. Sex free									10	<.001
4. Sex and age free								57.04		
								3a. 70.28		
								3b. 48.83		
SP										
1. Constrained	231.96	70	<.001	3.31	0.91	0.050	251.96			
	190.92	55	<.001	3.47	0.93	0.052	240.92		15	<.001
2. Error variances free	169.31	50	<.001	3.39	0.94	0.051	229.31	41.04	5	.001
	125.30	50	<.001	2.51	0.96	0.040	185.30		5	<.001
3a. Age free	101.76	40	<.001	2.54	0.97	0.041	181.76	21.61	10	<.001
3b. Sex free									10	.009
4. Sex and age free								65.62		
								3a. 67.55		
								3b. 23.54		

Note: CFI = comparative fit index; RMSEA = root mean square error of approximation; AIC = Akaike's information criterion; GAD = generalized anxiety disorder; PD = panic disorder; SA = school anxiety; SAD = separation anxiety disorder; SP = social phobia.

TABLE 3
Age and Sex Cohort Differences in Growth Parameter Estimates and Model Mean Scores for Each Measurement Wave

Factor	M_{IC}	M_{SL}	COV_{ICSL}	r_{ICSL}	Wave 1	Wave 2	Wave 3	Wave 4	Wave 5
GAD									
Early adolescent boys	1.312**[a]	−0.019**[a]	−0.009**	−0.51[a]	1.312	1.293	1.274	1.255	1.236
Middle adolescent boys	1.339**[a]	−0.020*[a]	0.001	0.14[b]	1.339	1.319	1.299	1.279	1.259
Early adolescent girls	1.363**[a]	0.024**[b]	−0.002	−0.12[ab]	1.363	1.387	1.411	1.435	1.459
Middle adolescent girls	1.522**[b]	0.004[c]	0.002	0.09[b]	1.522	1.526	1.530	1.532	1.536
PD									
Early adolescent boys	1.246**[a]	−0.031**[a]	−0.007**	−0.76[a]	1.246	1.215	1.184	1.153	1.122
Middle adolescent boys	1.172**[b]	−0.016*[b]	−0.002	−0.48[b]	1.172	1.156	1.140	1.124	1.108
Early adolescent girls	1.237**[a]	−0.017**[b]	−0.003*	−0.45[ab]	1.237	1.220	1.203	1.186	1.169
Middle adolescent girls	1.203**[ab]	−0.007[b]	−0.002	−0.18[b]	1.203	1.196	1.189	1.182	1.175
SA									
Early adolescent boys	1.277**	−0.023**[a]	−0.013**	−0.70[a]	1.277	1.254	1.231	1.208	1.185
Middle adolescent boys	1.264**	−0.046**[b]	−0.012**	−0.85[ab]	1.264	1.252	1.240	1.228	1.216
Early adolescent girls	1.237**	−0.005[c]	−0.005	−0.34[b]	1.237	1.232	1.227	1.222	1.217
Middle adolescent girls	1.241**	−0.033**[ab]	−0.009**	−0.62[ab]	1.241	1.208	1.175	1.142	1.109
SAD									
Early adolescent boys	1.326**[ac]	−0.044**[a]	−0.006*	−0.69[a]	1.326	1.282	1.238	1.194	1.150
Middle adolescent boys	1.217**[b]	−0.027**[bc]	0.000	0.02[b]	1.217	1.190	1.163	1.136	1.109
Early adolescent girls	1.354**[a]	−0.033**[ab]	−0.004*	−0.39[ab]	1.354	1.321	1.288	1.255	1.222
Middle adolescent girls	1.282**[c]	−0.014*[c]	0.000	0.03[b]	1.282	1.268	1.254	1.240	1.226
SP									
Early adolescent boys	1.437**[a]	−0.004[ab]	0.002	0.12	1.437	1.433	1.429	1.425	1.421
Middle adolescent boys	1.440**[a]	−0.008[ab]	−0.011	−0.33	1.440	1.432	1.424	1.416	1.408
Early adolescent girls	1.576**[b]	0.012[a]	−0.007	−0.19	1.576	1.588	1.600	1.612	1.624
Middle adolescent girls	1.695**[c]	−0.025*[b]	−0.009	−0.26	1.695	1.670	1.645	1.620	1.595

Note: Different superscripts within columns reflect significant differences between cohorts at $p < .05$. M_{IC} = mean intercept; M_{SL} = mean slope; COV_{ICSL} = mean covariance, r_{ICSL} = standardized covariance; GAD = generalized anxiety disorder; PD = panic disorder; SA = school anxiety; SAD = separation anxiety disorder; SP = social phobia.

* $p < .01$; ** $p < .001$.

meaningful developmental changes for the early and middle adolescent boy and girl cohorts when compared to previous studies. As can be seen in Table 3, in general, there was a slight decrease in the PD, SA, and SAD anxiety symptoms for all of the adolescents, with the exception of SP symptoms, which remained fairly stable. Moreover, adolescent girls showed a slight increase of GAD symptoms, whereas these symptoms decreased for the adolescent boys.

However, in contrast to previous studies of adolescent anxiety that studied group mean score differences or group score predictions, this investigation was able to study both the initial anxiety symptom severities (intercepts) and the shape of the anxiety development (slope) by analyzing the individual trajectories of adolescent anxiety disorder symptoms factors in a prospective design. To our knowledge, no previous study has examined adolescent developmental trajectories of anxiety disorder symptoms in a longitudinal design to prospectively document the rise and fall of different anxiety disorder symptoms.

The initial anxiety symptom levels (LGM intercepts) as obtained in this study clearly reflect the sex differences that have been reported in previous studies.[14] Such studies have also shown that, in general, girls from the general population tend to display higher anxiety levels than boys, and this appears to be true for children as well as for adolescents.[9,26,27]

In terms of the specific adolescent anxiety disorder symptom factors, studies have found that girls scored higher on GAD, SAD, and SP than boys.[6,28,29] The sex differences on these three factors, which are strongly based on anxiety with respect to interpersonal interactions, may be explained by a tendency for girls to have a stronger interpersonal orientation than boys.[30] In addition, it should also be noted that genetic

predispositions may also make adolescent girls susceptible to anxiety development.[31] Furthermore, adolescent girls tend to display more stable anxiety scores than adolescent boys. These findings are in agreement with epidemiological studies that have noted both higher and more stable anxiety prevalence rates in adolescent girls than boys.[32,33]

These sex differences may also depend on the informant of the study. For example, it has been found that the mothers of adolescents reported no significant differences between boy and girl anxiety disorder symptoms; however, girls did report more anxiety than reported by their mothers.[34] The issue of informants is revisited in the discussion of the limitations of this study.

Results concerning the longitudinal changes in anxiety symptom levels of the early and middle adolescent boy and girl cohorts, as expressed by the slope and standardized covariance findings of this study, also correspond to findings of previous studies suggesting a general decrease in anxiety symptoms as boys and girls from the general population grow from early to middle adolescence.[35]

One exception to this general decrease of adolescent anxiety is that of GAD. Whereas previous researchers have noted a general increase in GAD during adolescence,[18] the present study demonstrates that this increase predominantly applies to adolescent girls. Young adolescent girls had significantly stronger growth rates than middle adolescent girls, and middle adolescent girls started with significantly higher intercepts and then maintained these high symptom levels.

This finding on GAD may be of interest for both researchers and clinicians. For example, in a prospective community study of adolescents that used the Diagnostic Interview Schedule for Children to determine psychiatric diagnoses, it was found that adolescent overanxious disorder (the *DSM-III* diagnosis changed to GAD in the *DSM-IV-TR*) was strongly associated with a future diagnosis of depression in adults.[7] Although follow-up to adulthood was not conducted in this study, it may well be that female GAD symptoms form a risk factor for the future development of depression. As noted in other studies, the core symptom of GAD, worry, has been found to be a strong risk factor for the development of depression in girls.[36] Girls also run a greater risk for heterotypic continuity (having an underlying disorder that has different manifestations at different ages) than boys,[37] and girls have a higher risk for developing depression than boys.[38] GAD worry is strongly focused on interpersonal difficulties,[18] and previous studies have shown that interpersonal difficulties with peers are associated with general anxiety in girls.[32] Moreover, interpersonal difficulties with parents are associated specifically with GAD in adolescent girls.[39] Given the strong increase of GAD symptoms in girls in early adolescence and the relative stability in middle adolescence found in this study, early interventions focused on strengthening social competence and on supplanting worry as a dysfunctional coping skill may help reduce the risk for later developmental maladaptation, as suggested by Bosquet and Egeland.[32] Future studies could be conducted to test whether such interventions in fact reduce these risks.

In terms of limitations, it should first be noted that this study focused only on the adolescent's self-report of anxiety symptoms. Although it is generally accepted that adolescents should be the main informant in the case of anxiety disorders,[40] use of a multi-informant structured diagnostic interview, such as the Anxiety Disorders Interview Schedule for Children and Parents, could have been used to study differences in adolescent and parent reporting of anxiety symptoms as well as to determine the relation between the self-report and an actual diagnosis.[41]

Second, because this study focused only on self-reports of anxiety symptoms of adolescents from the general population, results cannot be readily extrapolated to adolescents from clinical populations. Woodruff-Borden and Leyfer[42] have noted that although the developmental course of anxiety symptoms is transient for many youths, a significant minority of children and adolescents may develop clinically significant anxiety problems. Therefore, community studies such as the present study are important because they circumvent the problem of referral bias that frequently occurs in the clinical setting.

In summary, research has begun to study developmental trajectories in the phenomenology of other types of adolescent disorders. However, no other study was identified that specifically examined adolescent developmental trajectories of anxiety disorder symptoms in a longitudinal design to prospectively document the rise and fall of anxiety disorder symptom factors. In this 5-year prospective community study, it was found that the developmental trajectories of adolescent anxiety disorder

symptom factors differed from one another for various adolescent age and sex cohorts in agreement with previous studies of adolescent anxiety disorders. However, those earlier studies had primarily investigated adolescent anxiety development by means of group mean score differences and group score predictions. By contrast, in this study, LGM was used to study differences in the individual trajectories of adolescent anxiety disorder symptom factors over time, resulting in more nuanced distinctions of adolescent anxiety development.

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REFERENCES

1. Ollendick TH, King NJ, Muris P. Fears and phobias in children: phenomenology, epidemiology, and aetiology. *Child Adolesc Mental Health*. 2002;7:98–106.
2. Ollendick TH, Yang B, King NJ, Dong Q. Fears in American, Australian, Chinese, and Nigerian children and adolescents: a cross cultural study. *J Child Psychol Psychiatry*. 1996;37:213–220.
3. Muris P, Merckelbach H, Mayer B, Prins E. How serious are common childhood fears? *Behav Res Ther*. 2000;38:217–228.
4. Birmaher B, Khetarpal S, Brent D, et al. The Screen for Child Anxiety Related Emotional Disorders (SCARED): scale construction and psychometric characteristics. *J Am Acad Child Adolesc Psychiatry*. 1997; 36:545–553.
5. Birmaher B, Brent DA, Chiappetta L, Bridge J, Monga S, Baugher M. Psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED): a replication study. *J Am Acad Child Adolesc Psychiatry*. 1999;38:1230–1236.
6. Hale WW III, Raaijmakers Q, Muris P, Meeus W. Psychometric properties of the Screen for Child Anxiety Related Emotional Disorders (SCARED) in the general adolescent population. *J Am Acad Child Adolesc Psychiatry*. 2005;44:283–290.
7. Pine DS, Cohen P, Gurley D, Brook J, Ma Y. The risk for early-adulthood anxiety and depressive disorders in adolescents with anxiety and depressive disorders. *Arch Gen Psychiatry*. 1998;55:56–64.
8. Ferdinand RF, Verhulst FC. Psychopathology from adolescence into young adulthood: an eight-year follow-up study. *Am J Psychiatry*. 1995; 152:1586–1594.
9. Muris P, Merckelbach H, Ollendick T, King N, Bogie N. Three traditional and three new childhood anxiety questionnaires: their reliability and validity in a normal adolescent sample. *Behav Res Ther*. 2002;40:753–772.
10. American Psychiatric Association. *Diagnostic and Statistical Manual of Mental Disorders, 4th edition, Text Revision (DSM-IV-TR)*. Washington, DC: American Psychiatric Publishing; 2000.
11. Myers K, Winters NC. Ten-year review of rating scales: II. Scales for internalizing disorders. *J Am Acad Child Adolesc Psychiatry*. 2002;41: 634–659.
12. March JS, Parker JD, Sullivan K, Stallings P, Conners C. The Multidimensional Anxiety Scale for Children: factor structure, reliability, and validity. *J Am Acad Child Adolesc Psychiatry*. 1997;36: 554–565.
13. Muris P, Merckelbach H, Schmidt H, Mayer B. The revised version of the Screen for Child Anxiety Related Emotional Disorders (SCARED-R): factor structure in normal children. *Person Ind Diff*. 1999;26: 99–112.
14. Clark DB, Smith MG, Neighbors BD, Skerlec LM, Randall J. Anxiety disorder in adolescence: characteristics, prevalence, and comorbidities. *Clin Psychol Rev*. 1994;14:113–137.
15. Cole DA, Martin NC. The longitudinal structure of the Children's Depression Inventory: testing a latent trait-state model. *Psychol Assess*. 2005;17:144–155.
16. Duncan TE, Duncan SC, Strycker LA, Li F, Alpert A. *An Introduction to Latent Variable Growth Curve Modeling. Concepts, Issues, and Applications*. Mahwah, NJ: Erlbaum; 1999.
17. Cohen P, Cohen J, Kasen S, et al. An epidemiological study of disorders in late childhood and adolescence: I. Age and gender specific prevalence. *J Child Psychol Psychiatry*. 1993;34:851–867.
18. Rapee RM. The development of generalized anxiety. In: Vasey MW, Dadds MR , eds. *The Developmental Psychopathology of Anxiety*. London: Oxford University Press; 2001:481–503.
19. Ohannessian C, Lerner RM, Lerner JV, von Eye A. Does self competence predict gender differences in adolescent depression and anxiety? *J Adolesc*. 1999;22:397–411.
20. Ollendick TH, King NJ. Fears and their level of interference in adolescents. *Behav Res Ther*. 1994;32:635–638.
21. Lewinsohn PM, Gotlib IH, Lewinsohn M, Seeley JR, Allen NB. Gender differences in anxiety disorders and anxiety symptoms in adolescents. *J Abnorm Psychol*. 1998;107:109–117.
22. Centraal Bureau voor de Statistiek (The Dutch Central Bureau for Statistics). *Jeugd 2003, cijfers en feiten [Dutch youth 2003, numbers and facts]*. Voorburg, the Netherlands: Centraal Bureau voor de Statistiek (Dutch Central Bureau for Statistics); 2003.
23. Arbuckle JL, Wothke W. *Amos 7 User's Guide*. Chicago: SmallWaters; 2006.
24. Kline RB. *Principles and Practice of Structural Equation Modeling*. New York: Guilford; 2005.
25. Byrne BM. *Structural Equation Modeling With AMOS: Basic Concepts, Applications, and Programming*. Mahwah, NJ: Erlbaum; 2001.
26. Essau CA, Muris P, Ederer EM. Reliability and validity of the Spence Children's Anxiety Scale and the Screen for Child Anxiety Related Emotional Disorders in German children. *J Behav Ther Exp Psychiatry*. 2002;33:1–18.
27. Muris P, Dreessen L, Bögels S, Weckx M, van Melick M. A questionnaire for screening a broad range of DSM-defined anxiety disorder symptoms in clinically referred children and adolescents. *J Child Psychol Psychiatry*. 2004;45:813–820.
28. Hewitt JK, Silberg JL, Rutter M, et al. Genetics and developmental psychopathology: 1. Phenotypic assessment in the Virginia twin study of adolescent behavioral development. *J Child Psychol Psychiatry*. 1997;38: 943–963.
29. Ogliari A, Citterio A, Zanoni A, et al. Genetic and environmental influences on anxiety dimensions in Italian twins evaluated with the SCARED questionnaire. *J Anxiety Disord*. 2006;20:760–777.
30. Hankin BL, Abramson LY. Development of gender differences in depression: an elaborated cognitive vulnerability transactional stress theory. *Psychol Bull*. 2001;127:773–796.
31. Silberg J, Rutter M, Neale M, Eaves L. Genetic moderation of environmental risk for depression and anxiety in adolescent girls. *Br J Psychiatry*. 2001;179:116–121.
32. Bosquet M, Egeland B. The development and maintenance of anxiety symptoms from infancy through adolescence in a longitudinal sample. *Dev Psychopathol*. 2006;18:517–550.
33. Handwerk ML, Clopton K, Huefner JC, Smith GL, Hoff KE, Lucas CP. Gender differences in adolescents in residential treatment. *Am J Orthopsychiatry*. 2006;76:312–324.
34. Romano E, Tremblay RE, Vitaro F, Zoccolillo M, Pagani L. Prevalence of psychiatric diagnoses and the role of perceived impairment: findings from an adolescent community sample. *J Child Psychol Psychiatry*. 2001; 42:451–461.
35. Gullone E. The development of normal fear: a century of research. *Clin Psychol Rev*. 2000;20:429–451.
36. Papadakis AA, Prince RP, Jones NP, Strauman TJ. Self-regulation, rumination, and vulnerability to depression in adolescent girls. *Dev Psychopathol*. 2006;18:815–829.
37. Costello EJ, Mustillo S, Erkanli A, Keeler G, Angold A. Prevalence and

development of psychiatric disorders in childhood and adolescence. *Arch Gen Psychiatry*. 2003;60:837–844.
38. Wade TJ, Cairney J, Pevalin DJ. Emergence of gender differences in depression during adolescence: national panel results from three countries. *J Am Acad Child Adolesc Psychiatry*. 2002;41:190–198.
39. Hale WW III, Engels R, Meeus W. Adolescent's perceptions of parenting behaviours and its relationship to adolescent generalized anxiety disorder symptoms. *J Adolesc*. 2006;29:407–417.
40. Stallings P, March JS. Assessment. In: March JS, ed. *Anxiety Disorders in Children and Adolescents*. New York: Guilford; 1995:125–147.
41. Comer JS, Kendall PC. A symptom-level examination of parent-child agreement in the diagnosis of anxious youths. *J Am Acad Child Adolesc Psychiatry*. 2004;43:878–886.
42. Woodruff-Borden J, Leyfer OT. Anxiety and fear. In: Hersen M, ed. *Clinician's Handbook of Child Behavioral Assessment*. San Diego: Elsevier; 2006:267–289.

Surfing for Thinness: A Pilot Study of Pro-Eating Disorder Web Site Usage in Adolescents With Eating Disorders Wilson JL, Peebles R, Hardy KK, Litt IF

Objective: Pro-eating disorder Web sites are communities of individuals who engage in disordered eating and use the Internet to discuss their activities. Pro-recovery sites, which are less numerous, express a recovery-oriented perspective. This pilot study investigated the awareness and usage of pro-eating disorder Web sites among adolescents with eating disorders and their parents and explored associations with health and quality of life. *Patients and Methods:* This was a cross-sectional study of 698 families of patients (aged 10–22 years) diagnosed with an eating disorder at Stanford between 1997 and 2004. Anonymous surveys were mailed and offered in clinic. Survey content included questions about disease severity, health outcomes, Web site usage, and parental knowledge of eating disorder Web site usage. *Results:* Surveys were returned by 182 individuals: 76 patients and 106 parents. Parents frequently (52.8%) were aware of pro-eating disorder sites, but an equal number did not know whether their child visited these sites, and only 27.6% had discussed them with their child. Most (62.5%) parents, however, did not know about pro-recovery sites. Forty-one percent of patients visited pro-recovery sites, 35.5% visited pro-eating disorder sites, 25.0% visited both, and 48.7% visited neither. While visiting pro-eating disorder sites, 96.0% reported learning new weight loss or purging techniques. However, 46.4% of pro-recovery site visitors also learned new techniques. Pro-eating disorder site users did not differ from nonusers in health outcomes but reported spending less time on school or schoolwork and had a longer duration of illness. Users of both pro-eating disorder and pro-recovery sites were hospitalized more than users of neither site. *Conclusions:* Pro-eating disorder site usage was prevalent among adolescents with eating disorders, yet parents had little knowledge of this. Although use of these sites was not associated with other health outcomes, usage may have a negative impact on quality of life and result in adolescents' learning about and adopting disordered eating behaviors. Reproduced with permission from **Pediatrics** 2006;118:e1635–e1643, Copyright 2006 by the AAP.