CORRECTED JANUARY 18, 2007; SEE LAST PAGE

Developmental Psychology
2006, Vol. 42, No. 2, 345–349

0012-1649/06/$12.00 DOI: 10.1037/0012-1649.42.2.345

Effect of Anxiety Reduction on Children's School Performance and Social Adjustment

Jeffrey Wood
University of California, Los Angeles

This study tested the effect of reductions in children's anxiety over time on improvements in school performance and social functioning in the context of participation in a cognitive–behavioral intervention program. Participants included 40 children with high anxiety (6–13 years of age). Independent evaluators, children, and parents rated child anxiety; parents rated school performance; and children and parents rated social functioning. Measures were completed at preintervention, midintervention, and postintervention. Fixed-effects regression analyses and random-effects regression analyses indicated that decreased anxiety was predictive of improved school performance and social functioning over the course of the intervention. These findings suggest that changes in anxiety influence trajectories of children's scholastic and social functioning.

Keywords: anxiety, school performance, social adjustment, longitudinal studies

Excessive anxiety is a common problem facing youth that can harm them in many areas of their lives, including school performance and social functioning. Although past studies have demonstrated an association between child anxiety disorders and poor academic performance as well as between child anxiety disorders and social maladjustment, these studies relied on cross-sectional designs. Although cross-sectional designs have several strengths, one limitation is that these designs cannot establish the direction of effects. To address this limitation in the literature, researchers need to conduct longitudinal studies. Longitudinal designs address dynamic rather than static relations among variables and thus help establish the plausibility of hypotheses concerning the direction of effects (Cowan & Cowan, 2002). In the present study, we used a longitudinal design in the context of a short-term intervention for anxiety disorders to test whether reductions in children's anxiety over time would predict improvements in school performance and social adjustment.

Links Among Anxiety, School Performance, and Social Adjustment

Anxiety is a negative mood state that occurs in anticipation of a perceived threat (Barlow, 1991). Theory and research suggest a link between high anxiety and impaired cognitive performance and, consequently, a link between high anxiety and poor academic outcomes. Elevated anxiety produces a state of physiological arousal and a narrowing focus of attention on perceived threat. This arousal tends to impair concentration on nonthreat stimuli such as academic tasks; furthermore, high anxiety may be associated with disturbance in recall of previously mastered academic knowledge (Ma, 1999). Over the course of a school year, children with anxiety disorders (i.e., clinically elevated levels of anxiety; American Psychiatric Association, 1994) may perform below their ability level, which may lead to lower marks on report cards. Cross-sectional studies support this claim by showing associations between child anxiety disorder status and school performance (e.g., Langley, Bergman, McCracken, & Piacentini, 2004). However, the effect of a reduction of anxiety over time on academic outcomes has not yet been tested.

In addition to school performance, other outcomes such as social functioning may be harmed by anxiety. Children who are highly anxious may be overly reticent, may avoid peer interaction, or may act in a less competent manner when around peers because of preoccupation with threat and an inability to focus on the social cues at hand. Researchers have identified cross-sectional links between elevated anxiety levels and impaired social functioning (e.g., peer relationships; Barrett & Heubeck, 2000; Fordham & Stevenson-Hinde, 1999; Langley et al., 2004). Whether a change in anxiety over time is associated with changes in social adjustment remains to be seen.

Interventions for Childhood Anxiety

The past decade has seen the development of several efficacious interventions for children with high anxiety on the basis of the cognitive–behavioral paradigm (e.g., Kendall, 1994). About 50%–80% of children who receive intervention no longer meet criteria for an anxiety disorder at the end of such programs. Spence, Donovan, and Brechman-Toussaint (2000) found that intervention produced significant increases in children's social skills. However, Flannery-Schroeder and Kendall (2000) did not detect a significant effect of the intervention on social functioning or on loneliness. Although the literature has not assessed academic performance, cognitive–behavioral interventions also may affect such outcomes. Given the hypothesized role that high anxiety plays in poor school performance and social maladjustment, an intervention that sub-

I would like to thank Michael Mitchell for his statistical consultations and advice during the writing of this article.

Correspondence concerning this article should be addressed to Jeffrey Wood, Department of Education, 3132a Moore Hall, Moore Hall #951521, University of California, Los Angeles, Los Angeles, CA 90095. E-mail: jeffwood@ucla.edu

stantially reduces anxiety might indirectly improve these outcomes.

This pilot study tested the effect of reduction in anxiety over time on improvements in school performance and social adjustment in the context of participating in a cognitive–behavioral intervention. Additionally, because the sample comprised children of a broad age range (6–13-years) with potential developmental differences in the importance of anxiety for children's scholastic and social outcomes, we examined the moderating effects of age on the relationship between anxiety and outcome variables. Similarly, we explored the moderating effects of gender, given findings in the literature suggesting that boys and girls may differ with respect to the intensity and type of anxiety that they experience (Craske, 1999).

Methods

Participants

The initial sample included 40 children with high anxiety living in a major metropolitan area of the western United States, ranging in age from 6 to 13 years (M = 9.85 years), and their primary parent (defined as the parent or parents who was primarily responsible for overseeing the child's daily activities). Children were referred to the study by multiple community sources, including local school psychologists, principals, and a medical center. Children participated in a randomized, controlled trial of a cognitive–behavioral intervention (see *Intervention* section; for details, see Wood, Piacentini, Southam-Gerow, Chu, & Sigman, in press).

All children met *Diagnostic and Statistical Manual of Mental Disorders (*4th ed.; *DSM–IV*; American Psychiatric Association, 1994) criteria for at least one anxiety disorder (separation anxiety disorder, n = 27; generalized anxiety disorder, n = 11; social phobia, n = 20) diagnosed by an independent evaluator using a semistructured diagnostic interview (see *Measures* section). Eight of these children (20%) exhibited school refusal (less than 40% of school days in the past month missed because of emotional upset, not because of medical problems) prior to the intervention; all of these children returned to school full time by the end of the intervention. Most parents reported an age of onset of anxiety problems in the toddler or preschool years; many of the children (n = 24; 60%) had received previous counseling or pharmacotherapy.

Thirty-eight children (95%) completed the intervention and were assessed at postintervention. Slightly more than half the children were boys (n = 24; 60%). Most primary parents were mothers (n = 35; 87.5%), and most were married (n = 35; 87.5%). More than half the parents had graduated from college (n = 26; 65%). The sample was ethnically diverse (60% Caucasian; 22.5% multiracial; 10% Latino/Latina; 2.5% African American; 2.5% Asian).

Intervention

Two variations of a cognitive–behavioral therapy (CBT) intervention program were implemented; children were randomly assigned to either family-focused CBT or child-focused CBT. Although these intervention conditions differ slightly in focus, they largely overlap in methods and goals. Interventionists included nine psychology doctoral students and one doctoral-level psychologist.

CBT for childhood anxiety comprises the two elements of skills training and application (e.g., Kendall, 1994). During skills training, children are taught the coping strategies of emotion recognition, relaxation, and cognitive restructuring. The application and practice phase lasts for at least eight sessions and consists primarily of in vivo exposure tasks; these tasks involve facing an increasingly challenging set of anxiety-provoking situations, applying coping strategies, and attaining mastery experiences until anxiety is reduced. Teachers are contacted in certain cases (e.g., a child's failure to speak in class) and may be asked to oversee the child's in vivo exposures at school.[1]

In both intervention groups, parents were informed about the goals and methods of therapy. The two variants of CBT differ primarily in the amount of parent involvement and contact (see Wood et al., in press). In the child-focused condition, contact with the family is limited to a 30-min parent-education meeting and brief check-ins at the end of each session. In the family-focused condition, parents are more involved and learn about the child's coping plan as well as about ways to enhance the child's emotion regulation skills. Treatment dosage was equal in both intervention conditions: 12–16 sessions lasting 60–80 min each.

Measures

The severity of children's anxiety was assessed using the Anxiety Disorders Interview Schedule for *DSM–IV* (American Psychiatric Association, 1994): Child and Parent Versions (ADIS-C/P; Silverman & Albano, 1996), a semistructured interview schedule with established reliability and convergent validity. Trained independent evaluators (graduate students) conducted diagnostic interviews before intervention and immediately after intervention and made ratings on the ADIS-C/P Clinical Rating Scale (Silverman & Albano, 1996) regarding the severity of the child's anxiety (0 = *not at all*, 4 = *some*, 8 = *very, very much*).

Children responded to the Multidimensional Anxiety Scale for Children (MASC; March, 1998), a 39-item scale with excellent internal consistency and strong convergent validity that assesses children's anxiety symptoms (α = .86). Children also rated perceptions of their social acceptance on the Perceived Competence Scale for Children (PCSC; Harter, 1982; α = .80).

Parents made ratings on the Child Anxiety Impact Scale (CAIS; Langley et al., 2004), a 34-item scale with established validity and reliability that assesses difficulties in children's school and social functioning. In the present study, we used the CAIS School scale (α = .70) and CAIS Social scale (α = .87).

Parents also completed the Child Behavior Checklist (CBCL; Achenbach, 1991). Only those scales that were related to the specific hypotheses of this study were selected—namely, the CBCL School Performance scale (Achenbach, 1991), CBCL Social Competence scale, and CBCL Internalizing scale (the Internalizing scale was used as an indicator of anxiety). Totaled scores were then transformed into standardized T scores on the basis of national norms.

Lower scores on all measures of anxiety reflect less anxiety. Higher scores on the CBCL School Performance scale, CBCL Social scale, and PCSC Social Acceptance scale (Harter, 1982) represent better functioning. Lower scores on the CAIS School scale and CAIS Social scale represent better functioning.

Procedure

Interested families contacted the study coordinator. On the day of the assessment, consent forms were reviewed and signed, and the ADIS-C/P interview and questionnaires were administered. Subsequently, intervention began. A midintervention assessment at Session 7 included only child-report measures and parent-report measures. The postintervention assessment included all measures administered at preintervention.

Data Analysis

In this article, we examine the role of reduced anxiety over time in predicting improvements in school performance and social functioning

[1] Teachers of 22 children were contacted. No statistical difference was observed on any outcome measure for children whose teachers were involved in the intervention versus those whose teachers were not involved.

Table 1
Descriptive Statistics for All Variables Assessed at Preintervention, Midintervention, and Postintervention

	Preintervention		Midintervention		Postintervention		
Domain/measure	*M*	*S*	*DM*	*S*	*DM*	*S*	*D*
Anxiety							
ADIS-C/P	4.85	0.70			2.45	1.86	
MASC	51.64	16.97	47.85	19.10	42.17	18.49	
CBCL Internalizing	63.18	9.19	58.84	9.99	56.00	10.38	
School functioning							
CBCL School Performance	44.54	8.49	45.97	8.93	46.27	9.13	
CAIS School	11.14	8.15	8.64	7.95	7.05	8.35	
Social adjustment							
CBCL Social Competence	43.62	10.23	42.14	10.11	44.51	9.32	
CAIS Social	9.68	7.04	8.87	7.34	8.22	9.22	
PCSC Social Acceptance	18.58	4.18	18.89	4.93	19.74	3.85	

Note. $N = 37$. ADIS-C/P = Anxiety Disorders Interview Schedule for *Diagnostic and Statistical Manual,* 4th ed. (*DSM-IV;* American Psychiatric Association, 1994); Child and Parent Versions (Silverman & Albano, 1996); MASC = Multidimensional Anxiety Scale for Children (March, 1998); CBCL = Child Behavior Checklist (Achenbach, 1991); CAIS = Child Anxiety Impact Scale (Langley et al., 2004); PCSC = Perceived Competence Scale for Children (Harter, 1982).

rather than compare the family-focused conditions and the child-focused conditions.[2] Thus, families in the two conditions were combined into a single group for all analyses.

The effect of reduced anxiety (preintervention to midintervention to postintervention) on improvement in school performance and social functioning outcomes was assessed with (a) regression with fixed effects (conditional maximum likelihood) and (b) regression with random effects (generalized least squares) using Stata regression models for panel data (i.e., "xtreg"; StataCorp, 2005). For both regression models, we arranged the data set in long form (i.e., each subject has three lines of data representing three time points, and we used identification and time variables to determine within-person clusters of data and the time series for each subject, respectively). Regression coefficients reflect change from Time 1 to Time 2 to Time 3 in the independent variable predicting change over the same time period in the dependent variable, or, stated differently, the average intraindividual slope relating change in the independent variable and change in the dependent variable. Both regression models account for the relationship among observations on the same individual. Both models allow for individual-level variation in the mean of the outcome, but they model this variation in different ways. The random-effects model assumes that the person-level intercepts are drawn from a normal distribution and that these factors are uncorrelated with observed individual characteristics. In contrast, the fixed-effects model makes neither assumption and so is likely to be more robust. The cost of using the fixed-effects model, however, is that it uses up one degree of freedom per individual (rather than one for just the variance of the random effects). The random-effects model treats the intercept as a random variable, which generally leads to more efficient model estimation. A Hausman test can be used for the determination of whether the fixed-effects model or the random-effects model is a more appropriate representation of the data for each analysis.

We also conducted posthoc moderator tests to evaluate the effects of age and gender on change over time. In these analyses, age was treated as a dichotomous variable (children were grouped into 6- to 9-year-olds [45%] and 10- to 13-year-olds [55%]), as was gender (children were grouped into boys [60.5%] and girls [39.5%]). The interaction effects of these two moderator variables with the independent variable were tested separately in regression analyses parallel to those described in the previous paragraph of this *Data Analysis* section. For this series of analyses, a Bonferroni correction was applied.

Results

Table 1 presents the preintervention, midintervention, and postintervention means and standard deviations for the outcome variables assessed in this study (the ADIS-C/P was not evaluated at midintervention).

Table 2 provides a summary of the fixed-effects regression analyses or random-effects regression analyses that tested the slope of change in anxiety scores as related to the slope of change in school performance and social adjustment scores over time (i.e., the amount of improvement in school/social functioning associated with a 1-point improvement in anxiety between two time points). As noted in the *Data Analysis* section, we used the Hausman test to determine which model (fixed effects or random effects) was a more appropriate representation of the data for each analysis. Models tested with fixed-effects regression have a corresponding *t* statistic in Table 2, whereas models tested with random-effects regression have a corresponding *z* statistic in Table 2. The majority of tests indicated a statistically significant slope (see Table 2). In each case, decreased anxiety over the course of the intervention was associated with improved school performance and improved social adjustment.

Age and gender were tested as potential moderators of the effects reported in Table 2 (as described in the *Data Analysis* section). Bonferroni corrections were used for sets of analyses related to each anxiety predictor variable ($p < .05/5 = .01$). No significant moderational effects emerged for age or gender.

[2] Children in the two conditions differed on most anxiety outcome measures, with more improvement in the family condition (Wood et al., in press), but did not differ significantly on the CAIS, PCSC, or CBCL outcomes at postintervention.

Table 2
Fixed-Effects Regression Models and Random-Effects Regression Models: Testing the Effects of Improvement in Anxiety Over Time on Improvement in School and Social Functioning

Variable	*B*	*SE B*	*z*	*t*
		ADIS-C/P score		
CBCL School Performance	−1.108	0.304	−3.64***	
CAIS School	0.992	0.271	3.65***	
CBCL Social Competence	−1.013	0.363	−2.79**	
CAIS Social	0.784	0.234	3.33**	
PCSC Social Acceptance	−0.497	0.200		−2.50*
		MASC score		
CBCL School Performance	−0.125	0.034	−3.65***	
CAIS School	0.069	0.032	2.18*	
CBCL Social Competence	−0.043	0.046	−0.92	
CAIS Social	−0.004	0.028	−0.16	
PCSC Social Acceptance	−0.100	0.021	−4.72***	
		CBCL Internalizing score		
CBCL School Performance	−0.186	0.060	−3.12***	
CAIS School	0.248	0.057	4.33***	
CBCL Social Competence	−0.160	0.070	−2.28*	
CAIS Social	0.215	0.041	5.19***	
PCSC Social Acceptance	−0.038	0.043		−0.89

Note. $N = 37$. "Improvement" refers to changes from preintervention to midintervention to postintervention reflecting reduced anxiety scores, reduced Child Anxiety Impact Scale (CAIS; Langley et al., 2004) scores, and increased Child Behavior Checklist (CBCL; Achenbach, 1991) and Perceived Competence Scale for Children (PCSC; Harter, 1982) scores. Unstandardized coefficients are slopes. ADIS-C/P = Anxiety Disorders Interview Schedule for *Diagnostic and Statistical Manual,* 4th ed. (*DSM-IV;* American Psychiatric Association, 1994): Child and Parent Versions (Silverman & Albano, 1996); MASC = Multidimensional Anxiety Scale for Children (March, 1998).
* $p < .05$. ** $p < .01$. *** $p < .001$.

Discussion

Reductions in anxiety may potentiate improved school performance and improved social functioning among children who begin with elevated anxiety levels. Theory suggests that excessive anxious arousal prevents concentration on academic tasks as a result of narrowed attention to threat cues, and cross-sectional research has consistently demonstrated a link between high anxiety and poor school performance (Ma, 1999). In the present study, we attempted to extend this research by testing the relationship between anxiety reduction and improvement in school performance over time. Longitudinal analyses suggested that reductions in anxiety over the course of an intervention predicted improvements in parents' perceptions of children's school performance. These findings were statistically significant regardless of whether children's, parents', or independent evaluators' ratings of anxiety were used. This pattern of findings rules out method variance (e.g., response sets) as an explanation of the results. Perhaps reduced anxiety levels lead to increased attentional capacity among children with anxiety disorders for non-threat-related stimuli (such as instructional materials, lessons, and tests) at school. For those children who are anxious specifically about school performance, a reduction of their anxiety may lead directly to greater engagement with scholastic stimuli.

Although high anxiety has been linked with poor social adjustment conceptually and empirically (e.g., Barrett & Heubeck, 2000), previous research has not tested the effects of improving anxiety on changes in children's social functioning. Reductions in independent evaluators' ratings of children's anxiety predicted increased social functioning scores on the basis of child report and parent report. However, when parent-report measures of anxiety and child-report measures of anxiety were used, cross-informant analyses (e.g., child reports of anxiety predicting parent reports of social functioning) did not yield statistically significant effects in the social domain. Method variance could account for the significant findings obtained in the same-informant analyses (all of which were statistically significant). Yet all three models that used independent evaluators' ratings of anxiety significantly predicted child ratings and parent ratings of social functioning, thus increasing confidence that reductions in anxiety are beneficial for children's social outcomes.

There was no evidence of a moderating effect of age or gender. Patterns of change were comparable for younger and older children and for boys and girls. Anxiety reduction could be an important means of enhancing important developmental outcomes regardless of age or gender.

Conclusion

This sample comprised elementary school children and middle school children aged 6–13 years, the majority of whom were from two-parent families that were middle class and educated. These

characteristics, as well as the relatively small sample size, may limit generalizability. Teacher reports of children's school performance would have been useful, although researchers have suggested that there is convergence between parent ratings and teacher ratings of children's academic competence (e.g., Cole, Maxwell, & Martin, 1997). Furthermore, despite their advantages, longitudinal studies have limitations as well (Cowan & Cowan, 2002). If the timing of change in a longitudinal study is misspecified (e.g., if reduction in anxiety gradually led to improved school performance over the course of years rather than months), then results can be misrepresentative. Also, we cannot rule out the possibility that the intervention directly affected the dependent variables of the study (i.e., school and social outcomes) by enhancing social or academic skills rather than indirectly affecting the dependent variables of the study by reducing anxiety. However, social and academic skills training was not an explicit focus of the intervention. An experimental test of the obtained associations (through use of a wait-list control group) would provide a more definitive test of causal relations (Cowan & Cowan, 2002).

Strengths of this study include the use of independent raters of children's anxiety symptoms as well as the use of multiple methods of assessment of the dependent variables. A primary implication of this study is that children's school performance and social functioning may be enhanced as a result of a reduction in children's anxiety over the course of time. These findings lend support to theories that posit a role for anxiety disorders in the undermining of children's scholastic and adaptive functioning. Parents, teachers, and counselors should be aware that anxiety could be an undetected accomplice in children's academic problems and social difficulties.

References

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4–18 and 1991 profile*. Burlington: Department of Psychiatry, University of Vermont.

American Psychiatric Association. (1994). *Diagnostic and statistical manual of mental disorders* (4th ed.). Washington, DC: Author.

Barlow, D. H. (1991). Disorders of emotions: Clarification, elaboration, and future directions. *Psychological Inquiry, 2,* 97–105.

Barrett, S., & Heubeck, B. G. (2000). Relationships between school hassles and uplifts and anxiety and conduct problems in Grades 3 and 4. *Journal of Applied Developmental Psychology, 21,* 537–554.

Cole, D. A. Maxwell, S. E., & Martin, J. M. (1997). Reflected self-appraisals: Strength and structure of the relation of teacher, peer, and parent ratings to children's self-perceived competencies. *Journal of Educational Psychology, 89,* 55–70.

Cowan, P. A., & Cowan, C. P. (2002). What an intervention design reveals about how parents affect their children's academic achievement and behavior problems. In J. G. Borkowski & S. L. Ramey (Eds.), *Parenting and the child's world: Influences on academic, intellectual, and social-emotional development. Monographs in parenting* (pp. 75–97). Mahwah, NJ: Erlbaum.

Craske, M. G. (1999). *Anxiety disorders: Psychological approaches to theory and treatment.* Boulder, CO: Westview Press.

Flannery-Schroeder, E. C., & Kendall, P. C. (2000). Group and individual cognitive–behavioral treatments for youth with anxiety disorders: A randomized clinical trial. *Cognitive Therapy and Research, 24,* 251–278.

Fordham, K., & Stevenson-Hinde, J. (1999). Shyness, friendship quality, and adjustment during middle childhood. *Journal of Child Psychology and Psychiatry and Allied Disciplines, 40,* 757–768.

Harter, S. (1982). The Perceived Competence Scale for Children. *Child Development, 53,* 87–97.

Kendall, P. C. (1994). Treating anxiety disorders in children: Results of a randomized clinical trial. *Journal of Consulting and Clinical Psychology, 62,* 100–110.

Langley, A. K., Bergman, R. L., McCracken, J., & Piacentini, J. C. (2004). Impairment in childhood anxiety disorders: Preliminary examination of the Child Anxiety Impact Scale–Parent Version. *Journal of Child and Adolescent Psychopharmacology, 14,* 105–114.

Ma, X. (1999). A meta-analysis of the relationship between anxiety toward mathematics and achievement in mathematics. *Journal for Research in Mathematics Education, 30,* 520–540.

March, J. S. (1998). *The Multidimensional Anxiety Scale for Children (MASC*). North Tonawanda, NY: Multi-Health Systems.

Silverman, W. K., & Albano, A. M. (1996). *The Anxiety Disorders Interview Schedule for DSM–IV* (Child and Parent Versions). San Antonio, TX: Graywind Publications, a division of the Psychological Corporation.

Spence, S. H., Donovan, C., & Brechman-Toussaint, M. (2000). The treatment of childhood social phobia: The effectiveness of a social skills training-based, cognitive-behavioural intervention, with and without parental involvement. *Journal of Child Psychology & Psychiatry & Allied Disciplines, 41,* 713–726.

StataCorp. (2005). *Stata statistical software: Release 9.* College Station, TX: StataCorp LP.

Wood, J. J., Piacentini, J. C., Southam-Gerow, M., Chu, B., & Sigman, M. (in press). Family cognitive behavioral therapy for child anxiety disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*.

Received February 25, 2005
Revision received October 19, 2005
Accepted November 1, 2005 ■

Correction to Wood (2006)

In the article, "Effect of Anxiety Reduction on Children's School Performance and Social Adjustment," by Jeffrey Wood (*Developmental Psychology*, 2006, Vol. 42, No. 2, p. 345), the byline and author note should have included the author's middle initial, J. Thus, the byline and author note should refer to "Jeffrey J. Wood."