Mediators and Moderators of Outcome in the Behavioral Treatment of Childhood Social Phobia

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Abstract

Objective—The current study examined mediators and moderators of treatment response among children and adolescents (ages 7–17 years) with a primary diagnosis of social phobia.

Method—Participants were 88 youth participating in one of two randomized controlled treatment trials of Social Effectiveness Therapy for Children (SET-C). Potential mediators included changes in observer-rated social skill and child-reported loneliness after 12 weeks of SET-C. Age and depressive symptoms were examined as potential moderators.

Results—Loneliness scores and social effectiveness during a role-play task predicted changes in social anxiety and overall functioning at post treatment. Changes in social anxiety were mediated by child-reported loneliness. Outcomes were not moderated by age or depressive symptoms.

Conclusions—Findings support the role of loneliness as an important mechanism of change during treatment for childhood social phobia.

Keywords

Social Phobia; Children; Adolescents; Treatment; Mediators; Moderators

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Behavioral and cognitive-behavioral therapies (CBT) for childhood anxiety disorders are highly efficacious.[1] Across randomized controlled treatment trials, approximately 1/2 to 2/3 of anxious youth are considered to be responders (i.e., show significant reductions in anxiety and/or improvements in functioning) following treatment. These data are particularly encouraging given the long-term correlates and deleterious outcomes associated with untreated

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(or unsuccessfully treated) anxiety.[2,3] On the other hand, the fact that as many as 1/2 of anxious youth do not benefit substantially from these interventions underscores a need to better understand specific factors associated with treatment response.

Within this context, several studies have examined predictors of treatment outcome among children with anxiety disorders. Using data from two treatment trials [4,5], Berman, Weems and Silverman [6] examined the contribution of sociodemographic and diagnostic characteristics and child and parent-reported symptoms as potential predictors of outcome in youth with heterogeneous anxiety disorders. A comorbid diagnosis of depression and higher levels of child-reported trait anxiety were found to predict treatment failure. In other investigations using children with various anxiety disorders, older child age, high levels of maternal depression and family dysfunction, and increased parental stress have been associated with poorer CBT outcomes. [7–9]

While findings from such investigations are ultimately aimed at increasing the likelihood of treatment success, in fact, these data provide limited information about the variables of interest. Predictor analyses highlight significant associations between two variables, such as pre-treatment maternal depression and post treatment child anxiety, for all subjects in a given sample without regard to whether these associations vary for certain subgroups of participants. Further, despite the fact that CBT has been shown to be effective for a majority of anxious youth, relatively little is known about "why" or "how" these treatment actually work. Theoretical models have continued to flourish despite a general lack of data documenting changes in mechanisms hypothesized to underlie these childhood disorders. In the absence of a systematic understanding of active treatment ingredients, as well as the specific patients who are most likely to benefit from these interventions, tailoring treatments to match individual patient characteristics would appear unpromising.

As described in the literature, a moderator variable affects the direction and/or strength of a relationship between independent and dependent variables whereas a mediator variable refers to any patient characteristic that is changed during treatment and can account for observed changes in dependent measures.[10] Compared to adults, examinations of mediators and moderators of treatment outcome in anxious youth are sparse. Moreover, in conjunction with theoretical models, research among adults has begun to advance beyond broad CBT-based models of anxiety, focusing on unique factors associated with outcomes for individual disorders.[11–14] For example, based on the frequent co-occurrence of social phobia (SP) and depression, as well as findings suggesting that SP patients with high levels of pre-treatment depressive symptoms benefit less from CBT [15], Moscovitch and colleagues [14] examined changes in social anxiety and depression during group treatment for adults with primary SP. Reductions in social anxiety fully mediated subsequent changes in depressive symptoms whereas the reverse relationship was not found. Thus, beyond a broad association between comorbid depressive symptoms and less positive treatment outcomes, these results imply that depression improves during treatment primarily as a function of diminished social anxiety.

In children the vast majority of treatment outcome research has been conducted among youth with varied anxiety disorders; most commonly, generalized anxiety disorder (GAD), separation anxiety disorder (SAD) and SP. [16–19] "The high degree of overlap in symptoms and the distinction from other anxiety disorders (e.g., obsessive compulsive disorder)" are cited as guiding factors in this methodological design.[19] Despite high rates of comorbidity, however, unique symptoms and impairments clearly exist and research suggests that these disorders represent distinct constructs with potentially unique etiologic factors.[20] Among youth with SP, there is consistent evidence for social skill deficits and feelings of social isolation as core features of the disorder [21–24] and behavioral treatment programs directly targeting these problems have produced positive findings. For example, using a CBT program that included

social skills training, Spence and colleagues [25] reported that SP youth evidenced significantly greater reductions in social anxiety and increases in social skill compared to a waitlist condition. Two other treatment outcome studies have produced similarly positive results.[26,27] Following treatment with Social Effectiveness Therapy for Children (SET-C), which includes social skills training and unstructured peer generalization activities, more than half of SP youth across both studies were treatment responders. A school-based adaptation of SET-C resulted in similar improvements in social anxiety, avoidance, and overall social functioning among SP adolescents.[28]

Because most treatment studies have included children with GAD, SAD and SP and have not assessed unique features of these disorders (e.g., loneliness in SP), determination of specific mediators and moderators of change is hindered. Emerging treatment outcome data among SP youth offer a unique opportunity to examine potential disorder-specific mediators associated with successful treatment. The current study therefore examined the role of several factors associated with changes during treatment in youth treated with SET-C. In selecting variables for consideration we were guided by both the childhood anxiety treatment literature as well as developmental models of childhood SP.[23] Consistent with findings from previous research, we examined whether child age and depressive symptoms moderated treatment outcomes. We hypothesized that an older age and greater levels of depressive symptoms would moderate post treatment response to SET-C. We also examined whether observer-rated social skill during two behavioral tasks and child-reported loneliness mediated changes during treatment. We hypothesized that improved social skill and decreased loneliness would mediate improvements in social anxiety, global impairment and overall functioning.

Method

Participants

Eighty-eight children and adolescents (ages 7–17 years) who completed one of two treatment trials for SP were included in the current study ($n = 31$ from [26] and $n = 57$ from [27]). Both studies were approved by the appropriate Institutional Review Boards and children and their parents provided informed assent/consent prior to participation. Recruitment occurred through media announcements (newspaper, radio, television) or through referrals from local professionals.

All youth met criteria for a primary diagnosis of DSM-IV SP (generalized subtype) based on child and parent semi-structured diagnostic interviews (ADIS-C/P).[29] To receive a diagnosis of SP symptoms had to be of at least moderate severity (4 or higher on an 8 point scale) and result in impairments in daily functioning. Symptoms associated with SP were required to be more severe/impairing than any other diagnosis based on ADIS-C/P clinical severity ratings. Secondary diagnoses were allowed, provided that severity ratings and resulting impairments in functioning were less severe that those associated with SP. Youth with comorbid bipolar disorders, psychosis, conduct disorder, autism spectrum disorders, mental retardation, or moderate to severe depression who expressed active suicidal ideation were excluded. All children had at least average IQ based on assessment using the Wechsler Abbreviated Scale of Intelligence (WASI).[30]

Sociodemographic and diagnostic characteristics for the full sample are presented in Table 1. One half of all youth ($n = 44$) had at least one comorbid diagnosis including, most commonly, GAD ($n = 19$), specific phobias ($n = 9$), and ADHD ($n = 8$). Across the two treatment trials there were no significant differences with respect to sociodemographic or diagnostic characteristics with the exception of age. Children participating in the 2007 study [27] were older on average (11.6 years, $SD = 2.6$ vs. 10.5, $SD = 1.6$) [t (86) = −2.07, $p < .05$] than children participating in the 2000 study.[26]

In the 2000 study [26] $N = 67$ SP children were randomized to either SET-C or an active, nonspecific intervention called Testbusters.[31] Testbusters is a study-skills and test-taking strategy program that addresses skills such as establishing and practicing good study habits and test preparation. In the 2007 study[27] $N = 122$ SP children were randomized to receive either SET-C, fluoxetine or pill placebo. The SET-C assessments and treatment were identical across studies. Youth in both studies were considered treatment responders if they no longer met criteria for a SP diagnosis and/or if they had high end state functioning (i.e., both a score <18 on the SPAI-C [32] and a C-GAS[33] rating of 8 or 9) at post treatment. Based on these criteria, 53 of the 88 participants (60%) were treatment responders at post treatment.

Diagnostic Interviews

Diagnostic interviews were conducted by trained clinicians using the *Anxiety Disorders Interview Schedule for Children* (ADIS-C/P).[29] Adequate test-retest reliabilities for the ADIS-C/P anxiety disorders categories have been reported.[34] Parents and children were interviewed separately and final diagnoses were based on composite ratings derived from both interviews. The interviewer also assigned a clinical severity rating (CSR) for each disorder using a 0–8 scale. Twenty percent of the interviews were audiotaped and scored by a second interviewer to determine interrater agreement. Reliability for the diagnosis of SP was: kappa=0.85 for [26] and kappa=0.78 for [27].

Independent Evaluator Ratings

An assessment of children's overall level of functioning was completed by interviewers at pre-treatment and by an independent evaluator unaware of the child's treatment group assignment at all subsequent evaluations. Independent evaluators did not serve as therapists for either study. Interviewers and independent evaluators also completed the *Children's Global Assessment Scale* (C-GAS)[33] , a widely-used measure of global impairment in functioning. Inter-rater reliability for the C-GAS was based on a random 20% of participants and was excellent: r=0.85 for [26] and r=0.80 for [27].

Self Report Measures

All measures were completed at pre and post treatment.

The *Social Phobia and Anxiety Inventory for Children* (SPAI-C) [32] is a 26-item instrument that assesses potentially fearful social situations in youth. For each item, children are given 3 choices from which they select the one that best describes how they feel/think/behave in different social situations. Internal consistency, concurrent validity and two-week test-retest reliability for the SPAI-C among SP and non-anxious children are all excellent.

The *Children's Depression Inventory* (CDI) [35] is the most widely-used self-report depression inventory for children and adolescents and has been shown to be valid and reliable. For each of 27 items, children are given 3 choices from which they select the one that best describes how they have felt over the previous 2 weeks.

The *Loneliness Scale* (LS) [36] is 24-item questionnaire focused on feelings of loneliness and social dissatisfaction. Children responded to each item on a 5-point scale, indicating the degree to which each statement is a true for them. Higher scores indicate greater loneliness and social dissatisfaction. Adequate internal consistency and reliability estimates have been reported.

Behavioral Assessment of Social Anxiety and Skill

At pre and post treatment participants completed two behavioral tasks: 5 brief role-plays and a read aloud task. All role-plays were conducted with one same age peer (i.e., within 2 years) trained to respond in a friendly, but neutral manner. Gender of the peer was random and

participants and peers did not know each other prior to the assessment. Role play scenes were designed to assess participants' ability to start a conversation, give a compliment, respond assertively, etc. For the read-aloud, participants read an age-appropriate story in front of the same peer for 10 minutes. All tasks were videotaped to establish interrater reliability, which was excellent (see [26,27]). For both tasks, social effectiveness (i.e., skill) and anxiety were rated on a 4 point scale by observers naïve to diagnostic status and treatment assignment.

Social Effectiveness Therapy for Children

(SET-C) [26] is a 12-week manualized treatment for youth with SP that includes social skills training, peer generalization experiences, and in vivo exposure. Social skills training and peer generalization is conducted in small groups (4 to 5 youth) whereas in vivo exposure is conducted individually. Treatment consisted of 1 individual and 1 group session per week. Group sessions are 150 minutes in length (60 minutes social skills training and 90 minutes peer generalization) and were constituted with no more than a 3 year age span (e.g., 8–11). Social skills training was modified as needed as to be age appropriate. Peer generalization experiences directly followed social skills groups in order to allow SP children to practice newly learned skills in a naturalistic setting. Peer activities varied depending upon group age but typically included activities such as bowling, laser tag, pizza parties, etc. Same-age, friendly peers recruited from the community were trained as facilitators and participated in peer generalization sessions. Individual sessions, which averaged 60 minutes in length, targeted children's unique social fears through the use of in-vivo exposures.

Results

Preliminary Analyses

Outlier analyses were conducted to identify cases that might mask trends in the dataset. A leverage score was calculated for each case based on its multivariate profile for each of the variables entered in the models. An outlier was defined as any case having a leverage score four times the value of the mean leverage value [37] or a standardized *df* Beta larger than 2.0. No meaningful outliers were found. Missingness was tested by creating a dummy variable for each case which was then correlated with sociodemographic data and scores on the variables of interest. Less than 2% of the data were missing and missingness was not significantly correlated with any of the variables. Data were assumed to be missing at random and thus the full information maximum likelihood estimator was implemented in Mplus (Version 5.10). [38]

Moderator Analyses for SET-C Outcomes

Regression analyses were used to examine whether pre treatment ADIS-C/P CSR, SPAI-C, and C-GAS scores interacted with age or pre treatment depressive symptoms to predict post treatment ADIS-C/P CSR, SPAI-C, and C-GAS scores, respectively. All predictors were centered to reduce multicollinearity by subtracting the mean of a variable from each participant's score [39] and interaction terms were the product of the two centered predictors. A total of six multiplicative interaction terms were created using the two putative moderators and three independent variables. Six hierarchical regression models were conducted in which the components of an interaction term were entered on the first step (e.g., age, SPAI-C) and the corresponding interaction term was entered in the second step (e.g., Age × SPAI-C). No statistically significant moderator effects were found.

Mediator Analyses for SET-C Outcomes

We tested mediational hypotheses by testing the significance of the indirect effects of pre treatment variables on post treatment variables through LS scores and social effectiveness on the two behavioral tasks. [40] Mplus offers the advantage of applying a product of coefficients

strategy in the assessment of indirect effects. Specifically, partial mediation is assessed by a single variable (i.e., a partial indirect effect) in relation to the Z-distribution, with the ratio of the product of the (a) and (b) path coefficients over the normal-theory standard error (SE) for that product. To assess the indirect effect operating through multiple mediators, the sum of the products of coefficients is taken over the square root of the asymptotic variance of the sum of those products, which provides a ratio to be evaluated in relation to the Z-distribution. With this approach, an approximate Z statistic above 1.96 (absolute value) is considered statistically significant at the $p < .05$ level. Because the product of two coefficients is often skewed and highly kurtotic, we report confidence limits. [41]An indirect effect is considered significant if the interval between the upper and lower confidence limits does not contain zero. This approach has been shown to have higher power and lower Type I error rates than other approaches. [41,42]

Three multiple mediation path models were estimated [see Figure 1 (a–c)]. As shown, the LS and social effectiveness variables were conceptualized as mediators of the relation between pre and post treatment scores on three outcomes: ADIS-C/P CSR, SPAI-C, and C-GAS. Figure 1 depicts a simplified version of the models as it excludes the covariates of pre treatment LS scores and social effectiveness ratings as well as the correlations among variables (though these variables were included in analyses). Pre treatment scores for the putative mediators were included in the model as control variables because partialling-out these variables essentially converts the post test scores into a residual change variable.[43,44] Figure 1 shows the paths of interest and their associated standardized effect coefficients whereas Table 2 shows test-statistics corresponding to the total direct, total indirect (mediation), and total effects (direct + indirect) for each model.

The model shown in Figure 1a accounted for 39% of the variance in estimating post treatment ADIS-C/P CSR ($z = 3.51$, $p < .001$). The pre to post treatment direct (c1) path approached significance ($\beta = .18$, $p = .05$). Results revealed significant direct (b) paths from LS scores and role-play social effectiveness to post treatment ADIS-C/P CSR ($\beta = .29$, $p = .02$; $\beta = -.37$, $p = .005$) (b1, b2). However, none of the three direct (a1, a2, a3) paths from pre treatment ADIS-C/P CSR to the mediator variables reached significance. In terms of total indirect effects, multivariate path analysis revealed that the association between pre and post treatment ADIS-C/P CSR was not mediated by the three hypothesized mediators ($\beta = .07$, $p = .32$). Additionally, the relation between pre and post treatment ADIS-C/P CSR was not mediated by any variable while controlling for the effects of pre treatment mediator scores.

The model shown in Figure 1b accounted for 42% of the variance in estimating post treatment C-GAS scores ($z = 4.26$, $p < .001$). The pre treatment to post treatment direct (c2) path was statistically significant ($\beta = .21$, $p = .02$). Results revealed significant direct (b) paths from LS scores and role-play social effectiveness to post treatment C-GAS ($\beta = -.33$, p = .005; $\beta = .41$, $p = .001$) (b4, b5). However, none of the three direct (a4, a5, a6) paths from pre treatment C-GAS scores to the hypothesized mediators were significant. Multivariate path analysis (total indirect effects) revealed that the association between pre and post treatment C-GAS scores was not mediated by the inclusion of the mediators ($\beta = .10$, $p = .15$). For specific indirect effects, the relation between pre and post treatment C-GAS scores was not mediated by any variable while controlling for the effects of pre treatment mediator scores.

The model shown in Figure 1c accounted for 57% of the variance in estimating post treatment SPAI-C scores ($z = 7.01$, $p < .001$). A statistically significant pre to post treatment direct (c3) path was found ($\beta = .28$, $p < .001$). Results revealed significant direct (b) paths from LS scores and role-play social effectiveness to post treatment SPAI-C scores ($\beta = .53$, $p < .001$; $\beta = -.29$, $p = .02$) (b7, b8). The direct (a) path from pre treatment SPAI-C scores to LS scores also was significant ($\beta = .25$, $p = .02$) (a7). Additionally, multivariate path analysis revealed that

the association between pre and post treatment SPAI-C scores to be partially mediated by the inclusion of the mediator variables ($\beta = .17$, $p = .02$). LS scores significantly mediated the relation between pre and post treatment SPAI-C scores ($\beta = .13$, $p = .03$, LCL = .01, UCL = .31) while controlling for the effects of pre treatment LS scores.

Discussion

Research has begun to examine predictors of treatment response among youth with heterogeneous anxiety disorders. However, emerging data reveal these disorders to represent distinct constructs with unique features and impairments and potentially unique etiologic mechanisms. Thus, there are compelling reasons to examine specific moderators and mediators of treatment outcome for individual disorders. Based on developmental models of SP, the current study examined several theoretically-relevant moderators and mediators of treatment response among youth participating in a trial of SET-C. Results revealed loneliness and social effectiveness ratings (while interacting with a peer) predicted SP severity, C-GAS and SPAI-C scores at post treatment. Neither child age nor depressive symptoms moderated SET-C outcomes. Additionally, changes in loneliness mediated post treatment changes in social anxiety.

Contrary to our hypothesis, age did not moderate post treatment outcomes. Rather than simply comparing treatment responders and non-responders, however, the current study examined whether age moderates treatment outcomes among younger and older SP youth. While adolescents often present with a more pervasive pattern of social avoidance and greater levels of impairment, [45] the content of SET-C sessions were modified as needed to be age appropriate for younger and older children (e.g., using age-appropriate conversation topics). This likely resulted in a more robust and ecological validity treatment for all youth and may account for similar improvements across the age groups. Despite the current finding, explanations for why age may be associated with differential treatment outcomes are complex and several possibilities remain unexplored. For example, the extent to which a longer course of illness, timing of onset, and developmental changes in peer relationships and social demands impact treatment responsiveness are generally unknown.

Similarly, depressive symptoms did not moderate treatment responsiveness. Although not specifically examined among SP children, Berman et.al.[6] previously reported a comorbid diagnosis of depression to predict treatment failure, while Southam-Gerow et al.[8] did not find CDI scores to predict treatment response. The degree to which depressive symptoms may impact treatment outcome may of course vary among disorders. In SP adults, reductions in social anxiety fully mediate changes in depressive symptoms at post treatment[14] implying that depression both develops and improves as a function of changes in social anxiety. In SP youth, for whom comorbid depressive disorders are less common[22], feelings of social isolation (i.e., loneliness) as opposed to hopelessness or anhedonia, for example, may be a more salient co-occurring feature of the disorder.

With respect to mediators, changes in feelings of loneliness partially accounted for changes in social anxiety. Although it is somewhat surprising that improved social skill did not also help to explain treatment outcomes, relationships between social anxiety and children's social behaviors, peer interactions, and social appraisals are notably complex.[24,46,47] While 12 weeks of group training may have produced only small changes in objective social skill, peer reactions and opportunities for social interaction may have significantly improved during the same period. Further, self-perceptions of social effectiveness and peer acceptance, which are important factors in the maintenance of social anxiety[21,48,49] may improve at a different rate than actual skill and help to explain meditational findings. LS scores capture not just the number of friends a child has but, notably, the child's perceived ability to make and keep friends in the

future. Findings therefore highlight the importance of attending to overall social functioning and peer relationships during treatment. Moreover, because social effectiveness did predict changes in social anxiety and functioning at post treatment, it will be important for future research to specifically examine the acceleration of change in social skill (i.e., growth curve analyses) as a potential mediator of treatment response.

Notably, data were drawn from two separate treatment trials and not from one study specifically designed to assess mediators and moderators of treatment outcome. Although SET-C procedures were identical across trials, these studies did include different comparison conditions and the potential impact of this is unclear. Additionally, while not the purpose of this study, the current design does not allow for the assessment of temporal associations as mediators were assessed conjointly with outcomes.[50] Future research will need to confirm that loneliness improves prior to improvements in social anxiety to adequately establish a mediational effect. The retrospective design also did not allow us to specifically examine more discrete aspects of children's peer relationships and social activities in order to more fully understand how changes in loneliness are linked to certain facets of socialization. However, based on the apparent relevance of loneliness for treatment, prospective investigations should examine these relationships.

Despite its limitations, this study represents the first attempt to examine mediators and moderators of treatment in youth with primary SP. Results suggest that improvements in social anxiety and overall functioning are predicted by decreases in loneliness and improvements in social skill irrespective of child age and depressive symptoms. Decreases in loneliness specifically mediated improvements in social anxiety, supporting a focus on and inclusion of assessments of loneliness and social functioning as part of treatment. Clinicians may want to specifically assess these variables as SP youth proceed in treatment since changes in loneliness may herald upcoming decreases in social anxiety.

Acknowledgments

References

1. Silverman WK, Pina AA, Viswesvaran C. Evidence-based psychosocial treatments for phobic and anxiety disorders in children and adolescents. J Clin Child Adol Psychol 2008;37:105–130.

2. Bruce SE, Yonkers KA, Otto MW, Eisen JL, et al. Influence of Psychiatric Comorbidity on Recovery and Recurrence in Generalized Anxiety Disorder, Social Phobia, and Panic Disorder: A 12-Year Prospective Study. Am J Psychiatry 2005;162:1179–1187. [PubMed: 15930067]

3. 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. [PubMed: 9435761]

4. Silverman WK, Kurtines WM, Ginsburg GS, Weems CF, Rabian B, Serafini LT. Contingency management, self-control, and education support in the treatment of childhood phobic disorders: a randomized clinical trial. J Consult Clin Psycholo 1999a;67:675–687.

5. Silverman WK, Kurtines WM, Ginsburg GS, Weems CF, Lumpkin PW, Carmichael DH. Treating anxiety disorders in children with groups cognitive behavioral therapy: a randomized clinical trial. J Consult Clin Psycholo 1999b;67:995–1003.

6. Berman S, Weems C, Silverman W. Predictors of treatment outcome in cognitive behavioral intervention for childhood anxiety and phobic disorders. Behav Ther 2000;31:713–731.

7. Crawford AM, Manassis K. Familial predictors of treatment outcome in childhood anxiety disorders. J Am Acad Child Psychiatr 2001;40:1182–1189.

8. Southam-Gerow MA, Kendall PC, Weersing VR. Examining outcome variability: Correlates of treatment response in a child and adolescent anxiety clinic. J Clin Child Psychol 2001;30:422–436. [PubMed: 11501258]

9. Victor AM, Bernat DH, Bernstein GA, Layne AE. Effects of parent and family characteristics on treatment outcome of anxious children. J Anxiety Disord 2007;21:835–848. [PubMed: 17161582]

10. MacKinnon DP, Fairchild AJ, Fritz MS. Mediation Analyses. Annual Review of Psychology 2007;58:593–614.

11. Hofmann SG. Cognitive mediation of treatment change in social phobia. J Consult Clin Psychol 2004;72:392–399.

12. Hofmann SG, Suvak MK, Barlow DH, Shear MK, Meuret AE, Rosenfield D, Gorman JM, Woods SW. Preliminary Evidence for Cognitive Mediation During Cognitive–Behavioral Therapy of Panic Disorder. J Consult Clin Psychol 2007;75:374–379. [PubMed: 17563154]

13. Smits JA, Powers MB, Cho Y, Telch MJ. Mechanism of change in cognitive behavioral treatment of panic disorder: evidence for the fear of fear meditational hypothesis. J Consult Clin Psychol 2004;72:646–652. [PubMed: 15301649]

14. Moscovitch DA, Hofmann SG, Suvak MK, In-Albon T. Mediation of changes in anxiety and depression during treatment of social phobia. J Consult Clin Psychol 2005;73:945–952. [PubMed: 16287394]

15. Chambless DL, Tran GQ, Glass CR. Predictors of response to cognitive-behavioral group therapy for social phobia. Journal of Anxiety Disorders 1997;11:221–240. [PubMed: 9220298]

16. Barrett PM, Dadds MR, Rapee RM. Family treatment of childhood anxiety: a controlled trial. J Consult Clin Psychol 1996;64:333–342. [PubMed: 8871418]

17. Kendall PC, Flannery-Schroeder E, Panichelli-Mindel SM. Therapy for youths with anxiety disorders: A second randomized clinical trial. J Consult Clin Psychol 1997;65:366–380. [PubMed: 9170760]

18. Research Unit on Pediatric Psychopharmacology Anxiety Study Group. Fluvoxamine for the treatment of anxiety disorders in children and adolescents. N Engl J Med RUPP 2001;344:1279–1285.

19. Walkup JT, Albano AM, Piacentini J, Birmaher B, Compton S, Sherrill J, Ginsburg G, Ryan M, McCracken J, Waslick B, Iyengar S, Mrach J, Kendall P. Cognitive Behavioral Therapy, sertraline or a combination in childhood anxiety. N Engl J Med 2008;359:1–14. [PubMed: 18596269]

20. Ferdinand RF, Bongers IL, van der Ende J, van Gastel W, Tick N, Utens E, Verhulst FC. Distinctions between separation anxiety and social anxiety in children and adolescents. Behav Res Ther 2006;44:1523–1535. [PubMed: 16412977]

21. Alfano CA, Beidel DC, Turner SM. Cognitive correlates of social phobia among children and adolescents. J Abnorm Child Psychol 2006;34:189–201. [PubMed: 16514553]

22. Beidel DC, Turner SM, Morris TL. Psychopathology of childhood social phobia. J Am Acad Child Psychiatr 1999;38:643–650.

23. Ollendick TH, Hirshfeld-Becker DR. The developmental psychopathology of social anxiety disorder. Biol Psychiat 2002;51:44–58. [PubMed: 11801230]

24. Spence SH, Donovan C, Brechman-Toussaint M. Social skills, social outcomes, and cognitive features of childhood social phobia. J Abnorm Psychol 1999;108:211–221. [PubMed: 10369031]

25. Spence SH, Donovan C, Brechman-Toussaint M. The treatment of childhood social phobia: The effectiveness of a social skills training-based, cognitive-behavioural intervention, with and without parental involvement. J Child Psychol Psychiatr 2000;41:713–726.

26. Beidel DC, Turner SM, Morris TL. Behavioral treatment of childhood social phobia. J Consult Clin Psychol 2000;68:1072–1080. [PubMed: 11142541]

27. Beidel DC, Turner SM, Sallee FR, Ammerman RT, Crosby LA, Pathak S. SET-C vs. fluoxetine in the treatment of childhood social phobia. J Am Acad Child Psychiatr 2007;46:1622–1632.

28. Masia-Warner C, Klein RG, Dent HC, Fisher PH, Alvir J, Albano AM, Guardino M. School-based intervention for adolescents with social anxiety disorder: results of a controlled study. J Abnorm Child Psychol 2005;33:707–722. [PubMed: 16328746]

29. Silverman, WK.; Albano, AM. The Anxiety Disorders Interview Schedule for Children (ADIS-C/P). New York, NY: Oxford Press; 1997.

30. Wechsler, D. Wechsler Abbreviated Scale of Intelligence (WASI). San Antonio, TX: Psychological Corporation; 1999.

31. Beidel DC, Turner SM, Taylor-Ferreira JC. Teaching Study Skills and Test-Taking Strategies to Elementary School Students: the Test-busters Program. Behav Mod 1999;23:630–646.

32. Beidel DC, Turner SM, Morris TL. A new inventory to assess childhood social anxiety and phobia: the Social Phobia and Anxiety Inventory for Children. Psychol Assess 1995;7:73–79.

33. Shaffer D, Gould M, Brasic J, Abronsini P, Fisher P, Bird H, Aluwahlia S. A Children's Global Assessment Scale (C-GAS). Arch Gen Psychiatry 1983;40:1228–1231. [PubMed: 6639293]

34. Silverman WK, Saavedra LM, Pina AA. Test-retest reliability of anxious symptoms and diagnoses with an anxiety disorders interview schedule for DSM-IV: child and parent versions. J Am Acad Child Psychiatr 2001;40:937–944.

35. Kovacs, M. Children's Depression Inventory Manual. Toronto, Ontario, Canada: Multi-Health Systems; 1992.

36. Asher SR, Wheeler VA. Children's loneliness: a comparison of rejected and neglected peer status. J Consult Clin Psychol 1985;53:500–505. [PubMed: 4031205]

37. Jaccard J, Wan CK. Measurement error in the analyses of interactions effects between continuous predictors using multiple regression: Multiple indicator and structural equations approaches. Psycholo Bull 1995;117:348–357.

38. Muthén, B.; Muthén, L. Mplus [Computer software]. Los Angeles, CA: Author; 2007.

39. Aiken, LS.; West, SG. Newbury Park, CA: Sage; 1991. Multiple Regression: Testing and interpreting interactions.

40. Mackinnon DP, Lockwood CM, Hoffman JM, West SG, Sheets V. A comparison of methods to test mediation and other intervening variable effects. Psychol Meth 2002;7:83–104.

41. MacKinnon DP, Lockwood CM, Williams J. Confidence limits for the indirect effect: distribution of the product and resampling methods. Multivariate Behav Res 2004;39:99–128.

42. Sobel, ME. Asymptotic confidence intervals for indirect effects in structural equation models. In: Leinhard, S., editor. Sociological methodology. Washington, DC: American Sociological Association; 1982. p. 290-312.

43. Cole DA, Maxwell SE. Testing mediational models with longitudinal data: Questions and tips in the use of structural equation modeling. J Abn Psycho 2003;112:558–577.

44. Maxwell SE, Cole DA. Bias in cross-sectional analyses of longitudinal mediation. Psycho Meth 2007;12:23–44.

45. Rao PA, Beidel DC, Turner SM, Ammerman RT, Crosby LE, Sallee FR. Social anxiety disorder in childhood and adolescence: Descriptive psychopathology. Behav Res Ther 2007;45:1181–1191. [PubMed: 17007813]

46. LaGreca AM, Harrison HW. Adolescent peer relationships, friendships and romantic relationships: do they predict social anxiety and depression? J Clin Child Adol Psychol 2005;34:49–61.

47. Storch EA, Masia-Warner C, Crisp H, Klein R. Peer victimization and social anxiety in adolescence: a prospective study. Aggressive Behav 2005;31:437–452.

48. Flanagan KS, Erath SA, Bierman KL. Unique associations between peer relations and social anxiety in early adolescence. J Clin Child Adol Psychol 2008;37:759–769.

49. LaGreca AM, Lopez N. Social anxiety among adolescents: linkages with peer relations and friendships. J Abnorm Child Psychol 1998;26:83–94. [PubMed: 9634131]

50. Kraemer HC, Wilson GT, Fairburn CG, Agras WS. Mediators and moderators of treatment effects in RCTs. Arch Gen Psychiatry 2002;59:877–883. [PubMed: 12365874]
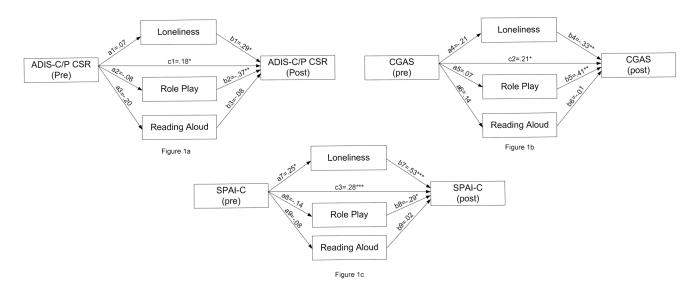
Figure 1a

Figure 1b

Figure 1c

Figure 1.
(a–c) excludes the covariates of pre treatment LS scores and social effectiveness ratings on the role play and read aloud tasks as well as the correlations among variables to avoid clutter, but these variables were included in tests of the model. Standardized effect coefficients for direct effects are shown. $*p < .05$; $**p < .01$; $***p < .001$. ADIS-C/P CSR = Anxiety Disorders Interview Schedule for Children for DSM-IV Child and Parent Clinical Severity Ratings. SPAI-C = Social Phobia and Anxiety Inventory for Children. C-GAS = Children's Global Assessment Scale.

Table 1

Means and Standard Deviations for the Primary Measures and Correlations

	M	SD	%	1	2	3	4	5	6	7	8	9	10	11	12	13	14
Age (years)	11.20	2.35															
Boys			51.1														
Ethnicity																	
Caucasian			70.1														
African American			20.7														
Other			9.2														
1 ADIS	5.90	1.09		--													
2 SPAI-C	27.86	8.38		.32*	--												
3 C-GAS	5.60	.98		-.34*	-.18	--											
4 LS	41.80	11.89		.01	.32*	-.28*	--										
5 Role-play	2.05	.89		-.06	-.07	.09	.02	--									
6 Reading	2.68	1.03		-.17	-.23*	.19	.05	.44*	--								
7 CDI	11.24	7.11		.20	.32*	-.23*	.65*	.04	-.01	--							
8 ADIS	1.90	1.90		.26*	.28*	-.20	.15	-.12	-.26*	.16	--						
9 SPAI-C	16.99	9.86		.30*	.44*	-.16	.32*	-.25*	-.32*	.36*	.61*	--					
10 C-GAS	7.40	1.03		-.24*	-.27*	.31*	-.19	.21	.35*	-.18	-.81*	-.55*	--				
11 LS	34.94	10.54		.06	.25*	-.22*	.67*	-.13	-.15	.51*	.36*	.59*	-.41*	--			
12 Role-play	2.58	.93		-.11	-.20	.08	.17	.65*	.50*	.12	-.38*	-.47*	.44*	-.12	--		
13 Reading	3.02	1.02		-.15	-.09	.11	.15	.33*	.54*	-.11	-.30*	-.29*	.28*	.01	.57*	--	
14 CDI	7.83	7.38		.10	-.30*	-.06	.50*	.02	-.13	.50*	.25*	.48*	-.17	.54*	-.06	-.17	--

Note. Pre treatment: 1–7. Post treatment 8–14. ADIS-*C/P* CSR = Anxiety Disorders Interview Schedule for Children for DSM-IV Child and Parent Clinical Severity Ratings. SPAIC = Social Phobia and Anxiety Inventory for Children. C-GAS = Children's Global Assessment Scale. LS = Loneliness Scale. CDI = Children's Depression Inventory.

*
$p < .05$.

Table 2

Standardized Effect Coefficients and Test-Statistics for Multiple Mediation Model

Outcome	Direct effects			Indirect effects (mediation)			Total effects (indirect + direct)			Mediated proportion of total effect
	β	SE	Z-score	β	SE	Z-score	β	SE	Z-score	
ADIS-C/P CSR	.03	.14	.53	.02	.16	.29	.05	.21	.58	.40
SPAI-C	.22	.10	2.63	.17	.09	2.26	.39	.13	3.54	.44
C-GAS	.15	.07	2.34	.08	.07	1.19	.23	.10	2.51	.35

Note. Critical *Z*-scores of 1.96, 2.58, and 3.29 correspond to *p*-values of .05, .01, .001, respectively. All standardized effect coefficients associated standard errors (SE) are rounded to the nearest hundredth. The model controlled for the pre treatment scores on each putative mediator. ADIS-C/P CSR = Anxiety Disorders Interview Schedule for Children for DSM-IV Child and Parent Clinical Severity Ratings. SPAI-C = Social Phobia and Anxiety Inventory for Children. C-GAS = Children's Global Assessment Scale.