Treatment of Comorbid Attention-Deficit/Hyperactivity Disorder and Anxiety in Children: A Multiple Baseline Design Analysis

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Objective: The present study evaluated a 10-week psychosocial treatment designed specifically for children with attention-deficit/hyperactivity disorder (ADHD) and a comorbid anxiety disorder. Method: Using a nonconcurrent multiple baseline design, the authors treated 8 children ages 8–12 with ADHD, combined type, and at least 1 of 3 major anxiety disorders (separation anxiety disorder, generalized anxiety disorder, social phobia). The integrated treatment protocol involved parent management training for ADHD and family-based cognitive-behavioral therapy for anxiety. Pretreatment assessments included semistructured diagnostic interviews and other standardized measures to determine study eligibility. Children were randomized to 1 of 3 baseline control conditions (i.e., 2, 3, or 4 weeks) and subsequently treated in a university-based psychosocial treatment clinic. Weekly assessments of ADHD and anxiety disorder symptoms occurred throughout treatment and comprehensive assessments were obtained at pretreatment, 1-week posttreatment, and 6-months posttreatment. Results: Single-case results supported greater success in the treatment phase relative to the baseline phase for both ADHD and anxiety symptoms, and ADHD and anxiety symptoms appeared to change concurrently. Pre–post group analyses revealed significant and clinically meaningful improvements in ADHD and anxiety symptoms at 1-week posttreatment, but only anxiety symptoms moved into the subclinical range. At 6-months follow-up, treatment effects were maintained with new movement into the subclinical range for ADHD. Conclusions: The present study provides initial data on an integrated treatment protocol for ADHD and anxiety. Further replication and evaluation are needed. Implications of the findings are discussed.

Keywords: attention-deficit/hyperactivity disorder, ADHD, anxiety, comorbidity, child psychotherapy

Attention-deficit/hyperactivity disorder (ADHD) is a disorder with varying developmental pathways (Nigg, Goldsmith, & Sackeck, 2004). Nigg et al. (2004) describe six potential pathways with one involving ADHD-combined type (ADHD-C) and comorbid anxiety. Clinical presentation was suggested to involve executive deficits in addition to anxiety. Given growing evidence for the interactive effects of executive functioning and emotionality (Nigg & Casey, 2005), concurrent treatment of ADHD and anxiety may result in beneficial impacts on anxiety symptoms, ADHD symptoms, and potentially executive functioning.

Although comorbidity of ADHD and anxiety is common (approximately 25%), little is known about treatment response (Jarrett & Ollendick, 2008). The Multimodal Treatment of ADHD Study (MTA Study; MTA Cooperative Group, 1999) found that children with ADHD-C and anxiety responded equally well to medication and behavioral treatments on core symptoms of ADHD at short-term follow-up, a finding that differed from the aggregate result of medication surpassing behavioral treatment. This differential treatment response is promising; however, only two small-scale studies have reported on interventions designed specifically for children with ADHD and anxiety. Costin, Vance, Barnett, O’Shea, and Luk (2002) reported results from a study of children with ADHD-C, oppositional defiant disorder (ODD), and anxiety. Treatment involved an 8-week cognitive-behavioral family-based intervention for five boys ages 10–12. Children were recruited following limited response to a combination of medication and psychosocial treatment over a 6-month period. The study did not include a comparison or control condition and was focused on anxiety treatment after “standard treatment” for ADHD was ineffective. High levels of satisfaction were reported, but no changes on symptomatology were evident.

More recently, Verreault, Berthaume, Turgeon, Lageix, and Guay (2007) used clinical replication to evaluate a 10-week cognitive-behavioral family-based anxiety protocol for 10 children (eight boys, two girls) ages 8–12 with ADHD and anxiety. The primary modification was the inclusion of an ADHD psychoeducation session for parents. Changes were found for parent- and child-reported anxiety symptoms but not parent-reported ADHD symptoms.

Overall, the studies to date have not been controlled and have not fully combined elements used in common treatment protocols for ADHD and anxiety, respectively. Psychosocial treat-
ment for ADHD often involves parent management training (Barkley, 1997). The treatments described above involved parent management of anxiety but not ADHD-related problems (e.g., difficulty with homework completion). This distinction is important for two reasons. First, parents may need assistance in differentiating problems due to anxiety (e.g., worry about homework) from problems related to ADHD (e.g., difficulty with the effort of homework). Second, this differentiation allows parents to choose from a set of treatment strategies. For example, a child’s refusal to complete homework may reflect difficulty with the effort of homework or worry about being able to complete the assignment. A clear differentiation is needed for choosing an appropriate treatment strategy (e.g., rewarding effort vs. cognitive restructuring).

In the present study, we sought to develop and evaluate an integrated treatment for children with ADHD and anxiety. A treatment manual was developed from two primary sources. The first source was “The Defiant Child,” a 10-week treatment for noncompliant children developed by Barkley (1997). The program involves parent management training (i.e., reward, response cost, time-out) and includes “special time” for improving parent–child relationships via positive attending. The protocol was modified to use time-out and response cost as optional procedures. This alteration was chosen due to concern that these components could be iatrogenic for children with anxiety, given the tendency for anxious children to be sensitive to punishment and the parents of anxious children to be overly critical (Quay, 1988; Rapee, Schniering, & Hudson, 2009). At the same time, these elements were included in the manual as optional modules.

The second source was a family-based treatment for child anxiety, the Cool Kids Program (Rapee, Wignall, Hudson, & Schniering, 2000). The treatment was delivered in an individual family format and included parent and child education about anxiety, cognitive restructuring, and graduated exposure. The treatment was modified to include suggestions offered by Hudson, Krain, and Kendall (2001) for anxious children with comorbid ADHD. Modifications included the use of games, reducing child sessions to 30 min, frequent breaks, rewards for on-task behavior, one-step instructions, child repeat of instructions, multiformat presentation, and modifying homework to minimize writing.

The final protocol involved 10 weekly sessions. Each session involved 50 min with the parent(s), 30 min with the child, and the final 10 min with the parent(s) and child together. Session 10 occurred 2 weeks after Session 9 as a booster session. The manual included goals and handouts for each session (available from the first author upon request).

Method

Participants included eight children and their parent(s). Inclusion criteria were as follows: (a) ages 8–12, (b) Diagnostic and Statistical Manual of Mental Disorders (DSM–IV), fourth edition diagnosis of ADHD-C, and (c) DSM–IV diagnosis of at least one of the following disorders: generalized anxiety disorder (GAD), social phobia (SOP), or separation anxiety disorder (SAD). ADHD-C was chosen given that the MTA Study and one of the prior studies described involved ADHD-C only. The age range and inclusion diagnoses were chosen on the basis of manual recommendations and criteria used in published trials (Barkley, 1997; Nauta, Scholing, Emmelkamp, & Minderaa, 2003). Exclusion criteria were (a) diagnosis of bipolar disorder or an autism spectrum disorder, (b) acute psychotic symptoms, (c) psychosocial or medication treatment for ADHD (unless on stable dosage, > 3 months) or anxiety symptoms, and (d) an IQ < 80.

Following Institutional Review Board approval, participants were recruited from Southwestern Virginia by contacting mental health professionals and area school districts. Interested parents underwent a telephone screen (n = 40). Children who met eligibility criteria (n = 11) were then scheduled for an assessment. Informed consent and assent were obtained on the first visit. A consensus meeting using findings from the Anxiety Disorders Interview Schedule for Children was used to establish diagnoses (see Grills & Ollendick, 2003, for details). All children had a clinician severity rating (CSR) of at least 4 on inclusion diagnoses: Eight of 11 families qualified for the study. Reasons for exclusion included the probable presence of an autism spectrum disorder, the probable presence of posttraumatic stress disorder but not an inclusion-related anxiety disorder, and a family decision to pursue medication treatment.

The final sample included eight children (mean age = 8.88; SD = 1.13) and their parent(s). Four of the children were boys (50%). All were Caucasian. Mean full scale IQ was 96.5 (SD = 9.62; range = 81–115) estimated from the Vocabulary and Block Design subtests of the Wechsler Intelligence Scale for Children—Fourth Edition (Wechsler, 2003). Two of the eight children (25%) had been taking medication (i.e., Adderall and Dexedrine) at the same dosage for at least 3 months and did not make changes during treatment. Eight of eight children (100%) met criteria for two or more anxiety disorders, and four of eight (50%) met criteria for three or more. Three of eight (37.5%) met criteria for ODD. These comorbidity rates are consistent with past studies (Costin et al., 2002; MTA Cooperative Group, 1999). Mean family income was $58,571 (SD = $36,596). Seven of eight (87.5%) children were living with both parents. Most mothers completed college (62.5%); partial completion of college for fathers was most common (37.5%).

Design

A nonconcurrent multiple baseline design was used. This design is a series of A-B replicates with randomized baseline periods. This design was chosen for a number of reasons. First, single-case designs have been endorsed by the evidence-based treatment movement (Task Force on Promotion and Dissemination, 1995). Although randomized controlled trials (RCTs) may offer greater causal clarity, they are time-intensive and require significant external funding (Barlow & Nock, 2009). An RCT may also be premature when pilot testing a novel treatment. Additional reasons included the recruitment of a specialized population (e.g., children with two disorders) and an inability to recruit and treat children concurrently.

Children were randomly assigned to baseline phases lasting 2, 3, or 4 weeks. Children and their parent(s) completed questionnaires over the phone on a weekly basis during this period. Repeated measures continued on a weekly basis during treatment with more
comprehensive assessments at 1-week posttreatment and 6-months posttreatment.1

Measures

Anxiety Disorders Interview Schedule for DSM-IV, Child and Parent Versions (ADIS-C/P; Silverman & Albano, 1996). The ADIS-C/P versions are semistructured interviews designed for the diagnosis of child and adolescent psychiatric disorders. The clinician assesses symptoms and obtains frequency, intensity, and interference ratings. Ratings are used to develop a CSR. A CSR >= 4 (range = 0–8) indicates a diagnosable condition. Trained graduate student clinicians in an APA-approved doctoral program in clinical psychology conducted the interviews. Our laboratory procedures were recently evaluated for reliability. Thirty of 150 (20%) videotaped interviews were randomly selected and reviewed by independent assessors. Using Cohen’s kappa, agreements on diagnoses were .93 and .88 on primary and secondary diagnoses. None of the interviewers served as therapists.

Disruptive Behavior Disorders Rating Scale (DBDRS; Barkley, 1997). The DBDRS includes the DSM–IV symptom lists for ADHD and uses a 4-point scale ranging from 0 (not at all) to 3 (very much). Ratings for the present study used the entire scale (i.e., 0–3).

Spence Child Anxiety Scale, Parent Version (SCAS-P; Nauta et al., 2003; Spence, 1998). The SCAS-P is a 44-item parent report that measures DSM–IV childhood anxiety symptoms using a 4-point scale ranging from 0 (never) to 3 (always).

Target behaviors. Target behaviors were identified at the start of treatment. Parents were asked to rate three ADHD-related problems (e.g., failing to complete homework) and three anxiety-related problems (e.g., afraid to sleep in own bed). Parents rated the severity of the problem on a 9-point scale (0–8; 0 = not at all, 2 = a little bit, 4 = some, 6 = a lot, 8 = very, very much).

Data Analysis

Nonparametric Friedman tests were used followed by post hoc Wilcoxon tests for pre–post comparisons. A method for calculating “clinical significance” was also used (Jacobson & Truax, 1991). Jacobson and Truax (1991) recommend a change of two standard deviations from the pretreatment group mean as a cutoff for “recovery” at posttreatment. A reliable change index (RCI) was also calculated to determine change relative to measurement error. Jacobson and Truax (1991) recommend an RCI cutoff of 1.96 in standard error of the difference units to meet the criteria of “improved”.

The clinical outcomes approach proposed by Parker and Hagan-Burke (2007) was used for analyzing single-case data. Weekly data points in the individual subject data stream (including baseline and treatment points) are sorted from highest to lowest, with higher scores reflecting greater symptoms. “Successful” performance includes those treatment phase data points that are lower than the n highest points (n = the number of baseline data points) and those baseline phase data points that are lower than the n highest points. Treatment and baseline success rates can be calculated along with a success rate difference. Success rates were calculated for individual subjects and then aggregated across the eight study participants. Because the study used < 20 data points/subjects, success rates were not calculated for the individual subjects.

Finally, Simulation Modeling Analysis (SMA; Borckardt et al., 2008) was used to analyze single-case data. SMA allows the user to examine changes in the level of symptoms and the slope of symptom change (in terms of the correlation between the data stream and a specified slope vector) and evaluates the significance of the effect using bootstrapping methods to create simulations that take the phase lengths and autocorrelation of the data stream into account. SMA also allows the user to examine multivariate process change or the temporal relationship between two variables (e.g., do ADHD symptoms change before anxiety symptoms?). Only multivariate process change was used for the present study given the relatively short baselines.

Table 1 includes means and standard deviations for the pretreatment, 1-week posttreatment and 6-months posttreatment consensus CSRs from the ADIS-C/P. The table also shows the percentage of participants Recovered, percentage Improved, and the percentage of participants in the subclinical range with a CSR < 4.

Results

Therapy Retention

Seven of the eight (87.5%) families completed the entire 10-session treatment. For the noncompleter, treatment consisted of nine sessions. Because Session 10 was a booster session, this family did not miss new therapeutic content. Only four cancellations occurred during the study. The therapist for the study was a master’s-level clinician in an APA-approved doctoral program in clinical psychology who showed adequate treatment competency and adherence.4

1 All families completed the 1-week posttreatment assessment, whereas six of eight families completed the 6-month assessment (75%). Two families were unavailable at follow-up: One family moved from our area, and the second family reported that they did not have time to participate (note that this family involved a child taking medication for ADHD).

2 Test–retest reliability for the ADIS-C/P was obtained from Silverman, Saavedra, & Pina (2001). For ADIS ADHD, r = .68, Sdiff = .57, cutoff for recovery ≤ 4.83. For ADIS anxiety-treated, r = .84, Sdiff = .37, cutoff for recovery ≤ 4.01, r = test–retest reliability of the measure. Sdiff = the spread of the distribution of changes scores that would be expected if no actual change occurred. Recovery = Mpretreatment − 2 SDpretreatment.

3 One video was selected from the first half of therapy (Session 2) and one from the second half (Session 6) for each child. A graduate student in an APA-approved clinical psychology doctoral program with significant coding experience and specific training for coding the present tapes coded the sessions (16 sessions in total). The coder was blind to study hypotheses. Tapes were rated for competence on a 10-item checklist (available from the first author upon request). Sessions were rated on a 3-point scale (0 = not at all, 1 = somewhat, 2 = highly). Mean ratings were 1.89 (Session 2) and 1.93 (Session 6).

4 The procedures described in Footnote 3 were also used to code treatment adherence on a 10-item checklist (available from the first author upon request). Adherence was defined on a 3-point scale (0 = absent, 1 = partial, 2 = full). Mean ratings were 1.91 (Session 2) and 1.94 (Session 6).
ADHD and Anxiety Symptoms

Two of the eight families were not available for the 6-months posttreatment assessment, so the last point was carried forward from the 1-week posttreatment assessment. Calculated CSRs included the CSR for ADHD and the mean CSR for anxiety disorders specifically treated (e.g., mean of GAD and other anxiety disorders treated in child-specific exposure activities).6

Friedman tests revealed significant changes in CSRs across the three time points for ADHD, χ²(2, N = 8) = 13.23, p < .01, and anxiety-treatment, χ²(2, N = 8) = 14.00, p < .01. For ADHD, significant changes were noted from pretreatment to 1-week posttreatment, Z(2, N = 8) = 2.27, p < .05, r = .57, and pretreatment to 6-months posttreatment, Z(2, N = 8) = 2.55, p < .05, r = .64.6 For anxiety-treatment, significant changes were noted from pretreatment to 1-week posttreatment, Z(2, N = 8) = 2.54, p < .05, r = .63, and pretreatment to 6-months posttreatment, Z(2, N = 8) = 2.54, p < .05, r = .64.

For “clinical significance” (see Table 1), two of eight (25%) improved, two of eight (25%) recovered, and zero of eight (0%) were in the subclinical range at 1-week posttreatment, (i.e., CSR < 4) for ADHD. Additional gains occurred at 6 months: five of eight (63%) improved, four of eight (50%) recovered, and two of eight (25%) were subclinical.

On anxiety-treatment, eight of eight (100%) improved, seven of eight (88%) recovered, and four of eight (50%) were in the subclinical range at 1-week posttreatment. Gains were maintained at 6 months as eight of eight (100%) improved, seven of eight (88%) recovered, and four of eight (50%) were in the subclinical range.

Wilcoxon tests revealed significant improvement for the primary ADHD-related problem (p = .04), which was most commonly homework completion (five of eight cases, 62.5%). Wilcoxon tests also revealed significant improvement for the primary (p = .02), secondary (p = .02), and tertiary (p = .03) problems identified for anxiety.

Single-case data are presented in Figure 1. In some cases, declining baselines limited interpretations of treatment effects relative to baseline, but single-case analyses were still conducted given that baseline decline was generally limited. The clinical outcomes approach was used for data analysis. For the DBDRS-P ADHD total score, the baseline success rate was 54.55%, and the treatment success rate was 77.5%. The success rate difference was significant at 22.95% (95% CI [.04, .42]), indicating that treatment was 22.95% more successful than baseline. For the SCAS-P total score, the baseline success rate was 48.48%, and the treatment success rate was 80%. The success rate difference was significant at 31.52% (95% CI [.12, .51]), indicating that treatment was 31.52% more successful than baseline.

Finally, multivariate process analysis was used via SMA. This approach allows for the examination of cross-lagged correlations between two variables of interest. Results of this analysis are presented in Table 2. Larger correlations reflect stronger relationships between ADHD and anxiety for the particular lag reported. Overall, results suggest that ADHD and anxiety symptoms changed concurrently or by a delay of 1 week, with ADHD symptom change preceding anxiety symptom change. One of these two patterns occurred for four of the eight cases.

Discussion

We evaluated an integrated treatment protocol for children with ADHD and anxiety in the present study. Past treatment studies of comorbid ADHD and anxiety have not been controlled and have not fully combined treatment elements used in common protocols for ADHD and anxiety. In addition, we used a diagnostic interview, the ADIS-C/P, which has shown evidence for valid diagnosis of both ADHD and anxiety in children (see Jarrett, Wolff, & Ollendick, 2007; Silverman & Albano, 1996).

Overall, results suggest improvement for both ADHD and anxiety symptoms, although gains were generally more limited for ADHD. The clinical outcomes approach showed significant success rate difference percentages, suggesting that changes can be attributed to the treatment. At the same time, baseline decline in

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5 CSRs were only included in the mean calculation if the following criteria were met: (a) a CSR was generated at pretreatment for the disorder and (b) the disorder was targeted in at least one treatment session (e.g., working on an exposure related to SOP). GAD was included in the mean calculation for all children, because the disorder was clinically diagnosed at pretreatment for all children, and a core component of the anxiety treatment involves the management of worry. This variable was created to evaluate changes in anxiety problems that were specifically targeted in treatment.

6 Effect size was calculated for post hoc Wilcoxon tests by converting the z-score to a correlation coefficient (Field, 2005). Cohen (1992) recommends the following interpretations for the effect size of r: small = .10, medium = .30, large = .50.
some cases limits the strength of this conclusion. Results more strongly supported short-term improvement in anxiety, a finding consistent with cognitive-behavioral treatment trials for anxiety (Silverman, Pina, & Viswesvaran, 2008). For ADHD, none of the eight cases were in the subclinical range at 1-week posttreatment, but this rate improved to two of eight (25%) at 6-months post-treatment.\(^7\) Anxiety-related gains were maintained at 6 months.

Although the study provides some evidence for the efficacy of the integrated treatment, some limitations must be noted. First, the concurrent treatment of ADHD and anxiety did not allow for the examination of sequential effects (e.g., ADHD treatment followed by anxiety treatment). Such a component analysis would be beneficial. A second limitation is the homogeneous make up of the sample. As a result, the findings may not generalize to younger or older children or other ethnic groups. Finally, single-case designs require baseline stability in order to clearly document changes between the baseline and treatment phase. In a few cases, declining

\(^7\) It should be noted that neither of the two cases that showed movement into the subclinical range for ADHD at 6 months were children on stimulant medication.
baselines weakened the causal inferences that could be drawn regarding the effect of treatment.

Overall, the present study provides preliminary efficacy data for the integrated treatment protocol. Although ADHD remains a condition that shows limited movement into the normal range in the short term, the subclinical rate at 6-months follow-up (i.e., 25%) and the percentage considered to be "recovered" (i.e., 50%) is encouraging, particularly given emerging views of ADHD as a developmental disorder (Nigg et al., 2004). Future studies will be needed to identify children who might best respond to such an integrated treatment protocol for ADHD and anxiety.

### Table 2
Multivariate Process Change Analysis for DBDRS-P Total and SCAS-P Total

<table>
<thead>
<tr>
<th>Participant</th>
<th>Cross-lagged correlations</th>
</tr>
</thead>
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<tr>
<td>1</td>
<td>.71 (0)*</td>
</tr>
<tr>
<td>2</td>
<td>.76 (+1)*</td>
</tr>
<tr>
<td>3</td>
<td>.89 (0)*</td>
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<tr>
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<td>−.63 (−1)</td>
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<tr>
<td>5</td>
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<td>6</td>
<td>.52 (0)</td>
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<tr>
<td>7</td>
<td>−.36 (−3)</td>
</tr>
<tr>
<td>8</td>
<td>−.69 (−3)*</td>
</tr>
</tbody>
</table>

*p < .05, with Bonferroni correction.

Note. DBDRS-P = Disruptive Behavior Disorders Rating Scale, Parent Version; SCAS-P = Spence Child Anxiety Scale, Parent Version. Parenthetical values indicate the significant lag.

References


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