

Efficacy of the *First Step to Success* Intervention for Students with Attention-Deficit/Hyperactivity Disorder

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Abstract This study evaluated the efficacy of the *First Step to Success* early intervention for students meeting criteria for attention-deficit/hyperactivity disorder (ADHD). First Step is a targeted intervention for students in grades K-3 with externalizing behavior problems, and addresses secondary prevention goals and objectives. As part of a larger randomized controlled trial conducted within the Albuquerque Public School system, the efficacy of the First Step program was evaluated on a subsample of 42 students meeting DSM-IV criteria for ADHD who were randomly assigned to either the intervention group or a usual care control group. The First Step program was found to have significant and moderate-to-large post-intervention effects on school-based measures of ADHD and disruptive behavior symptoms, social functioning, and academic functioning. The intervention effects on the home-based assessments of problem behaviors and social skills were less robust and nonsignificant. Implications and limitations of the study are discussed.

Keywords Attention-deficit/hyperactivity disorder · Externalizing behavior · School-based · Behavioral intervention · Randomized trial

Attention-deficit/hyperactivity disorder (ADHD) is a relatively common child behavior disorder estimated to affect 5–10% of school-age children in the United States (Barabresi et al., 2002; Centers for Disease Control, Prevention, 2005; Rowland et al., 2002; Woodruff et al., 2004). These prevalence estimates place at least one student with ADHD in every classroom on average (Fabiano et al., 2007). Students with ADHD often experience behavioral challenges that interfere with their academic success, including inattention, lack of impulse control, and over activity (Abikoff et al., 2002; DuPaul & Stoner, 2003). In addition, over half of children with ADHD are diagnosed with comorbid oppositional defiant disorder (ODD), which is frequently associated with disruptive classroom and school behavior (Barkley, 2006; Jensen, Martin, & Cantwell, 1997). ADHD is also associated with impaired academic and social functioning, which frequently portends a chronic course that is viewed as a lifelong disorder requiring developmentally appropriate intervention (DuPaul, 2007). Indeed, students with ADHD are at higher risk for placement in special education classrooms, grade retention, and later school failure and dropout (Barkley, Murphy, & Fischer, 2008; Fischer, Barkley, Fletcher, & Smallish, 1990). Because schools are the primary mental health service providers for youth generally (Burns & Hoagwood, 2002; Burns et al., 1995), classrooms are an important delivery setting for early interventions that aim to manage, treat, and prevent the negative sequelae of childhood behavior disorders such as ADHD (Walker, Ramsey, & Gresham, 2003–2004).

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Evidence-based practices for intervening with students having ADHD include psychopharmacological treatments (e.g., methylphenidate), behavioral interventions, or their combination (Pelham & Fabiano, 2008; Pelham, Wheeler, & Chronis, 1998). A review of recent randomized clinical trials comparing behavioral interventions with psychopharmacological treatments found that combined treatments are probably the most efficacious and psychopharmacological treatments may be somewhat more efficacious than behavioral interventions (Forness, Freeman, & Paparella, 2006). However, Forness and colleagues further argue that (a) based on the Multimodal Treatment of ADHD study (MTA; MTA Cooperative Group, 1999, 2004), the community stimulant treatment was considered to be generally substandard; and (b) behavioral interventions are considered both necessary and important for school settings. This argument is further bolstered by concerns about psychopharmacological treatments including adverse side effects (DuPaul, 2007), the preferences of families to avoid medication or limit its use (Fabiano et al., 2007), and the lack of long-term positive effects on academic achievement (MTA Cooperative Group, 2004) as well as symptom and functioning outcomes (Jensen et al., 2007). Thus, given this body of evidence, it is clear that school-based behavioral interventions should have a critical role to play in the treatment of children with ADHD.

Behavioral interventions have been widely used to treat ADHD symptoms and comorbid disruptive behaviors in children (DuPaul & Stoner, in press). DuPaul (2007) notes that consequence-based interventions that have the strongest empirical support involve token reinforcement and response cost procedures. Token reinforcement approaches provide immediate reinforcers contingent on appropriate behavior, whereas response cost strategies remove token reinforcers contingent upon the occurrence of inappropriate behavior. Consequence-based interventions have been found to be equivalent to stimulant medication in some studies. Although behavioral interventions such as consequence-based interventions for ADHD are considered evidence-based practices (U.S. Department of Education, Office of Special Education and Rehabilitative Services, 2003; Pelham & Fabiano, 2008; Pelham et al., 1998) that seem appropriate for delivery in classroom settings, school professionals often adhere to behavioral programs that eschew specific diagnoses and/or prefer to employ generic, wide-net, interventions that address an array of various disorders as a more efficient use of teachers' time (Forness, Kavale, & Davanzo, 2002). With very few exceptions, studies on such school-based wide-net interventions have demonstrated only modest impacts for broadband externalizing problems and have not analyzed outcomes for specific disorders such as ADHD (for review, see Hoagwood et al., 2007).

The purpose of this study is to examine the efficacy of the *First Step to Success* intervention with students meeting diagnostic criteria for ADHD. First Step is a wide-net, early intervention program targeted to K-3 students with externalizing behavior problems involving disruption, aggression, and oppositional-defiant forms of behavior (Walker et al., 1998). First Step is a consequence-based intervention that consists of three modular components: (a) universal screening to identify qualified candidates for the program, (b) a school intervention component focused on improving teacher and peer-related adjustment along with overall school success, and (c) a parent-training component, called homeBase, in which parents are taught to teach their child school-success skills at home which are then noted and reinforced by the child's teacher(s). First Step was developed via a 4-year federal grant and involved a cooperative agreement between the University of Oregon, the Eugene 4J school district, the Oregon Research Institute, and the Oregon Social Learning Center. The First Step program has been the subject of a continuous series of studies since it was developed (see Walker et al., 2008 for a review and update of the evidence base on First Step). These studies involved the use of single-subject methodology, quasi-experimental designs, and two randomized controlled trials. More recently, a large-scale randomized controlled trial was completed within the Albuquerque Public Schools (APS) on First Step that involved 200 cases evenly divided between experimental and control participants (Walker et al., in press).

To date, First Step has been extensively evaluated with mainly primary grade-level students identified as at risk for behavior problems and disorders of an externalizing nature. However, the First Step intervention has not been previously evaluated with students who have met diagnostic criteria for a specific disorder such as ADHD within a randomized controlled trial. We report herein results from the APS randomized controlled trial in which we examine acute phase outcomes for an ADHD subsample, across the following three outcome domains: ADHD and disruptive behavior symptoms, social competence, and academic functioning. In addition, both school and home setting assessments were conducted in order to evaluate the situational specificity of intervention outcomes to these settings. To further evaluate the appropriateness of the First Step intervention for students with ADHD, we report on the social validity and fidelity of implementation of the intervention. Lastly, we examine the association between the quality of implementation and the change in outcomes for the ADHD intervention students. Given the small size of the ADHD subsample ($n = 42$), this report should be considered as a feasibility or pilot study within the context of the larger trial.

Method

Participants and Procedures

In the 2005–2006 and 2006–2007 school years, we recruited two cohorts of first- through third-grade students, teachers, and general education classrooms from 34 elementary schools located in one of the largest and most diverse school districts in the nation, APS. These students, teachers, and parents participated in a large-scale efficacy trial of the *First Step to Success* intervention. We utilized a cohort design model in which waves of intervention and usual care control students participated in the study within either of the two implementation years. Random assignment to either the First Step program or to a usual care control condition (within each wave) occurred at the classroom level, with only one student per classroom targeted for study participation.

We randomly assigned consented general education teachers and their classrooms ($n = 260$) to either the intervention or control condition and then asked the teachers to complete Stages One and Two of a universal problem behavior screener, the *Systematic Screening for Behavior Disorders* (SSBD) procedure (Walker & Severson, 1990). In Stage One, teachers nominated and rank-ordered five students from their classroom who exhibited the highest levels of externalizing behavior and then, in Stage Two, cooperating teachers completed brief ratings of student adaptive and maladaptive behavior, and a checklist of 30 high-intensity, low-frequency, maladaptive behavioral indicators (e.g., critical behavioral events) on the top three identified students. We then targeted the student with the highest average ranking across these three screening measures and solicited parental consent for their child's participation in the study. Overall, we obtained parental consent for 210 of the 260 recruited teachers/classrooms (81%). Ten students (5%) dropped out of the study after parental consent was obtained for participation thereby reducing the participating sample to 200 students. There were 99 cohort 1 student participants (44 usual care control and 55 intervention); in cohort 2, there were 101 (55 usual care control and 46 intervention).

The 200 consented students who participated in the study ranged from 6 to 10 years in age at enrollment ($M = 7.2$, $SD = 1.0$), and were predominantly male (73%). Eighty-three students were first graders, 69 students were second graders, and 48 were third graders. Students were predominantly Hispanic (57%) or Caucasian (24.5%) with the remaining racial and ethnic groups representing <20% of the sample (4.5% American Indian, 0.5% Asian or Pacific Islander, 7% Black, 3% multiracial, and 3% unknown). Students came primarily from English-speaking households (88.9%). Seventy percent were eligible for free-

or reduced-price lunches and roughly 16% were English language learners. Further details regarding the study design, setting, and sample representativeness are described in Walker et al. (in press).

ADHD Sample

As previous research has demonstrated, diagnostic rating scales are highly correlated with structured interview case-finding methods and provide a valid and reliable means for diagnostic classification (Pelham, Fabiano, & Massetti, 2005). We identified the sample for this study using Conners' DSM-oriented symptom cutoff for teacher-reported ADHD symptomatology. As part of the baseline assessment, intervention and control teachers completed an 18-item version of Conners' ADHD/DSM-IV scale (CADS-T; Conners, 1997) that assesses the presentation of ADHD symptomatology *in the last month*. If a student presents six or more symptoms for predominantly Inattentive, predominantly Hyperactive-Impulsive, or Combined subtypes, there is a pronounced chance that DSM diagnostic criteria will be met (Conners, 1997). Forty-two students (21%) met ADHD diagnostic criteria from our larger APS sample of 200 cases—23 intervention students (22.8%) and 19 usual care control students (19.2%). As compared with the larger sample of non-identified students, the ADHD sample had significantly fewer females (7.1 vs. 28.8%; $\chi^2 [1, N = 198] = 8.49$) and significantly more Hispanic students (71.4 vs. 53.8%; $\chi^2 [1, N = 198] = 4.19$). Table 1 summarizes the demographic characteristics of the ADHD subsample. It should be noted that 18 students in the non-identified sample were receiving medication for ADHD. However, because these 18 students did not meet current DSM symptom criteria for ADHD, they were not included in the ADHD subsample for the purposes of this report.

The *First Step to Success* Intervention

The *First Step to Success* program is a manualized intervention that is packaged within a kit that contains a coach's manual, a parent manual, a forms packet, and sufficient consumable materials for the three applications of the intervention. First Step is a school and home intervention, which is initially set up and delivered by a behavioral coach (e.g., school psychologist, counselor, early interventionist, behavioral specialist, etc.) who invests 40 to 50 h of professional time over a 3-month intervention period. During the first 5 days of the school intervention program, the behavioral coach works with and coordinates specified roles of the target child, parent(s), teacher(s), and peers throughout the implementation process, and explains the intervention to each participating social agent, and

Table 1 Student baseline demographic characteristics by condition

Demographic characteristic	Total (<i>n</i> = 42)	Control (<i>n</i> = 19)	Intervention (<i>n</i> = 23)	Test statistic	<i>p</i> -value
ADHD subtype <i>n</i> (%)				1.16	.561
Hyperactive-impulsive	22 (52.4)	9 (47.4)	13 (56.5)		
Inattentive	10 (23.8)	4 (21.1)	6 (26.1)		
Combined	10 (23.8)	6 (31.6)	4 (17.4)		
ADHD medication use <i>n</i> (%)	4 (9.8)	1 (5.3)	3 (13.6)	0.81	.368
Female <i>n</i> (%)	3 (7.1)	2 (10.5)	1 (4.3)	0.60	.439
Receiving services <i>n</i> (%)	3 (7.1)	1 (5.3)	2 (8.7)	0.18	.667
Spanish-speaking <i>n</i> (%)	5 (12.2)	2 (10.5)	3 (13.6)	0.09	.762
Hispanic <i>n</i> (%)	30 (71.4)	15 (78.9)	15 (65.2)	0.96	.327
ELL <i>n</i> (%)	7 (7.5)	3 (16.7)	4 (18.2)	0.02	.900
Free or reduced-lunch <i>n</i> (%)	25 (64.1)	12 (70.6)	13 (59.1)	0.55	.458
Age <i>M</i> (<i>SD</i>)	7.2 (1.0)	6.9 (0.8)	7.5 (1.0)	−1.84	.073

Note: Reported test statistics are χ^2 for dichotomous measures and *t* for continuous

implements the classroom intervention. On program day 6, the teacher takes over operation of the program with the support, assistance, and supervision of the First Step coach. On program day 10, First Step is extended to the target student's home setting where the coach trains parents (referred to as the homeBase component), through six-weekly home visits about how to teach their child key school-success skills such as communication and sharing, cooperation, problem solving, limit setting, and friendship making. Through instruction, role playing, cueing, prompting, and feedback, parents learn how to teach and encourage these skills in their child and to communicate and cooperate with the child's teacher in prompting and reinforcing their display at school.

First Step requires a completion of 30 program days, each with a prescribed set of activities, tasks, and a reward criterion (Walker et al., 1997). For each day that the target student earns at least 80% of the possible daily points, as achieved by displaying positive behavior in the classroom, he/she earns a group activity reward that is shared with the entire class and a prearranged home reward can be earned as well. Thus, the First Step program utilizes school- and home-reinforcement contingencies for the target child where earned activity rewards are shared with classmates at school and individual rewards are prearranged with parents at home. In this procedure, peers are thus rewarded for the target student's success in improved school performance, whereas the child is individually rewarded and praised at home for doing well at school. If the requisite points are not achieved, the program day is "recycled" and the child is given additional opportunities to complete the failed day. This part of the First Step procedures involves a variation of cost contingency or response cost (Walker, 1983; Walker, Colvin, & Ramsey, 1995). Typically, response cost is delivered in two forms as follows: (a) the student

earns points for correct or appropriate performance and simultaneously loses them for inappropriate behavior or performance during a daily session or period, or (b) points are awarded at the beginning of the session or period and the student's task is to keep them by behaving or performing appropriately. With First Step, one point is available every so many units of time during a period (once every 5 min on average). The point will be awarded on either the green side (signaling appropriate behavior) of the point card or on the red side (signaling inappropriate behavior). At the end of the session, red points are subtracted from green points and there have to be 80% of the total points awarded on the green side of the card in order to earn the school reward. The final 10 days of the First Step program are designed to maintain the target child's improved behavior without reliance upon external rewards. In this phase, the focus shifts to adult praise, intrinsic rewards, and encouragement by teachers, peers, and parents to motivate and sustain the child's improved behavior.

Throughout the First Step program, the child's behavior is carefully monitored by the participating teachers at school and by parents at home. Parents teach school-success skills at home, whereas teachers look for, recognize, and praise the child's positive behavior at school. First Step coaches, and subsequently teachers, use a green card visible to the entire class to signal the target child that his/her behavior is positive and earning points whereas the red side of the same card is used to signal the opposite. Due to the group-dependent nature of the First Step program's contingencies, peers become supportive of the target child's attempt to display positive behavior. In turn, peer support and involvement, as reflected in increased rates of social bids, invitations, and positive peer-to-peer interactions, along with inclusion of the target child in peer-control activities, help attenuate the negative reputational bias that

peers often hold toward antisocial and disruptive students (Hollinger, 1987).

School-Based Outcome Measures

For this report, we examined teacher-reported and direct observation outcomes across three domains: ADHD and disruptive behavior symptoms, social competence, and academic functioning. We collected baseline data at the beginning of each wave (early fall, late fall, or early spring) and post-test data upon completion of the First Step program. The ADHD sample ($M = 57.5$ days; $SD = 28.3$ days) did not differ from the non-identified sample ($M = 58.6$ days; $SD = 28.3$ days) on the number of days between baseline and post-assessments, $t(192) = 0.20, p = .841$. As part of a larger questionnaire, collected prior to and following intervention, teachers completed the grades K-6 version of the Social Skills Rating System (SSRS; Gresham & Elliott, 1990), two scales from the SSBD (Walker & Severson, 1990), and the Achenbach Teacher Report Form (TRF/6-18) DSM-oriented subscale for ODD (Achenbach, 2001). Direct observation data were collected using the SSBD measure of Academic Engaged Time (AET).

ADHD and Disruptive Behaviors Symptoms

Symptom scales included measures specific to ADHD hyperactive and inattentive symptoms, one general measure of maladaptive behavior, and one measure of ODD symptoms (mean inter-correlation = .53). We examined change in hyperactive behavior using the hyperactivity subscale from the SSRS Problem Behavior Scale. This 6-item subscale ($\alpha = .76$) examines the teacher's perceived frequency of behaviors involving excessive movement, fidgeting, and impulsivity (Gresham & Elliott, 1990). SSRS behavioral items are assessed on a 3-point scale ranging from "Never" to "Very Often." Although the SSRS does not include a measure of Inattentive behavior, for this report we analyzed the SSRS teacher-reported Cooperation subscale ($\alpha = .81$) as a measure of Inattentive behavior. This 10-item subscale includes items that target behaviors specific to symptoms of inattentive behavior including following directions, completing assignments, attending to instructions, and ignoring peer distractions. Baseline scores for the Cooperation subscale were moderately correlated with the CADS-T Inattentive subscale ($r = .66$). For analytic purposes, we reversed the valence of the scale so that higher scores reflected higher inattentive behavior. The SSBD Maladaptive Behavior Index ($\alpha = .84$) is an 11-item scale that assesses a student's teacher-related and peer-to-peer maladaptive behavioral problems (e.g., refuses to participate, shouts, breaks rules,

threatens peers, bothers others) based on a 5-point rating scale ranging from "Never" to "Frequently." The ODD scale ($\alpha = .84$) is a 5-item DSM-oriented subscale of the Achenbach TRF/6-18 that assesses ODD symptoms.

Social Functioning

Social functioning scales included two measures of pro-social behavior (inter-correlation = .39). The SSBD Adaptive Behavior Index (ABI) is a 12-item scale ($\alpha = .82$) that assesses the student's teacher-related and peer-to-peer adaptive behavioral adjustments (e.g., follows rules, considerate of others, cooperates with peers, complies with requests) based on a 5-point rating scale ranging from "Never" to "Frequently." The SSRS Social Skills Scale ($\alpha = .88$) assesses the teacher's perceived frequency of the core skills of cooperation, assertion, and self-control reported on a 3-point scale ("Never," "Sometimes," or "Very Often").

Academic Functioning

We examined both teacher-reported data and direct observation data to assess changes in students' academic performance (inter-correlation = .25). The 9-item SSRS Academic Competence Scale ($\alpha = .91$) measures reading and math performance as well as the student's motivation, intellectual functioning, and parental support as estimated by the teacher on a 5-point percentage cluster scale (1 = lowest 10%, 3 = middle 40%, 5 = highest 10%). Direct observation data were collected at each data collection time point using the SSBD Stage Three measure of AET (Walker & Severson, 1990). AET estimates the amount of time a student spends engaged in allocated academic activities using a stopwatch recording procedure. As described in the study of Walker and Severson (1990), AET serves as an important indicator of a student's academic involvement and adjustment to the teacher's classroom expectations for all students. A detailed description of AET assessment procedures including observer training and monitoring protocol are described in Walker et al. (2008).

Home-based Outcome Measures

Parent-reported outcomes included the SSRS Social Skills and Problem Behavior Scales. The 38-item social skills subscale ($\alpha = .88$) assesses the parent's perceived frequency of the child's development of social competence as it pertains to day-to-day activities and interactions at home. The Problem Behavior Scale ($\alpha = .88$) has 17 items that measure the parent's perceived frequency of internalizing and externalizing problem behaviors that may interfere

with their child's social skills (Gresham & Elliott, 1990). Items for each subscale are assessed on a 3-point scale ("Never," "Sometimes," or "Very Often").

Process Measures

Implementation fidelity, teacher–coach alliance, estimates of student and parent program compliance, and social validity data were collected for all participants assigned to the intervention condition in order to (a) determine the extent to which the *First Step to Success* program was implemented as intended, (b) examine perceived satisfaction with the teacher–coach relationship as it pertains to program implementation, (c) measure whether students complied with the program and parents participated in the homeBase component of the program, and (d) assess teacher and parental consumer satisfaction with First Step.

Expert raters collected implementation fidelity data on four occasions during First Step implementation: once for the behavioral coach during the first 5 days of program implementation, and on three other occasions, at the beginning, middle, and end of the teacher phase of the program, for the teacher who implemented the program. The implementation fidelity checklist assesses the extent to which the coach and teacher deliver the *First Step to Success* program as intended. The checklist includes 18 First Step implementation components, such as whether the implementer announces the number of points needed for the reward, elicits cooperation from the class, informs the class of the reward, gives points when prompted, provides positive feedback to the target student during the red/green card game, and turns the card to red when inappropriate behavior occurs. For each implementation component, the fidelity checklist assesses (a) whether the component was implemented (yes/no), and (b) the quality of implementation using a 5-point scale ranging from 0 = Very Poor, .25 = Poor, .50 = Okay, .75 = Good, to 1.0 = Excellent ($\alpha = .86$). The intra-class correlation assessing inter-rater reliability for implementation fidelity checks was excellent ($ICC[3,1] = .92$).

Data from the Implementation Fidelity Checklist were used to calculate both adherence and quality implementation scores for the coach, teacher, and overall classroom. Coach and teacher adherence scores were calculated as the proportion of procedures correctly implemented and a mean of the coach and teacher adherence scores was computed to estimate the overall classroom adherence score. Mean quality ratings for the coach, teacher, and overall classroom were calculated as well.

To assess alliance, teachers and coaches completed a 10-item rating scale ($\alpha = .94$) during the post-intervention phase of the study. Alliance items were assessed on a 5-point scale (ranging from "Never" to "Always") and

measured the respondent's perception of shared goals, communication, trust, and effectiveness of the partnership with respect to implementation.

Data were also collected to assess parental involvement in the homeBase intervention module of the First Step program. A parent compliance measure was computed as the proportion of homework assignments completed and a dosage measure was calculated as the proportion of treatment units delivered based on the number of 1-h homeBase sessions (out of six possible) in which the parent(s) participated as described in the First Step manual. Student compliance was measured as the proportion of intervention sessions completed without "recycling" (repeating a program day of the First Step program).

Social validity data were recorded for teacher and parent satisfaction with the *First Step to Success* program. The 13-item teacher satisfaction report ($\alpha = .92$) assesses the teacher's perception of the program training and support received, as well as the usability of the program, the teacher's belief about the effectiveness of the program with respect to changes in student behavior and peer interactions, and whether the teacher would use and recommend the program in the future. Satisfaction items were scored on a 5-point scale from "Strongly Disagree" to "Strongly Agree." The 12-item parent satisfaction report ($\alpha = .92$), scored identically to the teacher version, examined the parent's perceptions of the usability, effectiveness, and value of the program based on the impact of the program on the child's behavior within the home setting.

Statistical Analysis

Analysis of covariance (ANCOVA) was used to compare the two study conditions on post-test outcomes, controlling for baseline levels. The school-based outcome measures were organized into three domains: ADHD and disruptive behavior symptoms, social functioning, and academic functioning. Multivariate analysis of covariance (MANCOVA) was conducted for each of the three school-based domains to determine the multivariate effect size followed by univariate ANCOVA models. Given the small sample size, alpha was set to .05 for all tests. Effect sizes are reported as η^2 for the multivariate effects and Cohen's *d* statistic (Cohen, 1988) for each outcome measure (dividing the difference between the treatment and control group post-test-adjusted mean scores by the pooled within-group standard deviation). In addition, in order to evaluate the practical significance of the intervention effects, we report the *What Works Clearinghouse* improvement index (Valentine & Cooper, 2003) which can be interpreted as the expected change in percentile rank for an average control group student if that student had received the First Step intervention.

Results

Preliminary Analyses

In order to evaluate the equivalency of the two study groups at baseline, the First Step group was compared to the usual care control group across all baseline measures. The student-level baseline demographic characteristics are reported in Table 1. As can be seen from this table, the two groups did not significantly differ from each other on any of the demographic characteristics. In addition, no significant differences between groups occurred on any of the school-based outcome measures or the parent-reported SSRS Problem Behavior subscale. However, the control group was found to have a significantly lower mean score on parent-reported SSRS Social Skills subscale compared to the intervention group (pre-test $M = 82.6$ vs. 95.5), $t(40) = -2.76$, $p = .009$. Pre-test and post-test data were available for all 42 students.

The ADHD sample was also compared to the non-identified sample on the pre-test outcome measures (see Table 2). Compared to the non-identified sample, the ADHD sample had significantly elevated scores on the ADHD and disruptive behavior symptoms and significantly lower scores on the social competence measures. However, the two samples did not differ with respect to the academic functioning measures or the home-based measures of problem behaviors and social skills.

Treatment Fidelity, Therapeutic Alliance, Program Compliance, and Satisfaction

Protocol adherence to First Step implementation was good for both the coach (84%) and teacher phase (86%) of the intervention, with an overall average implementation fidelity percentage of 85. The quality of implementation averaged .78 for classroom implementation and .87 for the homeBase components, which indicate mean ratings across intervention components within the good-to-excellent range. With respect to intervention dosage, students received on average 85% of the available classroom program days and 92% of homeBase sessions. Student compliance to the classroom component was also found to be high (mean compliance score = 92%). Parent compliance to the homeBase homework was good (mean compliance score = 80%). Working alliance was rated highly by both coaches (mean score = 4.5 on 5-point scale) and teachers (mean score = 4.7). Lastly, program satisfaction ratings were quite favorable based on parent report (mean score = 4.4 on 5-point scale; mean item ratings exceeded 4.0 on all 12 items), whereas teachers reported more moderate satisfaction ratings (mean score = 3.7). Lower teacher ratings (mean item ratings < 3.5) were reported for 3 of the 13 satisfaction items: “The program did not take much of my time” ($M = 3.0$), “The program did not interfere with my other teaching activities/responsibilities” ($M = 3.2$), and “The program was effective” ($M = 3.4$).

Table 2 Pre-test means and standard deviations for the school- and home-based outcome measures by ADHD and non-identified sample

Measure	Sample		<i>t</i>	<i>p</i> -value
	ADHD (<i>n</i> = 42) <i>M</i> (<i>SD</i>)	Non-identified (<i>n</i> = 156) <i>M</i> (<i>SD</i>)		
<i>School-based</i>				
<i>Symptoms</i>				
SSRS-HYP	10.8 (1.5)	8.3 (2.3)	-6.60	<.001
SSRS-INATT	12.7 (2.6)	10.2 (3.3)	-4.47	<.001
TRF-ODD	6.5 (2.4)	4.8 (2.9)	-3.39	.001
SSBD-MBI	37.7 (7.8)	33.5 (8.2)	-2.97	.003
<i>Social functioning</i>				
SSBD-ABI	28.0 (6.2)	33.6 (7.1)	4.69	<.001
SSRS-SS	80.2 (8.8)	84.7 (9.2)	2.84	.005
<i>Academic functioning</i>				
SSRS-AC	87.6 (12.5)	88.9 (10.5)	0.67	.501
Student AET	40.0 (16.8)	42.8 (19.5)	0.87	.386
<i>Home-based</i>				
SSRS-PB	112.6 (16.6)	111.0 (14.1)	-0.61	.545
SSRS-SS	89.7 (16.3)	88.8 (14.2)	-0.36	.721

SSRS Social Skills Rating System, SSBD Systematic Screening for Behavior Disorders; TRF Teacher Report Form, ODD oppositional defiant disorder, HYP hyperactivity, INATT inattentive, MBI Maladaptive Behavior Index, ABI Adaptive Behavior Index, SS Social Skills, AC Academic Competence, PB Problem Behavior

Table 3 Pre- and post-test descriptive statistics for the school- and home-based outcome measures by condition and ANCOVA results

Measure	Control (<i>n</i> = 19)			Intervention (<i>n</i> = 23)			Condition effect		Effect size <i>d</i>
	Pre-test	Post-test		Pre-test	Post-test		<i>t</i>	<i>p</i> -value	
	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> _{Adj}	<i>M</i> (<i>SD</i>)	<i>M</i> (<i>SD</i>)	<i>M</i> _{Adj}			
<i>School-based</i>									
<i>Symptoms</i>									
SSRS-HYP	10.7 (1.6)	10.6 (1.7)	10.7	10.9 (1.4)	7.8 (3.0)	7.8	-4.12	<.001	1.32
SSRS-INATT	12.9 (2.9)	12.2 (3.2)	12.0	12.5 (2.4)	9.1 (4.1)	9.2	-2.52	.014	.82
TRF-ODD	6.4 (2.7)	6.1 (2.6)	6.1	6.5 (2.2)	4.6 (2.9)	4.5	-2.30	.027	.74
SSBD-MBI	37.7 (9.6)	35.9 (7.7)	35.9	37.7 (6.1)	28.4 (9.5)	28.5	-2.99	.005	.96
<i>Social functioning</i>									
SSBD-ABI	26.4 (6.8)	30.4 (6.2)	31.1	29.3 (5.4)	37.7 (9.1)	37.0	2.49	.017	.80
SSRS-SS	79.8 (10.9)	82.5 (9.1)	82.7	80.5 (6.7)	94.0 (14.3)	93.8	3.14	.003	1.01
<i>Academic functioning</i>									
SSRS-AC	86.9 (11.8)	86.2 (12.0)	86.7	88.1 (13.2)	90.3 (12.4)	89.8	1.82	.076	.58
Student AET	36.5 (15.0)	44.5 (14.2)	45.9	42.8 (18.0)	58.9 (18.9)	57.5	2.39	.022	.76
<i>Home-based</i>									
SSRS-PB	116.7 (18.1)	111.2 (14.0)	109.0	109.2 (14.9)	100.9 (13.6)	103.2	-1.89	.066	.60
SSRS-SS	82.6 (15.4)	88.4 (16.5)	93.0	95.5 (14.9)	101.7 (16.0)	97.0	0.97	.336	.31

*M*_{Adj} = Post-test means adjusted for pre-test levels; *SSRS* Social Skills Rating System, *SSBD* Systematic Screening for Behavior Disorders; *TRF* Teacher Report Form, *ODD* oppositional defiant disorder, *HYP* hyperactivity, *INATT* inattentive, *MBI* Maladaptive Behavior Index, *ABI* Adaptive Behavior Index, *SS* Social Skills, *AC* Academic Competence, *PB* Problem Behavior

Post-Test Differences on School-Based Outcome Measures

Symptoms Domain

An overall multivariate model was tested for the four post-test symptom measures, controlling for pre-test levels, followed by univariate ANCOVA models. The multivariate test was significant in which the intervention students were found to have large overall gains compared to students in the control condition, $F(4, 33) = 3.87$, $p = .011$, $\eta^2 = .32$. The descriptive statistics and univariate ANCOVA results are listed in Table 3. As can be seen, the intervention group differed significantly from the control group ($p < .05$) in the predicted direction across all four symptom measures with effect sizes ranging from $d = .74$ to 1.32.

Social Functioning Domain

The multivariate test on the two post-test social competence measures, controlling for baseline levels, was significant in which intervention students were found to have large overall gains compared to students in the control condition, $F(2, 37) = 4.16$, $p = .023$, $\eta^2 = .18$. The intervention group differed significantly from the control group ($p < .05$) on both social functioning measures (see Table 3). Large effect sizes were obtained on teacher reports of adaptive behaviors ($d = .80$) and social skills ($d = 1.01$).

Academic Functioning Domain

The multivariate test comparing the two conditions on the two post-test academic measures, controlling for baseline levels, was also significant $F(2, 37) = 4.06$, $p = .025$, $\eta^2 = .18$ (large effect size). As shown in Table 3, the intervention group had significantly greater gains than the control group with respect to AET ($d = .76$) and a medium size trend-level effect was obtained for the SSRS academic competence subscale ($d = .58$).

Post-Test Differences on Home-Based Outcome Measures

With respect to disruptive behavior symptoms at home as measured by the SSRS Problem Behavior Scale (see Table 3), intervention group parents reported a medium size trend-level difference in the predicted direction compared with control group parents ($d = .60$). Although in the predicted direction, the intervention group did not differ from the control group on parent-reported social functioning as measured by SSRS Social Skills Scale ($d = .31$).

Practical Significance of Intervention Effects

To evaluate the practical significance of the First Step program changes in student behavior, the percentile rank improvement index was calculated for each of the school-

based outcome measures within the three domains. With respect to the symptoms domain, the mean improvement index score was +33 percentile points (range = +27 to +41). Similarly, the mean improvement index score for the social functioning domain was +32 percentile points (SSBD-ABI = +29; SRSS-SS = +34). The academic functioning domain mean improvement index score was +25 (SSRS-AC = +22; AET = +28). With respect to the home-based outcomes, the improvement index was +12 and +23 for the parent report of social skills and problem behaviors, respectively. Hence, positive gains were found for all of the outcomes assessed, with greater gains obtained for the school-based measures compared to the home-based measures.

Associations Between Process and Outcome Measures

Ancillary analyses were conducted with students assigned to the First Step condition to examine the associations between the process measures and change in outcome measures. Canonical correlation analysis was used to examine the magnitude of association for the set of school- and home-based outcome measures with (a) the coach, teacher, and parent quality of implementation measures; and (b) the school intervention and homeBase dosage measures. Change scores from pre-test to post-test were computed for each of the ten school- and home-based outcome measures. The canonical correlation for the association between change in outcomes and quality of implementation ratings was $R = .93$. With respect to dosage, the canonical correlation was $R = .89$. The canonical correlations are considered to be large effect sizes according to Cohen (1988, p. 478). Hence, the quality of implementation and dosage received are considered to have impacted the intervention effects that were obtained.

Discussion

This study is the first randomized controlled trial of the First Step program restricted to a sample of students meeting criteria for a specific disorder such as ADHD. Compared to the usual care control group, the First Step program was found to have a significant and large impact on school-based measures of ADHD and disruptive behavior symptoms (M effect size = .96; M percentile rank change = +33 points) and social functioning (M effect size = .91; M percentile rank change = +32 points). Significant and moderate effects on measures of academic functioning were also obtained for the First Step intervention (M effect size = .67; M percentile rank change = +25 points). In contrast, based on the parent

report of the two home-based assessments, a trend-level medium effect size was obtained for post-intervention improvement on problem behavior ($d = .60$; percentile rank change = +23 points), and a non-significant small effect size was found for social skills ($d = .31$; percentile rank change = +12 points). Although the home-based outcomes were not significant given the limited power associated with the small size of the ADHD subsample ($n = 42$), they could be interpreted as potentially clinically meaningful, particularly with respect to improvement in problem behavior, and provide some support to cross-setting specificity of the intervention effects.

The effects from the current study are comparable not only to school-home behavioral interventions that directly target elementary students with ADHD (e.g., Piffner et al., 2007), but also compare favorably to more generic interventions that target externalizing problem behaviors among high-risk students (e.g., Conduct Problems Prevention Research Group 1999, 2007). In addition, with the exception of parent-reported problem behaviors, the intervention effects for the ADHD subsample were equal to or greater than those obtained for the entire APS sample (Walker et al., in press). The robust post-intervention school-based effects of the First Step program with students meeting criteria for ADHD are not too surprising given that several of the strategies employed in First Step are recommended behavioral approaches for intervening with students with ADHD (DuPaul & Stoner, in press). These strategies include token reinforcement, response cost, peer involvement, daily report cards, and parent training. Further, it should be noted that the First Step intervention is individually tailored to the student as recommended by DuPaul and Stoner (in press). A unique feature of First Step is the recycling procedure that is used to accommodate the different pace with which target children move through the program. The First Step program is also individualized at the level of earned rewards. At school, the target child selects from an array of group activity rewards that are shared equally with peers for having met the daily reward criterion. If the target child successfully meets the reward criterion for both school sessions, he or she also earns a prearranged reward at home.

The intervention effects based on the parent assessment of problem behaviors and social skills were substantially lower than the school-based outcomes. These findings diverge from Piffner et al. (2007) home-school behavioral treatment for ADHD, referred to as the Child Life and Attention Skills (CLAS) program, where parents reported significantly greater improvement on global impression ratings at post-treatment for the treated group than the control group. However, parent and teacher ratings were aggregated on primary and secondary outcome measures in

that study which hindered further comparisons of cross-setting specificity. Nevertheless, the diverging finding of a greater impact of the CLAS home-based component may be explained in part by the differences in the intensity of the parenting training. The First Step homeBase component includes only six-weekly home visits as described earlier, whereas the CLAS parent-training component involved eight to ten group sessions and four to five family sessions. We are currently exploring ways in which to enhance the homeBase parent-training component in order to better motivate and engage the parents of students with tertiary-level concerns such as ADHD in the intervention and to provide linkages to appropriate school and community resources. Such an enhancement is warranted given that (a) we have found consistently lower adherence/compliance with the First Step program among parents compared to teachers, and (b) intervention dosage and quality of implementation are strongly related to change in the outcome measures among intervention participants from pre-test to post-test.

The First Step program was found to have high implementation ratings at both school and home settings, and both parents and teachers had mostly high satisfaction ratings of the program. However, a few of the satisfaction ratings (3 out of 13) reflect some concerns by teachers regarding the time required for implementing the program, interference of the program with other teaching activities, and perceived effectiveness. As Fabiano et al. (2007) point out, research indicates that teachers stop implementing classroom interventions once consultant contact is reduced and that innovative approaches are needed to ensure maintenance of behavior management programs. Clearly, approaches to facilitate district- and school-level buy-in and adoption of evidence-based classroom management practices are needed in order to help address the aforementioned concerns raised by teachers.

Although the immediate post-intervention effects of this small-scale randomized controlled trial are promising, the limitations of this study should be noted. First, the subsample of students meeting criteria for ADHD was small and fairly homogeneous with respect to race/ethnicity (71% Hispanic) and gender (7% female). Thus, our statistical power was too limited to examine potential moderation of student characteristics on intervention effects or to make adjustments to alpha for the number of measures tested (balancing trade-offs between Types I and II errors). However, few school-based studies on ADHD have been conducted on ethnic minority populations such as our largely Hispanic sample (Forness, 2005). Second, the assessment of ADHD was based on the teachers' CADS-T ratings (Conners, 1997) and did not include parent ratings of ADHD symptomatology. Our focus on teacher-reported symptoms, however, may be

justified given our focus on adaptive and maladaptive functioning in the classroom setting. Furthermore, Pelham et al. (2005) argue that although both parent and teacher ratings are necessary for treatment planning, they both may not be necessary for diagnosis. It is also important to note that the CADS-T was only collected at baseline which limited our assessment of change on ADHD symptoms to those assessed by the SSRS (Gresham & Elliott, 1990). However, this concern is somewhat mitigated by the significant baseline differences noted on the school-based outcomes between the ADHD identified and non-identified subsamples shown in Table 2. Third, although the First Step program produced large practical gains in the school-based outcome measures, normalization of symptoms and functioning clearly remain for some of the intervention students based on the post-intervention mean scores (e.g., the hyperactivity score is at the high end of the normal range and post-test mean score for AET is well below the 70 to 80% benchmark for normal functioning). Standards of evidence-based practices are only recently beginning to reflect outcomes that stress normalization of behaviors and the clinical significance of findings (Forness, 2005). Fourth, this study reported on only acute post-intervention effects, so the long-term effects of the First Step program for students with ADHD remain to be examined. Lastly, as mentioned above, the homeBase component of First Step would be considered low intensity and may require enhancement in order to more fully address the issues of families of students with ADHD, such as linkage to appropriate community services for tertiary-level treatment including stimulant medication.

This study provides an initial step toward establishing the efficacy of the First Step program for students with ADHD. While the replication of these findings in a large-scale efficacy trial targeted to students with ADHD that addresses some of the limitations presented above is needed, the findings from this small ancillary study should be considered as providing tentative support for the First Step program as a first-line treatment approach for students with ADHD. In addition, based on the provocative findings by Fabiano et al. (2007), it might be beneficial to study the combination of stimulant medication in conjunction with the First Step program to determine whether better outcomes can be achieved with perhaps lower dosage of medications than with medication treatment or First Step alone. Given the paucity of long-term effects for both behavioral and medication treatments, as well as their combination, further research is needed with respect to "designing prosthetic environments" for the maintenance of intervention gains and the normalization of behavior (Barkley 2007). Fortunately, most classrooms have the necessary infrastructure to support the ongoing behavioral

interventions for students with ADHD (Walker et al. 2003–2004).

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