A Randomized Controlled Trial of a School-Implemented School-Home Intervention for ADHD Symptoms and Impairment

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Abstract

Objectives: This study evaluated the efficacy of a novel psychosocial intervention (Collaborative Life Skills, CLS) for primary-school students with ADHD symptoms. CLS is a 12-week program consisting of integrated school, parent, and student treatments delivered by school-based mental health providers. Using a cluster randomized design, CLS was compared to usual school/community services on psychopathology and functional outcomes.

Methods: Schools within a large urban public school district were randomly assigned to CLS (12 schools) or usual services (11 schools). Approximately six students participated at each school (N=135, mean age= 8.4 years, grade range=2nd-5th, 71% boys). Using PROC GENMOD (SAS 9.4) the difference between the means of CLS and usual services for each outcome at post-treatment was tested. To account for clustering effects by school, the Generalized Estimating Equation method was used.

Results: Students from schools assigned to CLS, relative to those assigned to usual services, had significantly greater improvement on parent and teacher ratings of ADHD symptom severity and organizational functioning, teacher-rated academic performance and parent ratings of ODD symptoms and social/interpersonal skills.

Conclusions: These results support the efficacy of CLS relative to typical school and community practices for reducing ADHD and ODD symptoms and improving key areas of functional impairment. They further suggest that existing school-based mental health resources can be re-deployed from non-empirically supported practices to those with documented efficacy. This model holds promise for improving access to efficient, evidence-based treatment for inattentive and disruptive behavior beyond the clinic setting.

Clinical Trials registration information: Study of the Collaborative Life Skills Program, http://clinicaltrials.gov/; NCT01686724

Introduction

An estimated 5.9-7.1% of youth meet criteria for Attention Deficit Hyperactivity Disorder (ADHD).[1] Problems associated with ADHD constitute a common reason for referrals for mental health services and place children at risk for adverse interpersonal, educational, vocational and health outcomes.[2,3] Practice guidelines include psychosocial interventions among recommended treatments for ADHD (e.g., AACAP, AAP). Despite the existence of evidence-based psychosocial treatments (EBTs),[4–7] few children receive them. Most EBTs have been developed by university research teams and are not widely available in the community. Cost, transportation, and stigma are barriers to clinic-based care, underscored by the fact that more than half of those referred to clinics do not show up for their appointments.[8] Even if these barriers were mitigated, both psychosocial treatment and pharmacotherapy are likely to remain under-resourced (as evidenced by continued shortage of child psychiatrists), particularly in rural and low-SES locales.[9]

Access to psychosocial EBTs is limited even in schools, which are first-line providers of mental healthcare for students. Most students with ADHD do not receive any formal school-based services to address their difficulties,[10,11] and only 37% of students with ADHD who receive school services are provided with behavioral interventions.[11] Classroom-based services for ADHD are often limited to environmental (e.g., preferential seating) and academic modifications (e.g., extended time on exams, reduced workload, instructional modifications), none of which have empirical evidence to support their use[12]. Beyond these modifications, services may consist of child-centered interventions provided by school mental health providers which emphasize individual or small group counseling, with limited engagement of teachers and parents.[13] These well-intended interventions have little evidence to support their use.[13,14]

To address this research-to-practice gap, Pfiffner et al. (2011) developed the Collaborative Life Skills (CLS) program. CLS was adapted from an evidence-based, clinic-delivered intervention for ADHD-Predominantly inattentive presentation (ADHD-I)[15,16] for implementation in schools by school mental health providers (SMHPs). Locating the intervention in schools was intended to maximize access, as school is the setting where the vast majority (70%) of children receive mental health services for ADHD.[13,14] The study utilized existing school-based mental health professionals, rather than paid research staff, to favor generalizability and replication.

CLS consists of simultaneous delivery over 12 weeks of three empirically-supported treatments: teacher consultation and use of daily report cards (DRC) [17,18], parent training [19,20] and child social and life skills training.[15,21] Students learn independence, organizational, and social-emotional (e.g., social skills, self- control) skills, which are then reinforced by teachers and parents to promote generalization into naturalistic settings. Teachers and parents learn specific strategies for promoting engagement, motivation, and regulation of behavior. Reinforcement contingencies are set within and across settings (e.g., parents reward behaviors that occur at home and school, therapists reward behaviors that occur at home, school, and group, etc.). The net effect is to implement around-the-clock support of child behavior across impairment domains in an active partnership of parents, teachers, and SMHPs, sharing goals and terminology. Open trials of CLS have demonstrated feasibility, fidelity, acceptability, and preliminary efficacy.[18,22,23]

Goals of Current Study: The study evaluated the efficacy of CLS through implementation of a randomized controlled study comparing CLS to business as usual (BAU). The BAU condition represented the general level of school and clinical services accessed by the typical child with attention and behavior concerns. We predicted that ADHD and ODD symptom

severity, as well as key areas of functional impairment including organization, academic, and social functioning at home and at school, would be significantly improved at the end of treatment among those receiving CLS relative to BAU. We also predicted that CLS would result in significantly higher rates of recovery into the normative range on each of these outcomes.

Methods

Participant Characteristics

Participants included 135 children in grades 2-5 across 23 schools in a northern California urban public school district and 23 school mental health providers (SMHPs). See Table 1 for demographic information and symptom profiles based on combined parent and teacher symptom ratings of *often* or *very often* on the Child Symptom Inventory (CSI)[24]. Participating schools (19 K-5 and 4 K-8) averaged 420 students (range: 253-699), with 54.6% of students qualified for free or reduced lunch (FORL, range: 23-95%).

Participant Recruitment and Screening Procedures

Participant flow is depicted in Figure 1. Recruitment occurred from 2012-2015, beginning with invitations to SMHPs and their school principals to participate in the program. Those agreeing to participate initiated recruitment of students. Student participants (n=5-6 per school) were referred by school staff to the SMHP due to excessive inattention and/or hyperactivity-impulsivity and related academic and/or social problems (generally those who would be identified as needing school services) and whose teachers and parents provided consent to participate. Children taking medication were eligible as long as their regimens were stable. Students with significant visual or hearing impairments, severe language delay, psychosis, or pervasive developmental disorder or who were in full day special day classrooms were excluded.

Eligibility criteria were: (1) elevated ratings of ADHD symptoms (i.e., six or more inattention symptoms and/or six or more hyperactive/impulsive symptoms endorsed on the CSI by either the parent or teacher as occurring *often* or *very often*, (2) cross-situational impairment (home and school), documented as a score of ≥3 in at least one domain of functioning on both parent and teacher Impairment Rating Scales,[25] (3) FSIQ equivalent of >79 on the Wechsler Abbreviated Scale of Intelligence (WASI),[26] (4) a caretaker available to participate in treatment, and (5) a primary classroom teacher who agreed to participate in the classroom component.

Consent forms (parent and teacher) and an assent form (child), approved by the [redact] Committee on Human Research, were completed by parents, teachers, and children. Parents and teachers were paid $50 for completing measures at each time point.

SMHP Background

SMHPs (12 full-time and 11 half-time masters-level mental health clinicians) implemented study interventions as part of their work responsibilities. SMHPs received extended calendar pay, at a rate similar to their district salary, for attending training that occurred outside of their normal working hours.

Study Design and Description of CLS Treatment Components

A 2-level (students, schools) cluster randomized controlled design[27] accounted for treatment (CLS or Business as Usual; BAU) within level 2 (schools). Entry into the study was staggered into two cohorts during each of 3 school years, with one cohort beginning in Fall and one in Winter. Schools within cohorts (n=3-5 schools) were randomized into CLS (n=12) and BAU (n=11), with randomization of schools stratified based on the percentage of students receiving FORL. Schools were rank-ordered on percentage of students receiving FORL. Ordered

pairs were randomized to CLS or BAU by the study statistician after students, parents, and teachers consented to participation and completed baseline measures.

Classroom Component: SMHPs led 2 group meetings with participating teachers (one 1-hour orientation session, one 30-minute troubleshooting meeting), and 2-3 individual 30-minute meetings attended by parent, student, and the student's individual teacher. The classroom intervention consisted of a school-home daily report card (Classroom Challenge, CC), homework plan, and classroom accommodations as needed (e.g., preferential seating, targeted use of praise, providing prompts to improve student compliance). Each student's CC included 2-3 target behaviors (e.g., academic work, classroom deportment, social interactions) rated up to three times per day. Points earned for meeting target goals were exchanged for daily home rewards and brought to the child group each week for group-based reinforcement. Target behaviors were refined throughout the intervention period during the individual meetings.

Parent Component: SMHPs led 10 1-hour group sessions. Modules taught skills covered by traditional parent training programs, including effective use of commands, rewards, and discipline, plus strategies covered in the child group (e.g., homework time, organization, independence in completing daily routines, peer interactions and social skills) and stress management for parents. Families developed a homework plan and home challenges targeting child skills. They also learned skills for supporting the Classroom Challenge at home.

Child Skills Component: SMHPs led 9 40-minute child group sessions during the school day, and two celebratory parties with parents, teachers, and students. Modules targeted social functioning and independence.[21] Social skills modules included: good sportsmanship, accepting consequences, assertion, dealing with teasing, problem solving, self-control, and friendship making. Independence modules included: homework skills, completing chores and tasks

independently, and establishing and following routines. Activities accommodated developmental needs (e.g., having older children take more of a leader/helper role in groups, providing age-appropriate examples of skill use). Skills were taught through didactic instruction, behavior rehearsal, and in-vivo practice. A reward-based contingency management program was utilized to manage child behavior, encourage active group participation, and reinforce new skills. To facilitate generalization, children earned tokens and rewards for accomplishing target goals at home and school.

BAU Condition

Participating students in schools assigned to BAU received school and community services as usual. After families and teachers in schools assigned to BAU completed their final assessments in the fall of the subsequent school year, they were offered the CLS program.

SMHP Training

SMHPs attended group training sessions (an initial full-day training plus weekly supervision) with a doctoral-level clinician-trainer to review manual content, view session videotapes, role-play key interactions, and troubleshoot emerging problems. Trainers also attended each session to complete fidelity measures and to model the curriculum if needed.

Fidelity Measures

Trainers rated SMHP adherence to session content (coverage of each item rated as: *not at all*, *partially*, or *fully*) and implementation quality (competence of delivery rated 1=*not at all* to 5=*great deal*). Teacher fidelity included number of days the CC was completed (based on a count of completed CC forms). Parent implementation of strategies taught during groups was measured through weekly self-ratings of strategy utilization frequency (1=*no days* to 5=*every*

day), parent signatures on the daily CC, and clinician-trainer ratings of parent overall adherence to the treatment program (1=*not at all* to 5=*great deal*).

Student Outcome Measures

ADHD and ODD Symptoms: Teachers and parents completed the Child Symptom Inventory (CSI)[24]. The ADHD and ODD items were rated on a 4-point scale (*never, sometimes, often, very often*). The CSI has normative data and acceptable test-retest reliability and predictive validity for ADHD and ODD diagnoses.[24] In our sample, internal consistency was high for parent and teacher versions of the CSI (alphas>.8). Total ADHD and ODD scale scores were used in analyses to measure symptom severity.

Organizational Functioning: Teachers and parents completed the Children's Organizational Skills Scale (COSS).[28] Items are rated on a 4-point scale (1=*hardly ever or never* to 4=*just about all the time*). Items assessing organization, management of materials/supplies, and task planning skills (parent=58 items, teacher=38 items) were totaled for analyses, with lower scores indicating better organizational functioning. Both parent and teacher versions have adequate psychometric properties, including internal consistency (alphas=.94).

Social Skills: Parent and teacher versions of the Social Skills Improvement System (SSIS) Social Skills Scale were used to measure of social skills.[29] Each item is rated on a 4-point scale (*never, seldom, often, almost always*). The SSIS has excellent psychometric properties, including high internal consistency (alphas$\geq$.94), test-retest reliability (*rs*$\geq$.81) and evidence for convergent and discriminant validity.[29] In this study, we analyzed the total social skills standard score (sex-specific), which reflects communication, cooperation, assertion, responsibility, empathy, and self-control skills. Higher scores indicate greater social skill.

Academic Functioning: The Academic Competence scale on the teacher version of the SSIS was used to measure academic functioning. This scale measures reading and math performance, academic motivation, and general cognitive functioning. Each item is rated on a 5-point scale relative to students in the same class (lowest 10% to highest 10%). This scale has excellent psychometric properties, including high internal consistency (alpha=.97) and test-retest reliability (*r*=.93) and evidence for convergent and discriminant validity.[29] We analyzed the total academic competence standard score (sex-specific). We also dichotomized the standard score at 85 (with scores below 85 representing below average and scores above 85 representing average or above) to evaluate for treatment effects on the percentage of students functioning in at least the average range at post-treatment and on improving the academic functioning of those most at-risk for academic failure (i.e., those within the below average range at baseline).

Data Analytic Approach and Sample Size

Sample size was estimated based on our previous findings of effect sizes in the medium to large range for reduction in ADHD symptoms and impairment.[15,16] With a sample of K=24 schools and N=135 students, estimated detectable effect size for this study is 0.48 (ICC=.01, alpha=.05, two-sided).

Baseline demographic characteristics were compared between treatment conditions by testing linear models using SAS PROC GENMOD and the Generalized Estimating Equation (GEE) to account for clustering effects by school. Study hypotheses were tested by estimating and testing linear mixed-effects models of mean post-test scores between groups also using SAS PROC GENMOD with GEE (all two-tailed). In addition to intervention group, models also included the baseline level of the outcome measure. Effect sizes were based on group differences in estimated means at post-treatment (adjusted for pre-treatment score) using Cohen's *d*. To

control Type I error rate, a Benjamini-Hochberg False Discovery Rate (FDR)[30] was applied within domain. The FDR exerts more powerful control over incorrectly rejecting the null hypothesis compared to procedures that control the familywise error rate (e.g., the Bonferroni correction). Specifically, using this method, each *p*-value below the a priori family-wise alpha level of .05 (*i*) is ranked in ascending order, *i* thru *M*, where *M* is the rank of the largest (least significant) *p*-value. These *p*-values are then compared iteratively to an adjusted alpha level of $i(\alpha)/M$, until one of the *p*-values (*k)* is larger than the adjusted alpha level. When this occurs, *k* and all *p*-values ranked after *k* are considered nonsignificant. All comparisons with significant *p*-values (i.e., $p < .05$) remained significant after applying the Benjamini-Hochberg FDR correction. Finally, to judge clinical significance, we compared the percentage of cases with symptom and impairment scores within the normative range (within one SD of the sex-specific population mean) at post-treatment, separately for parents and teachers, based on published norms for each measure.

Results

Fidelity Measures and Attendance

SMHPs at least partially covered 94% of parent session elements and 97% of child session elements with moderate to high levels of competence (mean 4.4 for parent group and 4.8 for child group). Teachers used the CC an average of just over 4 days per 5-day week (mean=4.1). Parents reported using strategies taught during the parenting group to address home behaviors on most days (mean=4.3) and to support the CC on most days (mean=4.5), and parent signatures were obtained on more than 70% of the CCs collected. Trainer ratings of parent's overall adherence to the program averaged 4.1. Parent attendance at groups averaged above 79% (range 0-100%). Over 90% attended at least half of the group sessions. Child attendance

averaged above 92% (range: 67-100%). 85% of students had 2 teacher/family meetings, and 15% had one.

Student Outcome Measures

Few data were missing at baseline or post-treatment (2-5% across measures), so none were imputed. Most of the missing data were related to attrition. Groups did not differ on demographics or medication use at baseline. Several demographic variables (parent education, gender, child IQ) and medication status were associated with one or more outcome measures. Similar results were obtained in models that were adjusted vs. not adjusted for these covariates, thus we report results from the unadjusted models. Table 2 presents results for ADHD and ODD symptoms and functional impairment at baseline and post-treatment.

ADHD Symptom Severity: Significant treatment effects were found at post-treatment for ADHD symptom severity per parent (X^2=13.64, p=.0002) and teacher report (X^2=8.7, p=.0032), with large and medium effect sizes, respectively. Reductions in ADHD symptom severity from baseline to posttreatment for the CLS group averaged 46% and 35% per parent and teacher report respectively, but only 15% and 17% for the BAU group per parent and teacher report respectively. Following treatment, the percentage of cases that moved from outside to within the normative range was 59% and 50%, per parent and teacher report respectively, for the CLS group but only 16% and 17% per parent and teacher report respectively for the control group. These group differences were statistically significant (parent: X^2=11.26, p=.0008; teacher: X^2=7.01, p=.0081).

ODD Symptom Severity: Significant reductions in parent-reported ODD symptom severity were found for CLS relative to BAU at posttreatment (X^2=13.77, p=.0002), with ODD symptoms decreasing by 42% from baseline to posttreatment in the treated group but only 13%

in the control group and a between group effect size in the large range. Group differences in teacher-reported ODD symptom severity trended toward significance (teacher: X^2=3.56, p=.0593), with the treated group averaging a 29% reduction and the control group averaging a 20% reduction and a modest between group effect size. Following treatment, the percentage of cases that moved from outside to within the normative range was 62% and 53% per parent and teacher report respectively for the treated group and 28% and 31% per parent and teacher report respectively for the control group; these group differences were statistically significant for parent report (X^2=6.6, p<.0102) and trended toward significant for teacher report (X^2=3.49, p=.0618).

Organizational Functioning: The CLS group showed significantly greater improvement in organizational functioning relative to the control group per parent report (X^2=14.68, p=.0001) and teacher report (X^2=8.58, p=.0034) at post-treatment with effect sizes in the large and medium range, respectively. Significantly greater rates of recovery into the normal range were found for CLS (65%) relative to BAU (26%) on the parent-reported COSS (X^2=9.18, p=.0024) and for CLS (41%) relative to BAU (17%) on the teacher-reported COSS (X^2=4.7, p=.0301).

Social Skills: Parent ratings of social skills on the SSIS showed significant between-group differences at posttreatment favoring the CLS group (X^2=4.25, p=.0393) with an effect size in the modest range. Significantly greater rates of recovery into the normal range were found for CLS (69%) relative to BAU (28%) on the parent-reported SSIS social skills scale (X^2=8.69, p<.0032). Between group differences on teacher-reported social skills were not statistically significant (p>.1).

Academic Functioning: Teacher ratings of academic competence on the SSIS measured by mean standard scores did not show significant group differences at post-treatment (p>.1). However, when scores were dichotomized at a standard score of 85, significant between-group

differences were found at posttreatment favoring the CLS group (X^2=4.46, p=.0291) with an odds ratio (OR=3.41) in the moderate range. Significantly more students in CLS (72%) were scoring in the average or above average range than were students in BAU (58%). Significantly greater rates of recovery from below to within or above the average range were found for CLS (36%) relative to BAU (8%) (X^2=4.47, p=.0344).

Satisfaction measures

Parent, teacher and SMHP satisfaction with CLS was high at post-treatment. The vast majority of parents and teachers (>90%) rated the program as appropriate or very appropriate for treating children's attention, academic, and social skills problems, were satisfied or very satisfied with the services received, and would recommend or strongly recommend the program to others (these ratings are one of the two most favorable options on a 5-point scale). Students (93%) reported they liked the group and/or learned a lot (most favorable option on a 5-point scale). All SMHP's rated the overall quality of the program as high or very high (on a 5-point scale with rating options ranging from very low to very high).

Non-CLS Service Utilization for BAU and CLS

During the period between baseline and post-treatment, CLS and BAU did not significantly differ (ps>.1) in medication use (BAU: 7.9%, 5 cases; CLS: 12.7%, 9 cases) or receipt of educational interventions, including special education services at school (IEP) and/or tutoring during or after school (BAU: 39.7%, 25 cases; CLS: 40.9%, 29 cases). However, BAU received significantly more school counseling and/or psychotherapy in the community (family therapy, child therapy or parenting group) than CLS (BAU: 46%, 29 cases, CLS: 27.5%, 19 cases, X^2=4.87, p=.0274). Over half of students in BAU received one or more classroom accommodations, including preferential seating, modified homework, behavioral chart, and/or

extra time on tests (BAU: 58.7%, 37 cases). All CLS participants received classroom accommodations as part of their participation in the treatment.

Discussion

This is the first randomized trial of CLS, a novel school-implemented school-home intervention for ADHD symptoms and impairment. CLS resulted in statistically and clinically significant improvement in ADHD symptom severity and organizational skills across home and school settings relative to usual school/community services. Improvement was substantial, as indicated by medium to large effects (at or above levels reported in meta-analyses of behavioral treatment effects [6]) and clinically significant recovery of symptom severity and organizational impairment into normative ranges for a majority of those treated with CLS. As predicted, parents also reported statistically significant reductions in ODD symptoms and improvement in social skills, with recovery into normal ranges in both domains for the majority of youth in the CLS. Teachers reported reductions in ODD symptoms as well, but these were just shy of statistical significance, possibly owing to less severe teacher-reported ODD symptoms at baseline. These findings suggest that improvement from CLS in this trial, and by inference, a previous open (uncontrolled) trial,[22,23] is unlikely due to factors such as time, maturation, or response to usual services.

The substantial reduction in ADHD symptom severity is consistent with our prior study of multicomponent treatment (Child Life and Attention Skills program, CLAS)[16]. That study found moderate effect sizes for inattention symptom reduction per parent (d=.64) and teacher (d=.7) report as compared to effect sizes in the large range per parent (d=1.05) and moderate range per teacher (d=.67) report in this study. In contrast, another study involving clinic-based family and school components for school-age youth did not find treatment-related change in

ADHD or ODD severity[31]. In that study, medication usage was relatively high in all groups, and the treatment was compared to a psychoeducational intervention, which may have limited the extent to which behavioral treatment would show effects beyond services already provided. Our supposition is that the coordinated components and intensity that are specific to CLAS[16] and CLS confer greater efficacy for ADHD and ODD symptom reduction. However, because both of our samples used medication infrequently, we cannot rule out the possibility that concurrent medication use would substantially reduce "room for improvement" of ADHD symptoms for all behavioral treatments, including ours.

Although treatment effects on mean scores of academic competence were not significant, teachers rated significantly more CLS than BAU students as functioning at or above the average range in overall academic competence at post-treatment and as having improved from below average at baseline to at least the average range at post-treatment. Such effects on the dichotomized but not the continuous variable may have occurred because CLS does not improve academic competence in students already functioning at or above the normal range. CLS may be most helpful for improving the academic performance of those students who are most at risk for academic failure.

Contrary to expectations, CLS did not yield significant improvement on teacher-reported social skills. Lesser effects at school may be a function of less awareness by teachers of changes in the specific peer interaction skills assessed on the SSIS, as these may be relatively subtle and less observable in the structured classroom context. Alternatively, the intervention may not be sufficiently targeted or potent to address school-related social problems. For example, teachers tended to identify target behaviors for the daily report card focused on behavior and work-related outcomes rather than specific social skills. Increased use of socially-focused target behaviors in

peer recreational settings may yield stronger effects. It is worth noting that teachers do not often supervise less-structured activities, such as lunch and recess, and thus they most likely were unavailable to observe or to deliver treatment in these social activities.

This study demonstrated that CLS can be feasibly implemented at school sites by school personnel with similar, or in some cases stronger, effects than clinic-based family-school interventions. Feasibility was demonstrated by high attendance rates for parents, children and teachers at groups and meetings and low attrition. Acceptability of CLS was high per reports from the school mental health providers, teachers, parents, and students. Fidelity of implementation by SMHPs was high, as was parent and teacher implementation of the strategies at home and school. Implementing all intervention components at the school, by a full-time school employee, might have bolstered the acceptability of the intervention among teachers and parents and/or could have enhanced the treatment fidelity by facilitating closer monitoring of parent and teacher components (via daily access to teachers and parents). Together, these results suggest that SMHPs can be redeployed from conventional treatment to an evidence-based treatment. Pending controlled evaluation of cost-effectiveness, this shift may be accomplished with modest additional cost, compared to the costs that might be projected by sending these same children to clinics for comparable treatment. This approach confers the potential for increased accessibility for families, and it addresses the difficulties associated with disjointed school and clinic services. It could be adapted to areas with few services (rural and low-SES locales) in far less time than would be required to build out current (clinic-based) service delivery models.

The recovery rate of CLS, with symptom reduction effects similar to medication,[32] suggest that CLS or comparable interventions may attenuate the number of schoolchildren who require further treatment with medication.[33] If so, an alignment of public policy may

substantially ameliorate the current and projected underservice of needy children that is a function of too few child psychiatrists.[9] As a public health measure, this would be consistent with providing the lowest-risk intervention first. Other studies have shown that sequencing psychosocial treatment before medication treatment reduces the dose and overall exposure of medication[33] and increases parents' engagement in behavioral interventions.[34]

There are several limitations of the study. First, the sample may not be representative of children who typically present to clinics with complaints related to ADHD. The children were all school-referred and clinical diagnoses were not made (even though ADHD symptoms and impairment were confirmed at baseline for all participants). Many were from well-educated families (representative of the region), which may have contributed to higher treatment adherence. Rater bias or expectancy may have been factors (parents and teachers involved in the treatment provided the ratings). More objective measures of outcome (e.g., academic achievement tests, blinded observations) would avoid these biases. However, the fact that teachers reported significant improvements in some areas (ADHD symptom severity, organizational and academic functioning), but not in others (ODD symptom severity or social skills) suggests that if rater biases were operative, they were not universal. The study reports only short-term effects, thus, sustainability of treatment effects requires further study. The relative contribution of each treatment component is not discernable from the design. Finally, masters level SMHPs delivered CLS in this study, and while school clinicians are on staff in districts across the country[35], training may need to be modified for delivery by those without a mental health background.

In sum, school-delivered multicomponent psychosocial treatment can reduce ADHD and ODD symptoms and improve organizational, academic, and social functioning. The feasibility

demonstrated here holds promise for increasing accessibility and optimizing cost-effectiveness of services if the critical gap in initial training and supervision can be bridged. Future research should include the development of portable approaches to training school clinicians in multicomponent treatments such as CLS (e.g., via interactive web-based treatment and training); otherwise there will be a lag due to inadequate resources for in-person training in many locales. The dissemination of evidence-based behavioral interventions more generally across school districts is an urgent consideration and will depend upon policy decisions, which emphasize funding for school mental health and other systems of care so that these services are accessible to all youth and families in need.

Clinical Guidance

CLS is a multicomponent treatment for childhood ADHD symptoms and impairments that integrates classroom interventions, parent training groups, and child skills groups. CLS was designed for delivery by school mental health providers (SMHPs) at school sites. Treatment effects are generalized across school and home through behavior targets that are reinforced in both settings, and common terminology used by parents, teachers, and SMHPs.

CLS resulted in significant reductions in ADHD and ODD symptoms and organizational, academic, and social impairments, relative to usual services. In many cases, ADHD and ODD symptoms and impairments were normalized. Most benefits were reported in the home and classroom settings where CLS was implemented. SMHPs delivered CLS with high fidelity. Program satisfaction was high among parents, teachers, SMHPs and children.

The school delivery of CLS confers the potential for increased accessibility, potency and cost-effectiveness of empirically-supported services for youth with elevated ADHD symptoms and impairment.

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Table 1
Baseline Characteristics by Treatment Assignment

Variable	CLS			BAU		
	%	*M*	*SD*	*%*	*M*	*SD*
Child age (years)		8.3	1.1		8.5	1.1
WASI FSIQ		103.0	13.0		101.0	14.7
Gender (% boys)	75			67		
Grade: 2nd	31			27		
3rd	35			21		
4th	25			35		
5th	9			17		
Race/Ethnicity						
White	31			22		
African American	8			10		
Asian	22			19		
Hispanic/Latino	21			27		
Multiracial/Multiethnic	18			22		
On Medication at Randomization	9.7			7.9		
Single Parent Household	33.3			25.4		
Parent Education (% college grads)	65			55		

ADHD Presentation:		
Combined	54	62
Inattentive	40	38
Hyperactive-Impulsive	6	0
ODD	43	59

Note. CLS=Collaborative Life Skills program, BAU=Business As Usual, WASI FSIQ= Wechsler Abbreviated Scale of Intelligence, Full Scale Intelligence Quotient. ADHD=Attention Deficit Hyperactivity Disorder. ODD=Oppositional Defiant Disorder.

Table 2.
Means (M) and Standard Deviations (SDs) for Student Outcome Measures

		CLS		BAU			
Measure	Data Source	Baseline M (SD)	Post M(SD)	Baseline M(SD)	Post M(SD)	Cohen's *d*/OR *(*95% CI)	*p*-value
ADHD Symptom Severity	Parent	33.77(10.54)	18.09 (8.13)	32.25(9.29)	27.30(10.68)	-1.05 (-1.42, -.69)	.0002*
	Teacher	30.93(10.44)	19.99(9.33)	33.10(10.88)	27.50(9.82)	-.67 (-1.02, -.32)	.0032*
ODD Symptom Severity	Parent	10.38(6.28)	6.03(3.86)	10.79 (6.05)	9.43(5.09)	-1.08 (-1.45, -.71)	.0002*
	Teacher	6.31(6.02)	4.46(4.44)	7.6(6.63)	6.06(5.07)	-.35 (-.69, -.01)	.0593
COSS (total score)	Parent	158.50(21.62)	137.17(20.42)	155.02(23.80)	147.95(22.64)	-1.09 (-1.46, -.72)	.0393*
	Teacher	92.85(14.69)	84.96(14.34)	100.00(17.08)	96.61(16.15)	-.68 (-1.03, -.33)	.0001*
SSIS-Social Skills (standard score)	Parent	87.24(15.5)	93.16(14.45)	85.02(17.38)	86.84(17.33)	.39 (.04, .74)	.0034*
	Teacher	84.51(12.72)	85.07(11.43)	82.63(12.61)	83.87(13.78)	.01 (-.33, .35)	ns
SSIS-Academic Competence Standard Score	Teacher	89.0 (13.7)	89.6 (13.9)	88.0 (11.9)	88.1 (13.0)	.11 (-.24, .45)	ns
% at or		61%	72%	59%	60%	OR=3.41 (1.4, 8.6)	.0291*

above
average

Note. CI=confidence interval; ADHD=Attention Deficit Hyperactivity Disorder; ODD=Oppositional Defiant Disorder; SSIS=Social Skills Improvement System; COSS=Children's Organizational Skills Scale; ns=non-significant (p>.1)

* Significant after within-domain Benjamini-Hochberg FDR correction; OR=Odds ratio