

Attendance and Engagement in Parent Training Predict Child Behavioral Outcomes in Children Pharmacologically Treated for Attention-Deficit/Hyperactivity Disorder and Severe Aggression

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Abstract

Objectives: We examined the association of parent training (PT)-related factors with therapeutic success in the Treatment of Severe Childhood Aggression (TOSCA) study. Our aims were (1) to evaluate demographic and clinical characteristics as predictors of parent attendance and engagement in PT and (2) to examine the associations of parent attendance and engagement in PT with study-targeted child behavior outcomes (i.e., attention-deficit/hyperactivity disorder [ADHD] and disruptive behavior symptoms). TOSCA was a randomized clinical trial evaluating the effect of placebo versus risperidone when added to PT and psychostimulant for childhood ADHD with severe aggression.

Methods: Data for 167 parents and children 6–12 years old with ADHD, oppositional defiant disorder (ODD) or conduct disorder, and severe physical aggression were examined. Analyses used generalized linear models.

Results: Most parents (72%) attended seven or more of nine sessions. The average parental engagement, that is, the percentage of PT elements fully achieved across participants and sessions, was 85%. The average therapist rating of goal completion was 92%. Parents of non-white and/or Hispanic children ($p=0.01$) and children with lower intelligence quotient ($p=0.02$) had lower PT attendance; parents with lower family incomes ($p=0.01$) were less engaged. Attendance and engagement predicted better scores on the primary child behavior outcomes of disruptive behavior (Nisonger Child Behavior Rating Form Disruptive Behavior Total) and ADHD and ODD symptoms, adjusting for baseline severity.

Conclusions: When the clinical picture is sufficiently severe to warrant prescribing an atypical antipsychotic, PT is feasible for families of children with ADHD and co-occurring severe aggression. The promotion of attendance and engagement in PT is important to enhance clinical outcomes among this challenging population. Methods for overcoming barriers to participation in PT deserve vigorous investigation, particularly for those with low family income, non-white race, Hispanic ethnicity, or when children have lower cognitive level.

Keywords: ADHD, aggression, parent training, stimulant, antipsychotic

Introduction

ATENTION-DEFICIT/HYPERACTIVITY DISORDER (ADHD) is the most common neurobehavioral disorder of childhood (Po-

lanczyk et al. 2007). Among children with ADHD, up to 25% will be physically aggressive (Nagin and Tremblay 2001; Huijbregts et al. 2007; Fontaine et al. 2008). Disruptive behavior, including aggression, is a leading psychiatric reason for pediatric hospitalization

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(Bardach et al. 2014). Physical aggression by children with ADHD and other co-occurring disruptive behaviors are associated with significant negative outcomes in adolescence and adulthood, including criminality, substance use, and lower educational and occupational attainment (Nagin and Tremblay 1999). Given high health care and other societal costs resulting from childhood ADHD with co-occurring physical aggression (Birnbaum et al. 2005; Pelham et al. 2007), it is important to understand the factors associated with improved child outcomes for this challenging clinical profile.

Children with ADHD and co-occurring physical aggression are often treated with multiple concurrent drugs, including atypical antipsychotics (Patel et al. 2005; Pringsheim et al. 2015). The Treatment of Severe Childhood Aggression (TOSCA) study, a multisite, randomized placebo-controlled trial, was conducted to test whether the addition of risperidone (vs. placebo) to ongoing stimulant medication plus parent training (PT) improved behavioral outcomes for seriously aggressive children with ADHD (6–12 years old) (Farmer et al. 2011). Findings were that the addition of risperidone resulted in moderately sized improvement in aggressive and disruptive behaviors after 2–4 weeks of treatment (Aman et al. 2014; Gadow et al. 2016; Barterian et al. 2017).

An integral feature of the TOSCA study was the delivery of PT in child behavior management (PT), a skill-training behavior modification program, to all families. PT is a recommended intervention for ADHD and childhood aggression, and it is well established as efficacious in improving parenting behaviors and child outcomes (Serketich and Dumas 1997; Fabiano et al. 2009; Evans et al. 2018). However, treatment dropout rates are often high among families of children with ADHD and other disruptive behaviors (Nock and Kazdin 2005; Johnson et al. 2008; Baruch et al. 2009). This is particularly concerning when the clinical presentation is sufficiently severe to consider the use of multiple drug therapy. Determining the feasibility of PT in this difficult clinical context, and the factors that affect its implementation and outcome, could influence providers' decision to refer to this behavioral treatment that may be an important option for children and families. The current study reports the degree to which parents attended, and were actively engaged, in the PT component of the TOSCA study.

Demographic and clinical characteristics have been suggested in the PT literature to be linked to poor attendance and early termination from outpatient behavioral treatment. For example, Eisner and Meidert (2011) found that parents low in socioeconomic status (SES) were significantly less likely to complete a preventative PT program. Among studies of children with ADHD, oppositionality, or aggression, low maternal income and education, lower child intelligence quotient (IQ), and greater severity of disruptive behaviors have all been found to be associated with poor attendance and early termination from behavioral treatment (Firestone and Witt 1982; Kazdin and Mazurick 1994). Together, these studies suggested that families with fewer financial resources and greater clinical severity are less likely to attend PT.

Attendance is necessary for delivery of the treatment; however, attendance alone may not be sufficient for improvement in child behavior. PT is often designed to elicit active participation from the parent, including role-play for demonstration of skills and homework to implement the skills learned. Research has demonstrated that the quality of parent's engagement in PT affects parenting behavioral outcomes (Garvey et al. 2006; Nix et al. 2009). Greater parent engagement in school-based behavioral interventions for children with ADHD is associated with improvement in child behavior and academic productivity (Villodas et al. 2014; Clarke et al.

2015). Following a meta-analysis, Chacko et al. (2016) provided evidence that engagement is associated with child behavioral outcomes but also concluded that engagement is understudied. Prior research has suggested that demographic characteristics and severity of child behavior may be good predictors of engagement (Reyno and McGrath 2006).

The TOSCA study provides an opportunity to test whether demographic, IQ, and other clinical characteristics at baseline predict parent involvement (attendance and engagement) in PT in the clinically challenging context of serious aggression, ADHD, and other disruptive behaviors being treated with medication. Moreover, it also provides the opportunity to test whether, for this population, attendance and engagement lead to improved child behavioral outcomes. The current study aimed to (1) evaluate the feasibility of implementing PT with this patient population when they are being actively pharmacologically treated, (2) test whether demographic and clinical characteristics predict greater success in receiving PT as measured by parent involvement (attendance and engagement), and (3) determine whether parent involvement in PT predicts child behavior outcomes in this clinical scenario, after adjusting for demographic factors and medication randomization.

Methods

Design

This was a 9-week, parallel groups randomized clinical trial testing the efficacy of adding antipsychotic to stimulant medication and PT in children with ADHD and co-occurring severe aggression. This trial was conducted across four sites: Case Western University in Cleveland, Ohio; Stony Brook University in Stony Brook, New York; The Ohio State University in Columbus, Ohio; and University of Pittsburgh in Pittsburgh, Pennsylvania. Primary findings have been published elsewhere (Aman et al. 2014) and included moderate, yet statistically significant, benefit from adding antipsychotic.

At baseline, the children were randomized in a 1:1 ratio to placebo supplementation (termed Basic, to reflect the status of PT + stimulant as an established treatment) or risperidone supplementation (termed Augmented). Stimulant medication and PT were started at baseline, and the second medication (placebo or risperidone), as randomized at baseline, was added at week 3, up to week 6, if they were not excellent responders. "Excellent response," achieved by only 7 of the 168 participants, was defined as scoring within 0.5 standard deviation (SD) of the normal range (score of 15 or less) on the primary behavioral outcome—the Disruptive Behavior Total (D-Total) subscale score on the Nisonger Child Behavior Rating Form (NCBRF) Disruptive Total (Aman et al. 2008). "Excellent response" also included being rated as "very much improved" by the clinician. All participants were included in the analysis. Weekly assessments occurred until week 9.

A typical study visit was ordered such that parents completed all weekly questionnaires before the child participants were seen for assessment and medication administration by the psychiatrist, and PT sessions were held at the end of the study visit. Ten days worth of medications were administered at each weekly visit to allow for flexibility with rescheduling participant visits. The full TOSCA study protocol has been described elsewhere (Farmer et al. 2011; Aman et al. 2014; Gadow et al. 2016).

Participants

Participants in the TOSCA study were 168 children (76.8% male) aged 6–12 years who met the Diagnostic and Statistical

Manual of Mental Disorders, fourth edition (DSM-IV, American Psychiatric Association 1994), diagnostic criteria for ADHD and either oppositional defiant disorder (ODD) or conduct disorder as determined by a clinician interview using the Schedule for Affective Disorders and Schizophrenia for school-aged children (K_SADS-PL) (Kaufman et al. 1997); had a parent rating of severe disruptive behavior (≥ 90 th percentile on the NCBRF, D-Total) (Aman et al. 2008); had a score of 4 (moderately ill) or higher on the Clinical Global Impression–Severity scale; and had a score of 3 or greater on the Overt Aggression Scale–Modified (Coccaro et al. 1991) (rated 0=no events to 5=severe events). A score of 3 for “assaults against others” is characterized as “Attacks others, causing mild injury (bruises, sprains, welts, etc.)”

Exclusion criteria included IQ <70; medical conditions that could be negatively impacted by medication treatment (including seizures, abnormal liver function, first-degree family history of type II diabetes, and pregnancy); current or past year suicidal ideation, current bipolar disorder or major depressive disorder, lifetime pervasive developmental disorder, psychotic disorder, eating disorder, or substance use disorder; and evidence of child abuse. The study was approved by the institutional review boards at all four sites. Parents or guardians provided informed consent, and child participants provided assent before enrollment.

PT in behavior management

At the weekly study visits, parents participated in individual parent education sessions designed to teach evidence-based behavior management in nine 60-minute meetings. Masters or doctoral-level clinicians conducted all sessions. The PT program implemented in this study was the empirically established Community Parent Education (COPE) program (Cunningham et al. 2009). The COPE curriculum for parents of children with disruptive behavior disorders (DBDs), COPEing with ADHD, was se-

lected because it includes strategies that are particularly salient for parenting impulsive children (Cunningham 2006). This manualized PT employs videotaped vignettes, therapist modeling, brainstorming exercises, and parent rehearsal to improve parenting skills (Table 1). Structured handouts that facilitate parent mastery and implementation of the strategies were utilized and distributed at each session.

Measures

Baseline demographic variables including the child’s race, ethnicity, sex, age, maternal employment (not employed, part-time, full-time), maternal education (high school or less vs. some college or more), and household income (\$40K or less vs. >\$40K) were collected.

Child IQ was measured at baseline using the Kaufman Brief Intelligence Test (K-BIT-2) (Kaufman 2004), a brief clinician-administered measure of verbal and nonverbal intelligence. The K-BIT-2 has been used in populations, and its scores correspond well with more comprehensive tests of IQ, such as the Wechsler Intelligence Scale for Children (Prewett 1992; Naugle et al. 1993; Canivez 1995).

The NCBRF was completed by parents at baseline and each of nine weekly visits. The NCBRF provides one prosocial subscale (Positive/Social) and six problem behavior subscales: (1) Conduct Problem, (2) Oppositional Behavior, (3) Hyperactive, (4) Inattentive, (5) Overly Sensitive, and (6) Withdrawn/Dysphoric. The NCBRF has high internal consistency and distinguishes between controls and patients with DBDs (Aman et al. 2008). The Conduct Problem and Oppositional Behavior subscales were combined to create a Disruptive-Total subscale (D-Total), the primary outcome variable for the TOSCA study (e.g., Aman et al. 2014). Cronbach’s alpha in this sample was 0.85 and 0.90 at baseline and week 9, respectively.

TABLE 1. COPEING WITH ATTENTION-DEFICIT/HYPERACTIVITY DISORDER CURRICULUM

| <i>Session</i> | <i>COPEing with ADHD curriculum</i> | <i>Session content</i> |
|----------------|--|---|
| 1 | Introduction to ADHD | Informational session regarding diagnosis, potential treatments, and purpose of PT. |
| 2 | Balanced Attending | Development of skills for showing interest in and rewarding a child’s constructive play, cooperative interactions, and other prosocial behaviors. |
| 3 | Planned Ignoring | Development of strategies for ignoring minor annoying behaviors, including disengagement from potentially explosive situations, and identification and effective management of cognitions that may strengthen parental anger. |
| 4 | Incentive Systems 1 | Development of skills to establish, implement, and evaluate incentive systems for motivating and sustaining improvements in child behavior with a concentration on the use of rewards for positive behavior. |
| 5 | Transitional Warnings and “When-Then” | Development of strategies for managing daily transitions and increasing compliance with adult requests using “when-then,” an approach that elicits compliance with adult commands while reducing coercive interactions. |
| 6 | Planning Ahead | Development of strategies to promote planning, problem solving, and self-regulation by anticipating challenging situations, developing plans of action, and implementing and evaluating solutions. |
| 7 | Incentive Systems 2 Response Cost | Development of response cost techniques for managing behavior. Parents also have the opportunity to examine and redesign currently implemented incentive systems in this session. |
| 8 | Time Out from Positive Reinforcement 1 | Development of strategies for noncompliance with requests that are non-negotiable or engagement in behaviors that cannot be ignored (e.g., aggression, destruction of property). |
| 9 | Time Out from Positive Reinforcement 2 | Parents have the opportunity to evaluate, modify, and strengthen the time-out procedures developed during the previous session (if needed) or be introduced to a problem-solving method for parents. |

COPE, Community Parent Education; ADHD, attention-deficit/hyperactivity disorder; PT, parent training.

The ADHD Symptom Checklist 4 (ADHD SC-4) was completed by parents at baseline and each of nine weekly visits. The ADHD SC-4 includes the 18 DSM-IV symptoms of ADHD, the 8 DSM-IV symptoms of ODD, and a 10-item Peer Conflict Scale. Responses range from 0 (never) to 3 (very often), and internal consistency in this study at baseline and week 9 ranged from 0.86 to 0.95. The reliability and validity of the ADHD-SC4 and its sensitivity to stimulant drug effects have been demonstrated in several studies (Sprafkin et al. 2002) and reported in prior TOSCA publications (Gadow et al. 2016).

PT measures included (1) parent attendance—the number of weekly PT sessions attended over the course of the 9-week trial, (2) therapist-indicated goal completion, and (3) therapist ratings of parent engagement including parental knowledge and participation in the session. Some of these PT measures were adopted from the RUPP-PI autism study and modified to reflect goals of the COPE PT model (Johnson and Myers 2007).

Therapist-indicated goal completion, rated after each session, is the degree to which the therapist met each of seven PT goals: (1) review homework assignments from previous sessions, (2) present video vignettes, (3) point out errors not identified by the parent, (4) define and provide examples of the skills, (5) model the skills, (6) encourage parent to role-play the skills, and (7) complete homework planning sheets with the parent. Goals were rated immediately following the session on a 0–2 scale (0 = goal not achieved; 1 = goal partially achieved; 2 = goal fully achieved).

For this study, therapist ratings of each goal were recoded as 1 = fully achieved or 0 = not fully achieved, and the average therapist goal completion percentage was calculated for each parent across all available sessions. On average, therapists completed 92% of goals ($SD = 8\%$), ranging from 55% to 100% across participants. The average session length was 40 minutes ($SD = 9$ minutes). A randomly selected sample of 10% of completed PT sessions (balanced across sites and therapists) was rated for fidelity by a second therapist who reviewed videotapes. On average, the two therapists agreed on ratings 92% of the time.

Parent engagement is the therapists' rating of the parent's knowledge and participation in each of the following elements of the PT training for each session: (1) completed homework assignment from previous session, (2) identified parenting errors in video vignettes; (3) demonstrated comprehension of the skill, (4) verbally identified situations where the skill could be applied with their child, (5) participated in the role-play, and (6) participated in the completion of the homework planning sheet. Each of the six elements of participation were rated on a 0–2 scale (0 = parent did not comprehend or demonstrate the skill; 1 = partial comprehension/skill acquisition; 2 = full comprehension/skill acquisition).

Reflecting therapists' infrequent scoring of "1," 0 or 1 was recoded to 0 = incomplete comprehension/acquisition and 2 was recoded to 1 = full comprehension/skill acquisition for each element of participation. The average percentage of elements coded 2 across all available sessions was then computed for each parent. Again, 10% of completed PT sessions were randomly selected for review by a second therapist. Among the PT sessions evaluated, the two therapists agreed on ratings of parent engagement 83% of the time.

Statistical approach

After description of attendance and engagement, demographic characteristics, child cognitive (IQ), and child clinical (i.e., NCBRF subscale scores) variables were selected for their potential prediction of parent involvement in PT. Predictors of session attendance were evaluated using a generalized linear model with a zero-

inflated negative binomial distribution. This approach is appropriate for count variables (number of sessions attended) with a large proportion of zeros (in this case, a large proportion of parents who missed no sessions). Once exponentiated, regression coefficients are interpreted as the percent change in attendance with a one-unit change in the independent variable. Predictors of parental engagement were evaluated using general linear models with maximum likelihood estimation, appropriate for continuous outcomes. Predictors were screened for collinearity; model assumptions were evaluated visually using residual plots. The augmented medication was not administered until 3–6 weeks after PT had begun and created an inconsistent and delayed timing of its administration relative to the timing of PT. For this reason, randomization to risperidone or placebo was not tested as a predictor.

The effects of attendance and engagement on outcome (NCBRF D-Total and SC-4 scores for ADHD, ODD, and Peer Conflict at week 9) were examined with a general linear model (maximum likelihood estimation), adjusting for baseline score on the respective outcome, treatment group (augmented vs. basic), sex, and site. Depending on the results of the initial analyses evaluating predictors of attendance and parental engagement, significant predictors were included as additional covariates.

Although the use of maximum likelihood estimation allows for missing data on the dependent variable, there was a small amount of missing data on predictor variables (i.e., maternal employment, $n = 9$; maternal education, $n = 1$; household income, $n = 6$) that necessitated the use of multiple imputation to avoid listwise deletion. Fifty data sets were generated, and the results of the regression analyses were pooled across the replications. Multiple imputation and regression analyses were performed in Mplus version 7 (Muthén and Muthén 2015); data management was performed in SAS/STAT Version 9.3 (SAS Institute 2010). Alpha was set at 0.05 for these exploratory analyses.

Results

Parent attendance and engagement

Most parents attended a majority of PT sessions. For example, 71% ($n = 120/168$) of parents attended seven or more of nine sessions (Table 2). One family attended no sessions and was excluded

TABLE 2. DEMOGRAPHICS AND ATTENDANCE

| Participant characteristic | n (%) | <i>M</i> | <i>SD</i> |
|---|----------|----------|-----------|
| Child age (years) | | 8.9 | 2.0 |
| NCBRF D-Total | | 42.8 | 10.3 |
| Male | 128 (77) | | |
| White non-Hispanic | 96 (57) | | |
| Maternal education, at least some college | 111 (67) | | |
| Family income $\leq 40K$ | 95 (57) | | |
| PT number of sessions attended | | | |
| 9 | 67 (40) | | |
| 8 | 38 (23) | | |
| 7 | 15 (9) | | |
| 6 | 16 (10) | | |
| 5 | 4 (2) | | |
| 4 | 8 (5) | | |
| 3 | 9 (5) | | |
| 2 | 7 (4) | | |
| 1 | 3 (2) | | |
| 0 | 1 (<1) | | |

SD, standard deviation; *PT*, parent training; *D-Total*, Disruptive Behavior Total; *NCBRF*, Nisonger Child Behavior Rating Form.

from further analysis. Although most parents participated in PT individually, 43 (26%) participants attended the initial informational session with a partner. However, only 39 (23%) parents had a partner attend any subsequent PT session and 4 (2%) couples attended all PT sessions together. Parent engagement in PT was high. The average percentage of sessions in which parents were rated as “engaged” was 85% (SD=9%).

Predictors of parent attendance and engagement

Results are presented in Table 3 where it can be seen that few predictors emerged. Child’s IQ predicted attendance, such that for every 10-point decrease in child IQ, the attendance decreased by 10%. Attendance was 68% lower among the parents of non-white and/or Hispanic children compared with parents of white non-Hispanic children. Family income (split at \$40,000) was a significant predictor of engagement; lower income was associated with lower engagement. Parent attendance and engagement were not correlated ($r = -0.04$, $p = 0.58$).

Attendance and engagement as predictors of child behavior outcome

As shown in Table 4, both attendance and engagement predicted week 9 scores on NCBRF D-Total and ADHD SC4 scores for ADHD and ODD after adjusting for covariates (including baseline severity). In each case, more frequent attendance and greater engagement were related to lower severity scores on the outcome. More attendance, but not engagement, predicted less severe interpersonal peer aggression.

Secondary analysis of study completers

The primary model of analysis used multiple imputation to address missing data that resulted from study dropouts. However, we noted that the number of sessions attended was affected by early

exit from the study. Thus, we also performed a “completer” analysis, including only children who returned for the final assessment at week 9, and therefore, the parents had the opportunity to attend all PT sessions (Supplementary Table S1). Among the 137 individuals who completed the study, 120 (88%; 71% of the whole sample of 168 cases) attended seven or more sessions. Specifically, 67 (40%) missed no sessions, 38 (23%) missed one session, 15 (9%) missed two sessions, 16 (10%) missed three sessions, and 9 (5%) missed four or more sessions. Among the completers, the number of sessions attended was not related to behavior at week 9, but engagement was, such that higher engagement scores were related to lower behavior scores, for NCBRF D-Total and ADHD SC-4 scores for ADHD and ODD. Neither attendance nor engagement was related to week 9 interpersonal peer aggression (Peer Conflict Scale).

Discussion

The current study examined the feasibility of implementing PT as well as the effects of parent involvement in PT on child behavior outcomes for children with ADHD and severe physical aggression treated pharmacologically. We found a high rate of participation associated with 1:1 delivery of the COPE PT package, prediction of lower rates of attendance and/or engagement by lower child IQ (attendance), lower parental income (engagement), and racial or ethnic minority status (attendance). Better child behavior outcomes followed greater attendance and engagement in PT by parents. These findings provide new information regarding the potential benefits of utilizing PT for children with ADHD and severe aggression.

The majority of parents (71%) in the TOSCA study attended seven or more of the nine PT sessions, suggesting that even for high-risk populations, PT can be a viable intervention under the right conditions. This finding is important given the literature indicating that combined treatments (medications plus behavioral) are superior to medication alone for children with ADHD in

TABLE 3. CHARACTERISTICS PREDICTING PARENT TRAINING ATTENDANCE AND ENGAGEMENT

| Predictor | Attendance | | | Engagement | | |
|--|--------------|-------------|-----------------|--------------|-------------|-------------|
| | Estimate (B) | SE | p-Value | Estimate (B) | SE | p-Value |
| Intercept | 2.85 | 0.90 | 0.001 | 0.87 | 0.20 | 0.002 |
| Female (vs. male) | 0.07 | 0.15 | 0.64 | -0.01 | 0.03 | 0.67 |
| Age | -0.01 | 0.03 | 0.77 | <0.01 | 0.01 | 0.64 |
| Non-white and/or Hispanic (vs. white non-Hispanic) | -0.38 | 0.13 | <0.01 | 0.02 | 0.03 | 0.55 |
| IQ | 0.01 | 0.01 | 0.02 | -0.01 | 0.01 | 0.15 |
| Mother’s employment full-time (vs. unemployed) | 0.01 | 0.14 | 0.98 | -0.04 | 0.03 | 0.15 |
| Mother’s employment part-time (vs. unemployed) | -0.03 | 0.17 | 0.87 | -0.01 | 0.04 | 0.76 |
| Mother’s education at least some college (vs. ≤High School equivalent) | 0.12 | 0.13 | 0.38 | 0.04 | 0.03 | 0.24 |
| Family income >40K (vs. ≤40K) | 0.04 | 0.16 | 0.79 | 0.09 | 0.04 | 0.01 |
| NCBRF positive social | -0.01 | 0.02 | 0.80 | -0.01 | 0.01 | 0.10 |
| NCBRF overly sensitive | 0.03 | 0.02 | 0.18 | <0.01 | 0.01 | 0.45 |
| NCBRF oppositional | <0.01 | 0.02 | 0.69 | <0.01 | 0.01 | 0.47 |
| NCBRF conduct problem | -0.01 | 0.01 | 0.27 | -0.01 | 0.01 | 0.55 |
| NCBRF hyperactivity | -0.03 | 0.02 | 0.29 | 0.01 | 0.01 | 0.58 |
| NCBRF inattention | 0.04 | 0.02 | 0.07 | -0.13 | 0.01 | 0.50 |
| NCBRF withdrawn/dysphoric | -0.01 | 0.01 | 0.38 | -0.01 | 0.01 | 0.28 |
| Site Case Western (vs. Stony Brook) | 0.25 | 0.22 | 0.24 | 0.10 | 0.05 | 0.04 |
| Site OSU (vs. Stony Brook) | 0.21 | 0.19 | 0.27 | 0.07 | 0.04 | 0.10 |
| Site Pittsburgh (vs. Stony Brook) | 0.40 | 0.21 | 0.05 | -0.09 | 0.04 | 0.03 |

Bold indicates p value <0.05.

IQ, intelligence quotient; NCBRF, Nisonger Child Behavior Rating Form; SE, standard error; OSU, Ohio State University.

TABLE 4. PREDICTORS OF CHILD BEHAVIORAL OUTCOMES

| Predictor | D-Total | | | ADHD | | | ODD | | | Peer conflict | | |
|--|---------------|-------------|-----------------|--------------|-------------|-----------------|--------------|-------------|-----------------|---------------|-------------|-----------------|
| | Estimate (B) | SE | p-Value | Estimate (B) | SE | p-Value | Estimate (B) | SE | p-Value | Estimate (B) | SE | p-Value |
| Female (vs. male) | 1.80 | 2.33 | 0.44 | -0.06 | 0.11 | 0.61 | -0.02 | 0.13 | 0.87 | 0.06 | 0.10 | 0.50 |
| Non-white and/or Hispanic (vs. white non-Hispanic) | -1.47 | 2.30 | 0.52 | -0.07 | 0.12 | 0.52 | -0.13 | 0.13 | 0.31 | -0.14 | 0.10 | 0.13 |
| IQ | -0.11 | 0.08 | 0.18 | -0.01 | 0.01 | 0.04 | -0.01 | 0.01 | 0.23 | -0.01 | 0.01 | 0.38 |
| Family income >40K (vs. ≤40K) | 0.82 | 2.48 | 0.74 | 0.06 | 0.12 | 0.64 | 0.04 | 0.14 | 0.78 | -0.05 | 0.10 | 0.59 |
| Baseline score on outcome | 0.43 | 0.10 | <0.01 | 0.29 | 0.09 | <0.01 | 0.31 | 0.09 | <0.01 | 0.32 | 0.05 | <0.01 |
| Augmented randomization (vs. basic) | -8.09 | 1.97 | <0.01 | -0.28 | 0.10 | <0.01 | -0.41 | 0.11 | <0.01 | -0.25 | 0.08 | <0.01 |
| Attendance | -1.47 | 0.59 | 0.01 | -0.08 | 0.03 | <0.01 | -0.09 | 0.03 | <0.01 | -0.07 | 0.02 | <0.01 |
| Engagement | -16.83 | 6.09 | 0.01 | -1.04 | 0.31 | <0.01 | -1.05 | 0.34 | <0.01 | -0.42 | 0.25 | 0.09 |
| Site Case Western (vs. Stony Brook) | 1.08 | 3.70 | 0.77 | -0.07 | 0.18 | 0.69 | -0.09 | 0.20 | 0.656 | 0.03 | 0.15 | 0.83 |
| Site OSU (vs. Stony Brook) | 4.95 | 3.12 | 0.11 | 0.16 | 0.16 | 0.30 | 0.23 | 0.17 | 0.19 | 0.09 | 0.13 | 0.50 |
| Site Pittsburgh (vs. Stony Brook) | 3.12 | 3.29 | 0.34 | -0.03 | 0.16 | 0.87 | 0.09 | 0.18 | 0.64 | 0.07 | 0.14 | 0.60 |

Bold indicates p value <0.01.

D-Total, Disruptive Behavior Total; ADHD, attention-deficit/hyperactivity disorder; ODD, oppositional defiant disorder; SE, standard error; OSU, Ohio State University.

improving social skills and parenting behaviors (Hinshaw et al. 2000; Conners et al. 2001; Swanson et al. 2001).

The COPE PT program has been utilized in other ADHD clinical trials by including preschool-aged children (Preschool ADHD Treatment Study [PATS]; Kollins et al. 2006) and children 3–12 years old recruited from both clinical and community settings (Cunningham et al. 1995; Thorell 2009). The PATS did not report on the PT component of the study; participation was required for entrance into the study to ensure that symptoms did not significantly improve with PT alone before adding medication for these young children. Thorell (2009) reported high attendance rates similar to the TOSCA study. The clinic-referred sample attended an average of 7.13 of 10 sessions and the community-referred sample with high or low externalizing symptoms attended an average of 8.64 and 8.46 sessions, respectively (Thorell 2009).

In the current study, PT and stimulant medications were administered simultaneously, which may be an important factor in our high rates of participation. The psychiatrist assessment and medication administration occurred before the PT session in a typical visit. Thus, there were instances in which parents did not participate in the full PT session despite receiving medications (i.e., parent requested to leave early). Pelham et al. (2006) found, in a study examining the effects of administering medication versus PT first for children with ADHD, that parents of children receiving medication first were less likely to attend PT when continuing clinical difficulty that required more intensive treatment.

Given that clinical recommendations by experts have included starting with medications when symptoms are sufficiently severe for children with ADHD (Kutcher et al. 2004; Pliszka 2007), the findings of the current study suggest an alternative possibility. It may be feasible for some families to benefit from simultaneous engagement in PT and medication when clinical symptoms are severe. For example, in the current study, concomitant medication may have synergistically improved child behavior and provided parents with hope for improvement—leaving them enough energy to attend and engage in PT with immediate therapist support for doing so before becoming accustomed to medication as a sole treatment strategy.

Important design features that incentivized attendance in this study, and that would need to be considered in clinical application and in future research, included the following strategies: (1) compensating participants for time participating, (2) providing on-site childcare for the participants and siblings during the PT sessions, (3) reimbursing participants for travel expenses, and (4) dispensing medication at the weekly visits. It may be possible to improve PT attendance by implementing these or similar incentives in behavior health clinics. Cunningham et al. (1995) found that participants incurred fewer costs (i.e., travel, parking) when they participated in the community-based PT sessions compared with clinic-based PT sessions. Administration of the COPE PT program was successfully administered with child behavioral improvement noted in both settings (Cunningham et al. 1993). As such, considering community-based options may be a viable alternative to clinic-based treatment that could also aid in improving parent attendance.

Consistent with previous literature, the child’s race/ethnicity and IQ predicted parent attendance at sessions, such that parents of non-white non-Hispanic children and parents of children with lower IQ attended PT sessions less frequently. We noted that only 1 of our 12 behavior therapists was not white and that congruence of race between parent and therapist may have been a salient factor affecting treatment continuation.

A meta-analysis of racial/ethnic matching of patients and therapists found a moderately strong preference for a therapist of one’s

own race/ethnicity but did not find evidence of benefit of matching for treatment outcome (Cabral and Smith 2011). Cabral and Smith (2011) noted that the effect sizes were largest among African American patients with moderate effects for both preference and positive perceptions of an African American therapist. Racial matching with a therapist may be more important for early engagement of African American patients into therapy than other racial/ethnic minorities. In another study with more frequent PT (35 sessions) and additional behavioral treatments, the Multimodal Treatment Study of ADHD, ethnic/racial minorities benefited more from adding behavioral treatment to medication than did non-Hispanic whites (Arnold et al. 2003). Therapists in that study were mostly white, suggesting that racial matching of therapists is not a requirement for success (although it could still be the optimal situation). Future studies should explore the role of racial/ethnic matching between parents and therapists as a means of improving attendance to PT.

Interestingly, symptom severity at baseline and socioeconomic factors did not predict attendance. It is possible that child symptom severity was not a significant predictor because the inclusion criteria required all participating children to have clinically concerning level of symptoms. Additionally, the aforementioned study design features incentivizing attendance may have protected against the early termination typically found for families with lower SES.

Adding to the literature, we examined the factors associated with engagement in PT. Although SES factors did not predict attendance, lower family income (<\$40,000) was associated with less engagement. To be considered engaged in PT, parents had to demonstrate knowledge and actively participate in sessions, including homework, video vignettes, and role-play. Families with greater financial resources may have had adequate support that allowed them to better implement the strategies, complete the homework assignments, and be more interactive during PT sessions. Parental education may not have predicted engagement because it only described mothers (which may be why it was not highly correlated with total family income, $r=0.30$).

Future research should investigate ways to engage low SES families in PT. Forehand and Kotchick (2002) wrote about PT challenges and potential solutions, stating that low-income families cannot engage to the fullest extent until their basic needs are met; they suggested that social workers should be included in the PT program staff to offer referrals to social service agencies. Together, these two observations suggest that clinicians may need additional skills to bridge the gap for lower SES families. Also, it may be helpful to learn what additional parenting content and settings, such as basing treatment in pediatric offices (e.g., Turner and Sanders 2006; Perrin et al. 2014), these families may need.

Demographic factors and baseline symptom severity of participants at each treatment site were accounted for when assessing site as a predictor of parent adherence, yet site was a significant predictor of engagement in PT. It is possible that unmeasured systematic differences (i.e., therapist race, Case Western had the only African American therapist) might be responsible for the site differences. Despite the site differences, all sites reached at least 75% engagement. Thus, although there may have been systematic differences in engagement across sites, they were all well within the acceptable range.

We were interested in determining how parent involvement in PT predicted behavioral outcomes among these severely behaviorally disruptive children. We found that greater attendance predicted more improvement in all child behavioral outcomes. However, when we considered only families who completed the

study, attendance no longer predicted any child behavioral outcomes. This finding is likely a result of reducing the variability in attendance, in that dropouts were the main driver of poor attendance. An interesting possibility is the idea that PT attendance might have been a mediator of the effect of risperidone; in other words, behavioral improvements observed as a result of risperidone augmentation may have encouraged parents to attend more PT sessions, which enhanced the effect of the medication. However, the design of this study prevented testing of this mediational hypothesis, as the second medication was initiated partway through the course of PT.

Greater parental engagement was associated with lower end-point disruptive behavior as measured by the NCBRF D-Total, lower ADHD symptoms, and lower ODD symptoms. Fully engaged parents express understanding of the skills taught, recognize when the skills are used appropriately, demonstrate skills through role-play, plan to use skills at home, and implement the skills as part of their homework. Engagement requires an active role in skill attainment, which would improve learning through increased cognitive engagement and rehearsal of concepts and skills in contrast to less effective passive learning. Parental engagement did not predict improvement in Peer Conflict, which may have resulted from PT sessions not including discussion of social skills or translation to the school/community settings. However, even when social skills are directly targeted for children with ADHD, they are difficult to meaningfully improve (Mikami et al. 2017).

In the current study, therapists' impressions of parent engagement predicted how well the children responded to treatment, above and beyond the effects of medication. Although parents may have discussed improvements with their PT therapist, the clinical outcomes were assessed by separate blinded raters, and the therapists' ratings of parent engagement were shown to be reliable, suggesting that they were not overestimating their ability to engage a parent. Indeed, this is a useful outcome in and of itself, as it conveys that therapists are able to consistently gauge one metric of success during the therapeutic process.

Such detailed performance assessments on a weekly basis may provide an additional level of monitoring that might help guide therapists in tailoring content and management of training sessions, consistent with benefits found in measurement-based care (Fortney et al. 2016). One worthy objective of future research might be to operationalize such assessments to enable therapists to target the use of brief engagement strategies found to be successful in other studies for clients at risk of suboptimal outcomes.

Interest in interventions to improve attendance and engagement of families in child mental health treatments has been on the rise (Nock and Ferriter 2005; Nock and Kazdin 2005; Chacko et al. 2013; Becker et al. 2015). A meta-analysis identified brief interventions including motivational interviewing and discussions of barriers to seeking care (e.g., transportation, resistance to treatment) as being effective in enhancing early engagement in treatment (Ingoldsby 2010). Importantly, parent participants of the TOSCA study reported high levels of satisfaction with the PT component of the trial with 71% rating PT as very helpful (Rundberg-Rivera et al. 2015).

Additional research could investigate the use of telemedicine to administer PT as a means of improving access and decreasing obstacles associated with attendance and engagement. If clinicians are able to engage families early, and reduce hurdles for participation, increasing numbers of parents may find PT to be beneficial and child outcomes improved even for severely ill children with ADHD, comorbid DBD, and co-occurring aggression.

Conclusion

This study demonstrates that, combined with pharmacotherapy, PT may be a feasible behavioral treatment for families of children with ADHD and co-occurring severe aggression. On average, parents attended most of the nine PT sessions, and parent engagement in PT was high across all sessions. This study highlights the importance of both attendance and engagement in PT with each predicting improvement in child behavior. Child demographic factors were found to be associated with poorer attendance (non-white or Hispanic and lower IQ) and engagement (lower family income); thus, methods for overcoming barriers to participating in PT for these at-risk families should be investigated.

Clinical Significance

The results of this study suggest that PT may be a feasible behavioral intervention, combined with psychopharmacological treatment, for children with ADHD and co-occurring severe aggression. Importantly, attendance and engagement were each predictors of improvement in disruptive behaviors, including aggression, ADHD, and ODD symptoms. Given that our findings emanated from a clinic trial where families received medication alongside participation in PT, coupled with high dropout rates typically observed in many clinic settings, clinicians should consider strategies to incentivize attendance at PT sessions. These might include significant but important structural changes in service provision such as providing on-site childcare and scheduling PT concurrent with medication management appointments. Although challenging to consider, models for such structural changes are being developed (Kolko and Perrin 2014) and may be most important for reaching families whose lives are stressed by socioeconomic hardships.

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Supplementary Material

Supplementary Table S1

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