Face-to-Face vs. Online Behavioral Parent Training for

Young Children At-Risk for ADHD:

Treatment Engagement and Outcomes

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Abstract

Objective: Attention-deficit/hyperactivity disorder (ADHD) is associated with significant challenges in child functioning. Although behavioral parent training (BPT) can reduce ADHD symptoms, factors associated with traditional face-to-face (F2F) delivery results in only about half of families receiving BPT. The purpose of this pilot randomized controlled trial was to examine parent engagement and program acceptability of F2F and online BPT as well as the efficacy of both formats relative to a waitlist control (WLC) group. **Method:** Participants were 47 families with preschool children (30 boys, 17 girls) who were between the ages of 3-0 to 5-11 years old who were identified at-risk for ADHD. Children were randomly assigned to F2F or online BPT or to WLC; parents in the two treatment conditions received 10 sessions of BPT. Assessment data for all groups were collected at pre-, mid-, and post-treatment. **Results:** Both intervention formats resulted in high attendance ($M=80\%$), significantly improved parent knowledge of interventions, treatment implementation fidelity, and child behavior (reduced restlessness and impulsivity, improved self-control, affect, and mood) compared with WLC. However, parents in the F2F group reported significantly higher acceptability ratings than parents in the online group. **Conclusions:** Findings indicate a streamlined BPT delivered online or F2F results in high levels of engagement, acceptability, as well as parent treatment knowledge and fidelity. Online BPT is associated with similar efficacious outcomes with F2F BPT, suggesting the need for further research to determine variables that predict greater acceptability for and adoption of this format.

Keywords: ADHD, behavioral parent training, treatment engagement, online parent education

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Children with attention-deficit/hyperactivity disorder (ADHD) display developmentally inappropriate levels of inattention and/or hyperactivity-impulsivity that are associated with clinically significant impairment in academic and/or social functioning (American Psychiatric Association, 2013). ADHD is a disorder of childhood onset with symptoms and impairment frequently exhibited prior to or consonant with school entry (Barkley, 2015). Empirical studies consistently indicate that symptoms of ADHD typically emerge during the preschool years (Egger, Kondo, & Angold, 2006; Strickland, Keller, Lavigne, Gouze, Hopkins, & LeBailly, 2011) and are likely to persist into elementary school and beyond for the majority of children (Lahey et al., 2004). The prevalence of ADHD in young children ranges from 2% to 15.1% depending on diagnostic methods and severity of impairment (Lavigne et al., 1996; 2009), thus indicating that this is a relatively common disorder. In fact, approximately 11% of children in the US have received an ADHD diagnosis at some point in their lives (Visser et al., 2014).

Young children with ADHD often exhibit impairment in multiple areas and enter elementary school approximately two standard deviations below their typically developing peers in behavioral, social, and pre-academic functioning (DuPaul et al., 2001). In addition to impairment, young children with ADHD, particularly those who exhibit high levels of hyperactive-impulsive behavior, often display significant symptoms of disruptive behavior disorders (i.e., oppositional defiant disorder [ODD] and conduct disorder [CD]) (Bendiksen et al., 2014; Visser et al., 2015) that are associated with long-term psychological and social difficulties. Of particular concern, the combination of ADHD and disruptive behavior disorder significantly increases the likelihood that children will be expelled from preschool settings (e.g.,

Posner et al., 2007). Further, children with early attention difficulties complete significantly

fewer years of education and are at higher risk for dropping out of school than are those without

early attention problems (Rabiner, Godwin, & Dodge, 2016). Given the chronicity of ADHD and

the degree to which individuals with the disorder experience multiple impairments, ADHD is

associated with long-term economic burden to families and society. Specifically, it has been

estimated that annual costs for educational and mental health services provided to young children

with ADHD are on average 17.6 times higher than for typically developing peers when followed

into early adulthood (Chorozoglou et al., 2015). Thus, the development and implementation of

effective early intervention is sorely needed to reduce the behavioral, academic, and economic

impact of ADHD.

The most common interventions with demonstrated efficacy for reducing ADHD

symptoms and associated impairments are psychotropic medications and behavioral

interventions implemented in home and school settings (Barkley, 2015). Many empirical

investigations, including large-scale randomized control trials, have documented the efficacy of

pharmacotherapy and behavioral interventions for school-aged children with ADHD (e.g., MTA

Cooperative Group, 1999; 2004). Similar findings have been obtained for treatment of ADHD in

young children. For example, a randomized controlled trial of stimulant medication in a large

sample of preschool-aged children indicated significant reduction in ADHD symptoms

(Greenhill et al., 2006). Of great concern, however, is that stimulants in this age group are

associated with heightened risk for adverse side effects including reduced growth rates (Swanson

et al, 2006; Wigal et al., 2006). Although much more limited in number, empirical studies also

have demonstrated the efficacy of preschool behavioral intervention for young children with

ADHD (McGoey, Eckert, & DuPaul, 2002). In addition, strategies involving modification of

environmental antecedent and consequent events have been found to reduce challenging

behaviors in preschool settings (Smith, Lewis, & Stormont, 2010; Stormont, Smith & Lewis,

2007; VanDerHeyden, Witt, & Gatti, 2001). Although professional development efforts are

successful in enhancing the quality of teacher-child interactions in preschool classrooms (Pianta,

Mashburn, Downer, Hamre, & Justice, 2008), preschool teachers typically receive limited

training and support in use of behavioral strategies (Scott & Nelson, 1999; Stormont & Stebbins,

2005). Thus, many young children with ADHD probably do not have access to effective

preschool-based support.

　　　　To date, the most researched and efficacious psychosocial intervention for ADHD in

young children is parent education in the use of behavioral strategies, specifically behavioral

parent training (BPT; Charach et al., 2011; DuPaul & Kern, 2011). Multiple randomized trials

have shown that BPT can reduce symptoms of ADHD and related behavior disorders in

preschool children with or at-risk for ADHD (e.g., Bor, Sanders, & Markie-Dadds, 2002; Jones,

Daley, Hutchings, Bywater, & Eames, 2007; Matos, Bauermeister, & Bernal, 2009; Sonuga-

Barke, Daley, Thompson, Laver-Bradbury, & Weeks, 2001; Thompson et al., 2009; Webster-

Stratton, Reid, & Beauchaine, 2011) with medium size effects found for reduction of child

ADHD symptoms and conduct problems as well as negative parenting (Rimestad, Lambek,

Christiansen, & Hougaard, 2016). Further, recent research indicates that beginning intervention

for ADHD with BPT is superior to doing so with psychostimulant medication with respect to

child outcomes, parent engagement with intervention (Pelham et al., 2016), and cost

effectiveness (Page et al., 2016). Based on this extensive evidence, the American Academy of

Pediatrics (2011) issued guidelines that recommended behavior therapy as a first-line treatment

(i.e., to be used prior to medication) for children with ADHD younger than 6 years old.

Unfortunately, only about 55% of families with young children diagnosed with ADHD who have health insurance receive recommended behavior therapy support (i.e., parent-directed, school-based, or both) compared to 76% receiving psychotropic medication (Visser et al., 2016). Parent engagement with typical face-to-face (F2F) delivery of BPT may be limited by availability of clinicians to provide services as well as cost and access challenges (e.g., transportation, child care, family schedule constraints) among other variables (Chacko et al., 2016; McEwan et al., 2015). Even when families have access to BPT, evidence indicates that engagement with intervention is usually limited by low rates of session attendance (e.g., Kern et al., 2007) and minimal or inconsistent parent fidelity with prescribed intervention strategies (Chronis et al., 2004; Clarke et al., 2015). In particular, established programs may require parents to attend intervention sessions over an extended period of time (averaging over 20 to 25 hrs), thus taxing family time and resources (e.g., transportation, child care). For example, parents attended only 63% (behavior therapy only condition) and 61% (combined treatment condition) of BPT sessions in the state-of-the-art multimodal treatment of ADHD (MTA) study (MTA Cooperative Group, 1999).

Chacko and colleagues (2008; 2012) developed the Strategies to Enhance Positive Parenting (STEPP) program to improve engagement with treatment for parents of children with ADHD. STEPP includes an enhanced intake process focused on addressing maladaptive parent cognitions/expectations and identifying/addressing potential barriers to treatment participation. Compared to more traditional BPT procedures, STEPP was found to increase parent attendance and homework completion (i.e., fidelity) and was associated with higher levels of perceived quality of support and treatment meeting expectations. Despite positive findings, access to STEPP in community settings is presumably limited given what has been found for BPT in

general (i.e., Visser et al., 2016). To better address child disruptive behavior disorders, research has turned to alternatives to face-to-face BPT, such as bibliotherapy (e.g., Lavigne et al., 2008).

Web-based or online delivery of BPT has the potential to increase access to and engagement with treatment while not compromising intervention impact on parent knowledge of and fidelity with prescribed behavioral strategies or effects on child behavior outcomes. Internet-delivered behavioral or cognitive-behavioral treatment has been found efficacious for childhood anxiety (Spence, Holmes, March, & Lipp, 2006), depression (e.g., Andersson et al., 2005), and obsessive-compulsive disorder (Lenhard et al., 2014). Several studies have found positive effects on parent knowledge of behavioral procedures, fidelity with prescribed intervention, parent stress, treatment acceptability, and child behavior for internet-delivered BPT for children with autism (Jang et al., 2012; Kobak et al., 2011; Steever, 2009; Vismara et al., 2013; Wainer & Ingersoll, 2015). Irvine and colleagues (2015) conducted a randomized trial of internet-delivered BPT in a sample of over 300 parents of at-risk adolescents. The treatment group showed improvements relative to controls in terms of self-reported disciplinary actions and parenting self-efficacy; however, no group differences were found for parent-reported child behavior. The latter finding may have been due to the lack of therapist contact during or between internet sessions. For children with ADHD, a few studies have examined videoconferencing delivery of BPT (Reese, Slone, Soares, & Sprang, 2015; Xie et al., 2013), internet delivery of parent-adolescent conflict training (Carpenter et al., 2004), and school-based behavioral intervention education for teachers (Corkum et al., 2015). Nevertheless, no published studies to date have evaluated the relative efficacy of online vs. face-to-face delivery of BPT with the ADHD population. Franke, Keown, and Sanders (2016) evaluated the efficacy of an online self-help program for parents of preschoolers with ADHD symptoms and found significant improvements

for maternal ratings of child ADHD-related behavior, teacher ratings of prosocial behavior, and

parenting stress, mood, and self-efficacy. However, the children did not explicitly meet

diagnostic criteria for ADHD, outcomes were not compared to a traditional face-to-face BPT

group, nor did the investigators assess parent fidelity with recommended intervention strategies.

Despite consistent empirical support for the use of BPT to treat ADHD in young children,

there are two important gaps in the extant literature that were addressed by the current study.

First, although options for promoting parent engagement with BPT are available (Chacko et al.,

2015; Chacko, Wymbs, Chimiklis, Wymbs, & Pelham, 2012), community access to behavioral

treatment remains limited and parents typically are inconsistent with respect to session

attendance and fidelity with prescribed strategies. Second, no prior studies have examined the

efficacy of online BPT for parents of young children who meet diagnostic criteria for ADHD.

Given the potential for online treatment delivery to increase access for families who encounter

challenges in completing face-to-face sessions, it would be important to examine the feasibility,

acceptability, and efficacy of online BPT.

The purpose of the current study was to address these important research gaps by

conducting a pilot randomized controlled trial examining the relative effects of traditional face-

to-face and online BPT in comparison with a wait-list control group. Specifically, we examined

the degree to which a 10-session BPT program designed to address the unique behavioral and

pre-academic needs of young children at-risk for ADHD would impact parent engagement (i.e.,

session completion, treatment strategy knowledge, and treatment fidelity), parent stress, and

child behavior (i.e., ADHD symptoms, defiance, irritable mood/affect). We were particularly

interested in the degree to which treatment acceptability and outcomes differed between the two

treatment delivery formats. We hypothesized that both forms of BPT would be superior to the

wait-list control condition at post-treatment with respect to parent and child outcomes. Given that

this was an initial pilot trial of online BPT, we did not have specific hypotheses regarding

possible differences between the two treatment delivery formats.

Method

Participants

Recruitment procedures. Parents of pre-school children in northeastern Pennsylvania

were recruited for participation in Project Promoting Engagement for ADHD pre-Kindergartners

(PEAK) over the course of 2 years and four cohorts of families. Recruitment included the

distribution of flyers to local day care centers, preschools, pediatricians, dentist offices, and

organizations that provide products or services aimed at preschoolers and parents

of preschoolers; attendance at community fairs and festivals; contact with web-based mother

groups; social media posts; craigslist posts; and university e-mails.

Participants. In total, 100 families showed interest in Project PEAK. After eligibility

screening and scheduling, a total of 47 families participated in cohorts of 10 to 14 families (see

Figure 1). For parents to be eligible to participate, their child had to be between the ages of 3

years, 0 months and 5 years, 11 months; enrolled in a pre-school or day care setting at least 2

days a week unless otherwise unable to enroll (e.g. behavioral problems, lack of services for

unrelated disability); and have no diagnoses of autism spectrum disorder (ASD), pervasive

developmental disorder, intellectual disability, neurological damage, or significant motor or

physical impairments. Additionally, parents had to have an electronic device with Internet

access and be willing to attend face-to-face meetings or complete on-line sessions. Children must

have met DSM-5 criteria for one of the three presentations of ADHD based on graduate research

assistant-administered clinical interview and parent behavior ratings including parent report of

elevated levels of impairment at home (i.e., score greater than 90th percentile on one or more

Conners Early Childhood Rating Scale subscales relevant to ADHD). Although we attempted to

obtain teacher ratings, these were not available for some children who did not attend preschool

(e.g., due to exclusion based on behavior difficulties or changes in family schedules). Thus,

teacher ratings were not used as part of ADHD inclusion criteria. Children who obtained a

Differential Ability Scale global cognitive ability score of less than 80 were excluded.

After eligibility was determined and parent written consent was obtained, families were

randomly assigned to participate in either the face-to-face program (F2F; $n = 16$), the online

program ($n = 15$), or to be placed in the wait-list control (WLC) group ($n = 16$) to receive the

online program at the conclusion of 15 weeks, after post-treatment assessment phase. Children

were between the ages of 3-0 and 5-11 years of age ($M = 4.43$), were predominantly male

(63.8%) and White, non-Hispanic (78.7%). Children met DSM-5 criteria for all three ADHD

presentations; however, the majority was identified with combined presentation (61.7%) and

most also met criteria for ODD (53.2%). There were no significant between-group differences in

demographic and diagnostic characteristics or cognitive ability prior to treatment. Complete

demographics for the sample are in Table 1. Six children (F2F = 2, Online = 2, WLC = 2) were

dropouts for the following reasons. Two families were randomized but did not participate, two

families were lost to follow up, and one family withdrew after losing custody of the child they

had been fostering. Additionally, one family that had been assigned to the waitlist control group

accidentally attended the first F2F session and consequently had to be withdrawn (see Figure 1

for participation flow chart).

Child Participant Screening and Eligibility Measures

Conners Early Childhood Rating Scale (CERS; Conners, 2009). The parent version of the

CERS includes six behavior scales containing 190 items. For screening purposes, scores at or beyond the 90th percentile on the Inattention/Overactivity subscale were used for inclusion in the study. The internal consistency, test-retest reliability, and criterion-related validity of the CERS are all at or beyond accepted standards (Conners, 2009).

Barkley Semi-Structured Diagnostic Interview (Barkley, 2006). The Barkley diagnostic interview (Barkley & Murphy, 2006) was administered by graduate research assistants (under the supervision of the first author) to confirm eligibility for an ADHD diagnosis as well to assess for oppositional defiant disorder (ODD) and conduct disorder (CD) comorbidities. The Barkley diagnostic interview for ADHD consists of 23 items adapted from the diagnostic criteria in the DSM-IV-TR (American Psychiatric Association, 2000), which was further adapted to match DSM-5 (American Psychiatric Association, 2013) criteria. To qualify, caregivers had to endorse at least six symptoms within the inattentive and/or impulsive/hyperactive symptom domains, at least 6-month symptom duration, symptom presentation in at least two settings, and significant symptom-related impairment.

Developmental Ability Scale-II (DAS-II; Elliott, 2007). The DAS-II includes both preschool and school-age assessments of cognitive abilities. For the purpose of this study, the preschool range was used. This version of the scale is designed for children between the ages of 2:6 and 6:11 and consists of six core subtests that include verbal comprehension, picture similarities, naming vocabulary, pattern construction, matrices, and copying. From these subtest scores a General Conceptual Ability (GCA) is rendered, which is considered to be equivalent to a Weschler Full Scale IQ score. Children were excluded from participation in the study if they had a GCA that fell below 80. The DAS-II Preschool scale has acceptable psychometric properties making it appropriate for the interpretation of cognitive abilities (internal consistency = .76 - .96;

interscorer agreement = .98 - .99; intercorrelations between subtests and GCA = .61 - .75).

Further, the DAS-II is shown to have high correlations with school readiness scales as well as

additional cognitive scales (.83 - .89) (Elliott, 2007).

　　　　Social Communication Questionnaire (SCQ; Rutter, Bailey, & Lord, 2003). The SCQ is a

40-item parent-report questionnaire that measures the presence of abnormal social

communication behaviors associated with ASD. The SCQ is based on the Autism Diagnostic

Interview-Revised (ADI-R; Lord et al., 1994) and has established validity with the ADI-R and

diagnosis of autism (Berument et al., 1999). The SCQ has demonstrated adequate specificity and

sensitivity in identifying risk for ASD in children ages 3- to 5 (Allen, Silove, Williams, &

Hutchins, 2007). Children scoring higher than the established cut-off score of 15 on the SCQ

(Rutter et al., 2003) were excluded from the study.

Process and Outcome Measures

　　　　Parent Attendance or Completion.　Parent attendance to the face-to-face sessions or

completion of the online sessions was recorded weekly. Attendance was documented as a

percentage of total sessions, e.g., a parent who attended or completed 8 of 10 sessions was

recorded as having an 80% attendance rate.

　　　　Test of Parent Knowledge. A test of parent knowledge of behavioral strategies and

information specifically taught in Project PEAK was developed and administered pre- and post-

program to evaluate growth of knowledge. This 15-question test assessed parent understanding

of behavioral techniques and basic information related to ADHD. The percentage correct score

on this test was used as a dependent measure.

　　　　Parent Stress Index – Short Form (*PSI-SF*; Abidin, 1995). This parent-completed

measure includes 36 items designed to assess parental stress related to child behavior and parent-

child interactions. Items are completed using a 5-point Likert scale ranging from 1 (Strongly

Agree) to 5 (Strongly Disagree). In addition to a total stress score, raw scores for three domains

(Parental Distress, Difficult Child, and Parent-Child Dysfunctional Interactions) were used as

dependent measures. The PSI has adequate reliability and validity (Abidin, 1995).

    Treatment Fidelity Assessments: Session and Implementation. Treatment fidelity was

assessed for both session content and parent implementation of prescribed techniques. Each

parent session was audiorecorded for assessment of staff fidelity in delivering session content

and following prescribed session procedures. The second author reviewed each recorded session

using a fidelity checklist. Additionally, direct observations were conducted in the caregivers'

homes to evaluate fidelity of parent implementation of intervention procedures. The in-home

fidelity check consisted of nine items that aligned with program content (excluding introductory

content in week one). Graduate student observers completed the checks at each observation

period (pre-, mid-, and post-treatment) by either observing the behavior or strategy addressed in

each item or explicitly asking the caregiver for information regarding the behavior or strategy

(e.g. "Can you describe [how you would use] a preventative strategy?"). The observer then rated

the fidelity of the behavior/strategy with a "yes," "no," or "partial". Partial ratings were given

when parents showed some fidelity in completing the behavior or strategy but missed some key

elements. Total score on this measure could range from 0 to 18. Integrity observers were trained

and monitored by the first two authors and project staff through (a) review of definitions of the

nine behavioral strategies, (b) practice rating of example video clips, and (c) weekly team

meetings to review and resolve coding questions.

    Treatment Acceptability. Parents completed a modified *Intervention Rating Profile-15*

(*IRP-15*; Martens, Witt, Elliott, & Darveaux, 1985) to document the acceptability, feasibility and

effectiveness of the specific intervention components. The IRP-15 is a 15-item, 5-point Likert

scale that measures the acceptability of treatments. The internal consistency of the IRP-15 is .98

(Martens et al.).

Conners Early Childhood Rating Scale (CERS; Conners, 2009). Parent ratings using the

CERS (see previous description) were collected prior to the first education session and

immediately following the last session to document changes in child behavior as a function of

the program. For this study, five behavior scales were of primary interest including

Inattention/Overactivity (I/O), Defiant/Aggressive (D/A), Global Index-Restless Impulsive (GI-

RI), Global Index-Total (GI-T), and Mood/Affect (M/A). Standard scores on each scale were

used as dependent variables.

Procedures

Families enrolled in the treatment groups (F2F or online) were expected to participate in

10 BPT sessions. These sessions covered introductory material (e.g., What is ADHD?) and

progressed through intervention strategies typically taught in BPT programs as well as an

emphasis on parents using proactive problem-solving including prevention and instruction

strategies (See Table 2 for a list of session topics). Both treatment groups received identical

content, materials, and information. During the sessions, parents were provided with information

via lecture, group discussion, role-play, brief quizzes, and videos. An advanced graduate-level

student in School Psychology or Special Education led BPT sessions. Fidelity across cohorts

ranged from 90% to 100% ($M = 96.7\%$). Parents received a small stipend for completing

measures in each assessment phase.

F2F Program. Families enrolled in the F2F sessions were expected to attend all 10

sessions, which were held at a local school that was accessible to families and the instructor.

These sessions occurred across consecutive weeks unless bad weather prohibited driving. At each session, childcare and food were provided to the families. Graduate student therapists met with the research team on a weekly basis and each week's sessions were reviewed in detail regarding delivery of manualized content, participation of parents in group discussions, and any questions that therapists had about treatment procedures. In addition, the second author provided feedback to therapists based on fidelity checks of parent training sessions.

     Online Program. Families enrolled in the online program were expected to complete all 10 sessions. Unlike in the F2F program, families in the online program had some flexibility in when the sessions were completed. Online sessions were designed through the university's course site and families were given unique and confidential login credentials. To ensure that families could successfully log into the program, the first session was completed in person, along with the F2F families from the same cohort. Families from both groups received a brief introductory overview of the program together before separating to complete session one. Online families were provided technical assistance to log into the program prior to accessing session one. Subsequent sessions were released weekly and remained open for the remainder of the program. Parents in the online program received weekly calls from a research assistant to check on intervention implementation and answer any questions regarding intervention procedures. Parent completion of each session was tracked electronically through the program.

Data Analysis Procedures

     Possible differences in session attendance/completion and treatment acceptability between F2F and online BPT participants were examined using independent sample *t*-tests. Differences in parent knowledge, parenting stress, and child behavior ratings across the three groups were evaluated using analyses of covariance (ANCOVA) of post-treatment outcomes

while controlling for pre-treatment scores. Group differences in intervention strategy fidelity were assessed using 3 (group) x 2 (time) ANCOVA for mid-treatment and post-treatment outcomes while controlling for pre-treatment fidelity. For all statistically significant group effects, Tukey HSD post-hoc tests were used to elucidate pairwise differences. Given that this was a pilot randomized controlled trial, an alpha level of .05 was used for all analyses. Partial η^2 and Cohen's d effect sizes were used to estimate the magnitude of obtained group differences.

Results

Means and standard deviations for all dependent variables across groups and assessment occasions are reported in Table 3.

Session Completion and Treatment Acceptability

Both treatment groups showed high session attendance/completion ($M = 80\%$) with no group difference (t [27] = 0.65, NS). Mean IRP-15 (i.e., treatment acceptability) scores were in the moderate acceptability range for both treatment groups (approximately 5 on a 7-point scale); however, total score was significantly higher for the F2F condition relative to online delivery with a large effect size (t [22] = 2.21, $p < .05$; Cohen's $d = .90$).

Parent Knowledge and Parenting Stress

For parent knowledge of intervention procedures, the three groups were not significantly different prior to treatment (F [2, 41] = 0.4, $p = .65$); however, there was a significant difference of large magnitude in post-treatment score while controlling for pre-treatment score (F [2, 35] = 5.67, $p < .01$, partial $\eta^2 = .43$). Specifically, parents in the F2F ($p < .01$; Cohen's $d = 1.49$) and online ($p < .05$; Cohen's $d = 0.74$) conditions obtained higher knowledge scores at post-treatment than did parents in the WLC group with no significant difference between the two active treatment conditions (see Figure 2).

For parent stress ratings, the ANCOVA for post-treatment PSI total score (controlling for pre-treatment score) was not statistically significant (F [2, 35] = 1.20, p = .31); however, the effect size was medium with lower scores for both treatment groups relative to WLC (Cohen's ds range from .50 to .52). Similar results were obtained for ANCOVAs of PSI Parental Distress (F [2, 35] =0.76, p = .48), Difficult Child (F [2, 35] = 1.23, p = .30), and Parent- Child Dysfunctional Interactions (F [2, 35] = 1.19, p = .32).

Parent Treatment Fidelity

Treatment impact on parent fidelity with prescribed intervention procedures was examined with a 3 (group) x 2 (time) ANCOVA with pre-treatment fidelity score as a covariate. Statistically significant main effects for group (F [2, 35] = 18.65, p < .001; partial η^2 = .52) and time (F [1, 35] = 29.63, p < .001; partial η^2 = .46) were obtained as well as a significant group x time interaction (F [2, 35] = 23.51, p < .001; partial η^2 = .57). Follow-up one-way ANCOVAs indicated significant between-group differences in fidelity at mid-treatment (F [2, 37] = 5.48, p < .01 ; partial η^2 = .23) and post-treatment (F [2, 35] = 23.85, p < .001; partial η^2 = .58). At mid-treatment, parents in the F2F treatment condition exhibited significantly higher intervention fidelity than parents in the online treatment (p < .05; Cohen's d = 0.86) and WLC (p < .01; Cohen's d = 1.62) groups. Alternatively, at post-treatment, parents in both active treatment conditions obtained higher intervention fidelity scores than parents in the WLC group (p < .01; Cohen's d > 2.0 in both cases). Thus, as expected, the two treatment groups showed improved fidelity with no change for WLC (see Figure 3).

Child Behavior Ratings

Findings for parent ratings of child behavior were mixed in terms of statistical significance. ANCOVAs (controlling for pre-treatment ratings) of post-treatment Conners I/O (F

[2, 34] = 2.28, p = .12) and D/A (F [2, 36] = 1.40, p = .26) were non-significant with medium

(I/O partial η^2 = .12) and small (D/A partial η^2 = .07) effect sizes. Alternatively, statistically

significant group differences at post-treatment (while controlling for pre-treatment scores) were

found for Conners Global Index-Restless Impulsive (F [2, 34] = 5.06, p < .05; partial η^2 =.23),

Global Index-Total (F [2, 34] = 3.97, p < .05; partial η^2 =.19), and Mood/Affect (F [2, 34] =

5.26, p = .01; partial η^2 =.24). In all cases, post-treatment scores were significantly lower for the

two treatment conditions relative to WLC (p < .01) with no difference in outcomes for F2F vs.

online conditions. Cohen's d effect sizes for these group differences were medium to large

ranging from 0.60 to 1.04. For example, mean Global Index-Restless Impulsive scores decreased

from pre- to post-treatment by about 0.5 SD for children in both treatment conditions, while

mean ratings for WLC children were unchanged (see Figure 4).

Discussion

The results of this pilot randomized trial of F2F and online BPT indicated that both

treatment delivery formats were associated with relatively high rates of parent engagement as

parents in both groups completed an average of 80% of treatment sessions. Although session

completion rates have not been uniformly reported, the 80% session completion obtained in this

study compares favorably with prior BPT investigations (Bor, Sanders, & Markie-Dadds, 2002;

Jones, Daley, Hutchings, Bywater, & Eames, 2007; Matos, Bauermeister, & Bernal, 2009;

Sonuga-Barke, Daley, Thompson, Laver-Bradbury, & Weeks, 2001; Thompson et al., 2009;

Webster-Stratton, Reid, & Beauchaine, 2011). On the high end, session attendance rates were

above 80% for the Jones et al. and Webster-Stratton et al. studies; however, it is noteworthy that

session completion rates obtained in the current study are higher than those found in the MTA

study (i.e., 63% for behavior therapy only; 61% for combined pharmacotherapy and behavior

therapy; MTA Cooperative Group, 1999), as well as STEPP (i.e., 77% attended, 52.6% from

beginning to end of session; Chacko et al., 2012). Session attendance was probably aided by

provision of food and childcare for each F2F group session. It also is particularly promising that

high levels of session completion were found for online BPT given that the latter involved less

interaction with fellow parents of children at-risk for ADHD. It is possible that high levels of

engagement with online BPT were due, in part, to the weekly between-session phone calls with a

therapist when parents were able to ask questions about intervention procedures.

Both modes of BPT delivery were rated as at least moderately acceptable by participating

parents; this level of acceptability is commensurate with what has been found in prior BPT trials

(Matos et al., 2009; Webster-Stratton et al., 2011). The mean total IRP-15 score was significantly

higher for the F2F vs. the online condition with a large effect size. In fact, F2F ratings were

higher for every IRP-15 item. Perhaps regular contact with BPT session leaders and fellow

parents of young children at-risk for ADHD leads parents to perceive interventions as more

acceptable and feasible than when such contact and interaction is less available. Anecdotally,

parents in the F2F group reported that conferring with other parents whose children experience

similar behavior problems was assuring.

Both BPT conditions led to significant increases in parent knowledge of and fidelity with

recommended intervention strategies relative to delayed treatment controls. The post-treatment

difference in knowledge was large in magnitude with mean WLC score essentially in the

"failing" range (i.e., below 65% accuracy) and mean Online and F2F scores in the C+ and B

range, respectively. It is possible that the addition of a between-session coaching component to

online BPT could lead to additional increases in parent knowledge (Burns et al., 2011).

Unfortunately, few BPT studies included parent intervention knowledge measures; thus, it is not

possible to compare our findings for this variable to other investigations. Similar to parent

knowledge outcomes, parent treatment fidelity was higher for both treatment conditions at post-

treatment with F2F also showing an advantage at mid-treatment. Perhaps the mid-treatment

advantage in fidelity for F2F was because regular direct contact with a session leader and other

families motivated parents to try recommended strategies earlier than when content was

presented online. At post-treatment, the gap in treatment fidelity was large in magnitude (i.e.,

over 2 SD unit difference) with parents in the active BPT conditions obtaining an average of

72.2% (Online) to 83.3% (F2F) of integrity points while those in the WLC condition were below

30% on average. The obtained treatment fidelity compares very favorably with the few prior

BPT studies that have examined this outcome. For example, parents participating in the STEPP

trial completed 48% of assigned homework (Chacko et al, 2012).

Improvements in parent intervention knowledge and treatment fidelity were accompanied

by decreases in parent stress; however, group differences while medium in effect size were not

statistically significant. The mean total stress scores were in the normal range for both active

BPT conditions at post-treatment. The lack of statistical significance for this variable was

probably due to the limited statistical power associated with our relatively small pilot sample.

As has been found in prior BPT outcome studies, both BPT conditions in the current

investigation led to improved child behavior relative to WLC. Specifically, children were

reported to be significantly less restless and impulsive, to show greater self-control, and to

display improved affect and mood. Effect sizes for both F2F and online BPT ranged from .60 to

1.04; these medium to large effects compare favorably with effect sizes found in previous BPT

studies and are greater than the effect size of .51 for ADHD symptoms reported in a recent meta-

analysis (Rimestad et al., 2016). The moderate size effects for online BPT are particularly

noteworthy, as this one of the first studies to indicate that online parent training leads to significant child behavior change that is commensurate with effects typically found for F2F BPT. Further, the effect sizes obtained for online BPT in the current study (i.e., .60 and higher) are greater than those found by Franke et al. (2016) in their recent study of online parenting self-help (i.e., effect sizes for parent ratings ranging from .45 to .52).

Limitations

Conclusions based on the current findings are limited by several factors. First, this was a pilot randomized trial and, as such, the sample size was relatively small thereby limiting statistical power. Given that medium to large treatment effects were found, these were statistically significant for most outcomes; however, smaller more subtle differences between F2F and online BPT may have gone undetected with the small sample. In addition, BPT effects on child behavior were based on parent report only and thus could be subject to bias given that parents were directly involved in delivering intervention. Future studies should use child blinded outcome measures, such as in-home observation and/or teacher ratings, as has been recommended by recent meta-analyses (e.g., Sonuga-Barke et al., 2013). Third, although pre-treatment teacher ratings were obtained for 41 of 47 participants (i.e., all children who attended preschool), these ratings were not used to affirm ADHD diagnostic status contrary to best practice recommendations (Pelham, Fabiano, & Massetti, 2005). However, the mean inattention/hyperactivity rating for the sample exceeded the typical cut-off for clinical significance (i.e., T-score = 65; see Table 1) and several of the children who did not attend preschool had been excluded based on behavior difficulties presumably related to ADHD symptoms. Thus, this sample clearly demonstrated risk for ADHD diagnosis based on clinically significant symptoms of ADHD and related impairment that were demonstrated across settings.

Fourth, It should also be noted that child behavior ratings on most subscales were still in the

clinical range (i.e., at or above T-score of 60) at post-treatment. Thus, although both face-to-face

and online BPT significantly reduced challenging behaviors and improved emotional self-

regulation, this treatment did not "normalize" child behavior to the extent that continued

intervention was not necessary. Although the parent sample was diverse in terms of race and

ethnicity, the generalizability of study findings may be limited because of the relatively high

education level of participating parents. In fact, parent SES and education level in this study

were higher than for other studies of parent engagement with BPT (e.g., Chacko et al., 2012). It

is possible that the relatively high parent engagement rates obtained in this study were due, in

part, to the SES and education level of participating families. Clearly, our obtained findings need

to be replicated in samples with greater SES and ethnic diversity. Finally, only short-term

outcomes were examined and thus it is unclear whether obtained effects would maintain over

time and/or generalize to other settings (e.g., preschool classroom). We also do not know

whether maintenance and generalization would differ for F2F and online BPT outcomes.

Clinical and Research Implications

There are at least two important implications for clinical practice based on this pilot RCT

of the PEAK program. First, although effect sizes obtained in community practice may be

smaller than obtained in this controlled study, a relatively brief exposure to BPT (i.e.,

approximately 15 hr) may not only increase parent knowledge of and fidelity with recommended

intervention strategies and improve child behavior, but may also be more likely to engage

parents in treatment relative to longer, more demanding programs. Second, given that F2F and

online BPT led to similar parent and child outcomes, online treatment delivery may be a viable

alternative, especially for families challenged by limited access to treatment providers, schedule

conflicts, and direct (e.g., payment for services) and indirect (e.g., child care) costs associated with F2F treatment. In particular, schedule flexibility may be an important advantage of online BPT that could perhaps be replicated in the context of individual, rather than group, F2F BPT sessions (i.e., individual sessions can be scheduled at times convenient to the family and therapist).

Given the promising results found for online BPT, there are several important directions for future research in this area. First, it would be helpful to examine whether an initial face-to-face meeting (as was done in the current study) enhances engagement with the online program through developing an alliance with the treatment team. The impact of an exclusive online program (i.e., initial meeting held online) should be assessed. Second, it would be important to evaluate the degree to which improved parent and child outcomes maintain over time. The degree to which maintenance may differ depending on F2F vs. online treatment delivery will be particularly important to examine. Third, because young children with ADHD typically experience difficulties with early literacy and numeracy skills, future investigations should assess the impact of including academic support strategies as part of BPT. Fourth, we need data to help predict how families may differentially respond to F2F vs. online BPT delivery such that parents could be provided with the form of BPT that would work best given their individual circumstances. Finally, a stepped care approach using a Sequential Multiple Assessment Randomized Trial (SMART) design may be helpful in optimizing the sequence of online BPT relative to other treatment options including F2F BPT and/or stimulant medication (Chronis-Tuscano, Wang, Strickland, Almirall, & Stein, 2016).

Conclusion

Pilot data from the current study indicate that BPT remains an efficacious strategy for improving outcomes of young children at-risk for ADHD. Further, the findings suggest that online BPT is comparable to F2F BPT with respect to many important outcomes, including parent engagement, acquisition of intervention strategies, fidelity of strategy implementation, and improvements in child behavior. Although replication is needed, the implications are substantial given barriers that many families experience with F2F BPT. Considerable additional research is recommended to further evaluate and compare F2F and online formats to ascertain maintenance differences, family fit, and a broader range of intervention targets.

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Table 1

Demographic Data for Overall Sample and Treatment Groups

	Overall	F2F	Online	WLC
Age				
Age in Years M (SD)	4.43 (0.63)	4.51 (0.63)	4.52 (0.55)	4.27 (0.68)
Gender N (%)				
Male	30 (63.8)	8 (50.0)	9 (60.0)	13 (81.25)
Female	17 (36.2)	8 (50.0)	6 (40.0)	3 (18.75)
Race/Ethnicity N (%)				
White	37 (78.72)	13 (81.25)	10 (66.67)	14 (87.5)
Black	3 (6.38)	0 (0.0)	3 (20.0)	0 (0.0)
Hispanic	2 (4.25)	1 (6.25)	1 (6.67)	0 (0.0)
Other	2 (4.25)	1 (6.25)	0 (0.0)	1 (6.25)
Mixed	3 (6.38)	1 (6.25)	1 (6.67)	1 (6.25)
Parent Education N (%)				
completed post grad	19 (40.42)	6 (37.5)	5 (33.33)	8 (50.0)
completed college, four year degree	10 (21.28)	5 (31.25)	3 (20.0)	2 (12.5)
attended college, no four year degree	13 (27.66)	3 (18.75)	5 (33.33)	5 (31.25)
completed high school or trade school	3 (6.38)	1 (6.25)	2 (13.33)	0 (0.0)
partial high school	2 (4.25)	1 (6.25)	0 (0.0)	1 (6.25)
Income				
Income M (SD)	50,363.64 (28,617.98)	47,083.33 (32,508.62)	46,818.18 (25,771.37)	58,200 (28,007.14)
Parent Conners				
Inattention/Hyp Subscale M (SD)	80.47 (8.22)	81.31 (8.68)	80.6 (7.29)	79.5 (8.97)
Teacher Conners				
Inattention/Hyp Subscale M (SD)	67.34 (13.62)	63.31 (13.06)	70.36 (13.9)	68.07 (13.96)

DAS-II				
DAS GCA M (SD)	97.95 (14.73)	101.19 (12.65)	102.37 (14.03)	90.07(15.14)
Presentation N (%)				
ADHD-C	29 (61.7)	10 (62.5)	8 (53.33)	11 (68.75)
ADHD-IA	2 (4.3)	0 (0.0)	1 (6.67)	1 (6.25
ADHD-HI	16 (34.0)	6 (37.5)	6 (40.0)	4 (25.0)
Comborbidities N (%)				
ODD Only	25 (53.2)	7 (43.75)	10 (66.67)	8 (50.0)
CD Only	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
ODD + CD	3 (6.4)	2 (12.5)	0 (0.0)	1 (6.25)

Note. F2F = Face-to-face. WLC = Wait-list control. DAS-II = Differential Abilities Scale-II. ADHD-C = ADHD combined. ADHD-IA = ADHD Inattentive. ADHD-HI = ADHD Hyperactive-Impulsive. ODD = Oppositional defiant disorder. CD = Conduct disorder.

Table 2

Promoting Engagement for ADHD pre-Kindergartners (PEAK) Session Content and Activities

Session Content	Session Activities
Welcome and Introduction to ADHD	Introductions & ice breakers, self-rating of ADHD symptoms, identification of priority behaviors
Intentional Attention and Other Powerful Caregiver Responses	10 things my child does well, examples/role play of praise and encouragement; examples/role play of intentional attending
General Strategies: A Look at Structure, Routines and Expectations	Discussion and examples of organization of space and time; examples of using a reward chart effectively
Introduction to the Problem Solving Approach	Overview of problem identification, triggers, identification of the function or behavior, and intervention selection
Expanding Your Skill Set: Prevention Strategies (1 of 3 part series)	Examples and role plays of how prevention strategies can address escape- or attention-related behaviors and how the strategies can work for specific families
Expanding Your Skill Set: Instructive Strategies (2 of 3 part series)	Examples and role plays of how instructive strategies can address escape- or attention-related behaviors and how the strategies can work for specific families
Expanding Your Skill Set: Response Strategies (3 of 3 part series)	Examples and role plays of how response strategies can address escape- or attention-related behaviors and how the strategies can work for specific families
Extending What Works Across Settings	Examples and role play of community behavior plans; small group work with families to design individualized plans
Setting Up Your Child for Success: Pre-academic Skills; Early Reading Skills	Group reading of sample book to explain dialogic reading; examples and role play of early numeracy activities
Using Effective Communication; Preparing for the Transition to Kindergarten and Program Conclusion	Discussion of how to best communicate with child's school; tips and strategies for successful communication

Table 3

Means and Standard Deviations for Dependent Measures Across Treatment Group and Assessment Occasions

Variable	F2F			Online			WLC		
	Pre *M(SD)*	Mid *M(SD)*	Post *M(SD)*	Pre *M(SD)*	Mid *M(SD)*	Post *M(SD)*	Pre *M(SD)*	Mid *M(SD)*	Post *M(SD)*
Test of Parent Knowledge	66.3(10.4)	---	84.1(10.4)	64.0(16.3)	---	78.5(19.2)	58.5(24.1)	---	63.8(16.7)
PSI (raw scores)									
PD	31.9(7.6)	28.2(9.4)	26.6(7.5)	29.4(9.6)	28.1(9.0)	26.0(6.9)	31.0(9.7)	30.6(10.9)	29.3(10.1)
DC	35.9(8.9)	33.3(10.4)	31.4(9.2)	34.1(7.7)	35.7(7.6)	31.9(6.6)	37.0(6.7)	38.1(9.0)	35.5(7.8)
P-DCI	25.6(6.7)	21.5(6.7)	23.2(5.8)	24.6(5.5)	24.5(6.1)	23.8(5.5)	28.1(7.9)	28.7(6.6)	27.4(6.2)
Total Score	93.4(20.1)	83.0(25.3)	81.3(21.0)	88.1(19.4)	89.2(18.3)	81.2(16.1)	96.1(20.4)	97.4(22.7)	92.2(22.3)
Fidelity (total score)	4.5(1.3)	7.9(2.8)	14.9(3.3)	3.8(1.8)	5.0(2.9)	13.2(4.8)	3.2(1.3)	4.3(1.4)	5.4(2.3)
IRP-15 (total score)	---	---	78.1(23.6)	---	---	67.1(28.3)	---	---	---
Conners (standard score)									
I/O	75.5(9.6)	---	70.2(12.7)	76.5(8.1)	---	71.2(9.0)	77.4(9.5)	---	76.9(8.6)
D/A	72.9(15.7)	---	66.6(16.6)	77.1(13.6)	---	70.2(14.2)	75.9(12.8)	---	75.9(11.3)
GI-RI	74.5(9.8)	---	70.6(11.8)	75.2(9.8)	---	68.0(11.1)	77.2(9.0)	---	77.9(7.9)
GI-T	73.4(11.7)	---	69.0(12.9)	74.5(9.8)	---	66.4(10.9)	77.1(8.9)	---	77.1(8.7)
M/A	71.5(16.8)	---	65.3(16.3)	70.7(9.2)	---	60.9(9.8)	72.2(12.2)	---	72.4(10.8)

Note. F2F = Face-to-face. WLC = Wait-list control. PSI = Parent Stress Index. PD = Parental distress. DC = Difficult child. P-DCI = Parent-child dysfunctional interactions. IRP-15 = Intervention Rating Profile-15. I/O = Inattention/Overactivity. D/A = Defiant/Aggressive. GI-RI = Global Index-Restless Impulsive. GI-T = Global Index-Total. M/A = Mood/Affect.

Figure 1

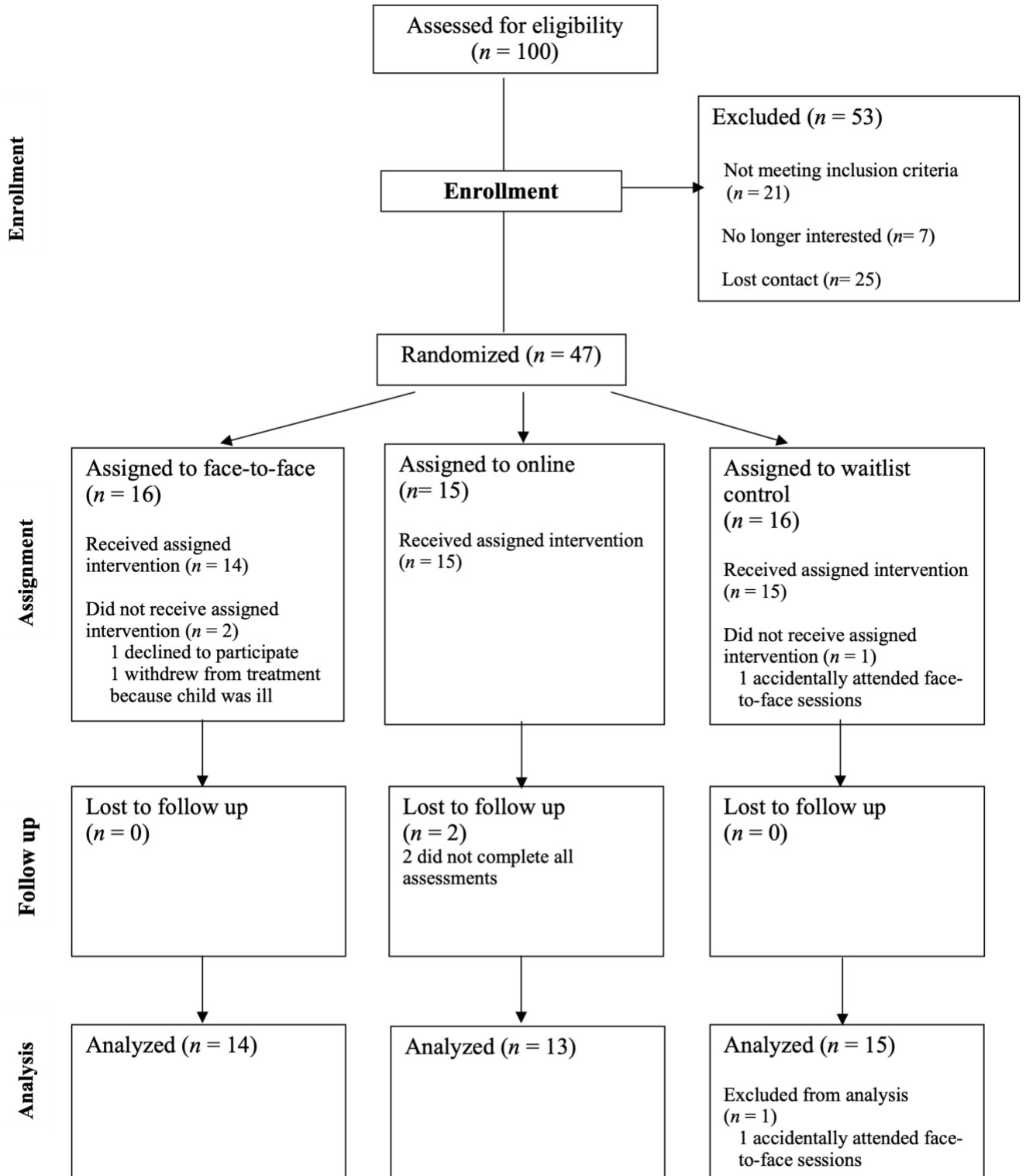*Flow of Participants Through Each Stage of Project PEAK*

Figure 2

Parent Knowledge of Intervention Strategies Test Scores Across Assessment Phases for Face-to-Face (F2F) and Online (Web) Behavioral Parent Training and Wait-List Control (WLC) Conditions
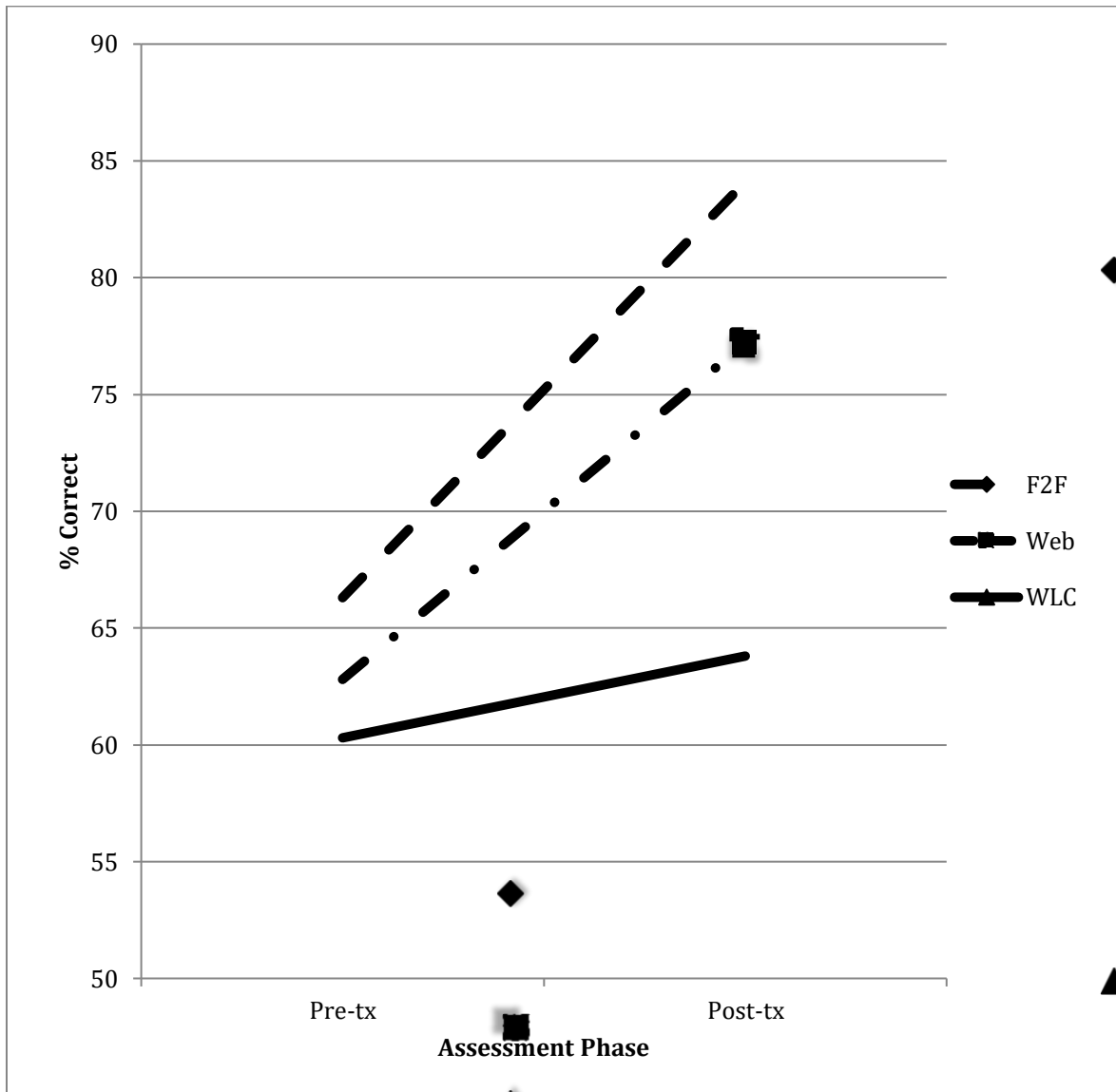
Figure 3

Parent Fidelity with Recommended Intervention Strategies Scores Across Assessment Phases for

Face-to-Face (F2F) and Online (Web) Behavioral Parent Training and Wait-List Control (WLC)
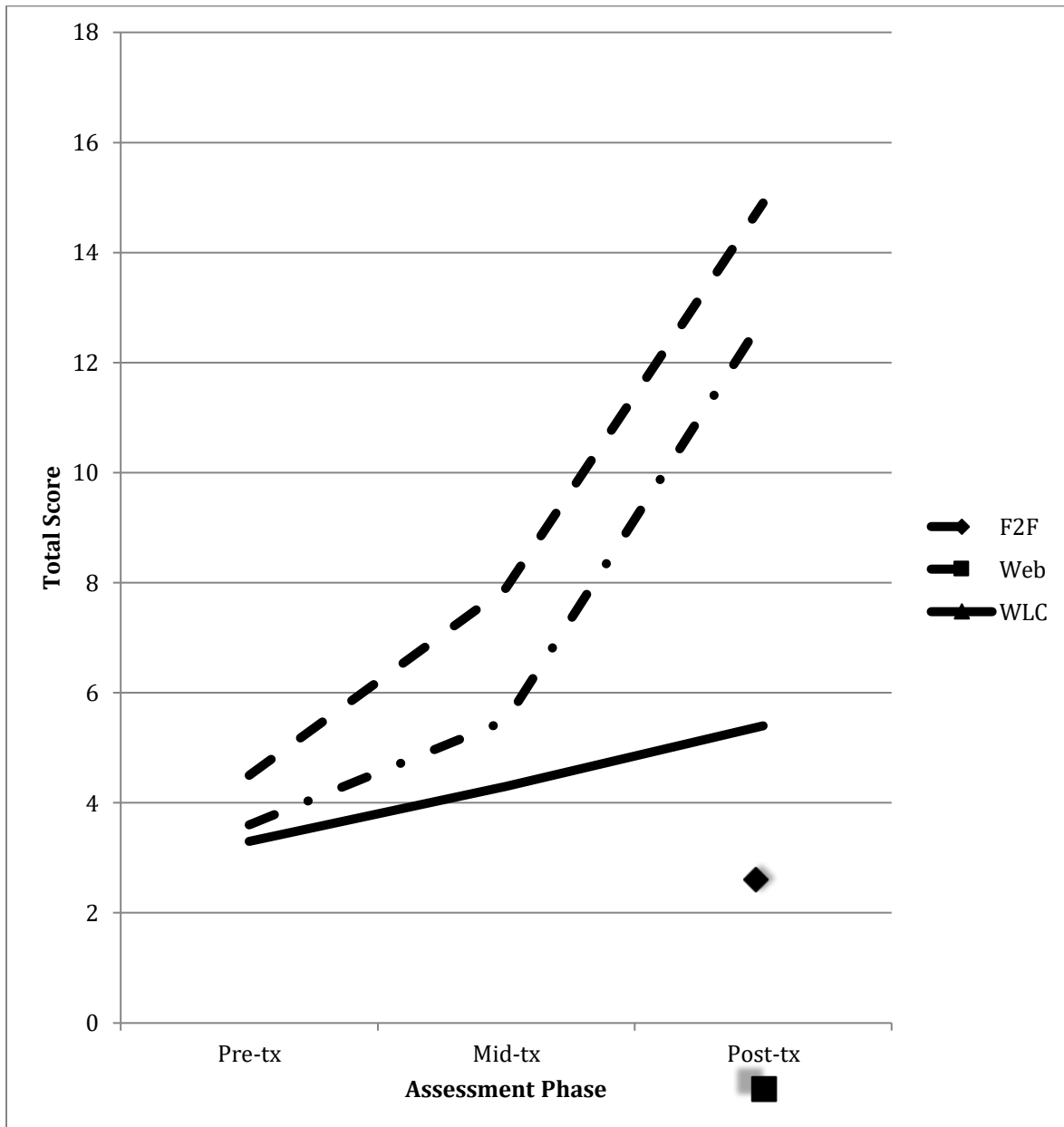
Conditions

Figure 4

Parent Ratings for Conners Global Index – Restless Impulsive Scale Across Assessment Phases

Phases for Face-to-Face (F2F) and Online (Web) Behavioral Parent Training and Wait-List

Control (WLC) Conditions