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Development and Testing of Remote Facilitation of Prevent-Teach-Reinforce for Families to Address Challenging Behavior in Young Children (PTR-F:R)

Abstract

As children advance through developmental stages, they often present behavioral difficulties such as tantrums, lack of cooperation, and aggression. For some children, behaviors are serious enough that they interfere with the child's ability to engage in positive relationships, participate in necessary routines, and learn new skills, warranting behavioral intervention (Dunlap et al., 2017). Being responsive to the needs of the family and appreciation for the central role that they play is crucial to the success of behavioral interventions and the maintenance of positive outcomes (Bailey, 2013; Campbell, 1995), thus, their input should be at the center of all recommendations and assistance. There is ample evidence to suggest that providers are limited in their capacity to provide evidence based behavioral intervention (Dunlap & Fox, 2011). Further, in light of the Covid-19 pandemic, children are receiving a reduced dosage of evidence-based practices. Telehealth has been offered as a platform that caregivers can access coaching on a variety of strategies pertaining to social emotional development of their young children and shown positive outcomes (Shieltz and Wacker, 2020).

The purpose of this study is to better understand the existing literature base on current telehealth practices providing support to caregivers of individuals exhibiting challenging behavior. A systematic and quality review of the literature was conducted and reported on training components, procedural fidelity, social validity, and evidence of impact of studies that met the inclusion criteria. While there exists a great deal of information on remote implementation of interventions for challenging behavior, gaps remain pertaining to systematic replicable coaching methods and the emphasis of social validity throughout the treatment process. Therefore, the experimental study pertains to the development and testing of remote facilitation of Prevent Teach Reinforce for Families (PTR-F:R) to address the challenging behavior of young children in home settings.

A single case multiple baseline design was used across five families with children between the ages of 2 and 5. Data was collected on the feasibility, usability, and acceptability of the process. Child outcomes such as percentage of intervals with challenging behavior (CB) and use of social skills using rating forms before and after PTR-F:R as well as caregiver outcomes such as stress levels and sense of competence were measured. Data were analyzed using visual analysis to assess the trend, variability, and immediacy of the effect of PTR-F:R on child challenging behavior across baseline and intervention phases. Repeated measures of parenting stress, parenting sense of competence, and child social skills were analyzed. All results were considered in light of fidelity measures, both caregiver implementation fidelity of the behavior support plan as written as part of the PTR-F:R process, as well as fidelity of remote implementation of facilitation of the PTR-F:R process, both recorded as percentage of steps completed each visit. Social validity ratings regarding the PTR-F:R process and the intervention plans developed and implemented during the participant's participation further indicated the extent of success of the process delivered in this new and different format. This study expands the research on both PTR-F as well as caregiver led function-based interventions for challenging behavior. Results, study limitations, recommendations for future research, and implications for practice are discussed.

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First Advisor

Gloria Miller

Second Advisor

Phillip S. Strain

Third Advisor

Garrett Roberts

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DEVELOPMENT AND TESTING OF REMOTE FACILITATION OF PREVENT-
TEACH-REINFORCE FOR FAMILIES TO ADDRESS CHALLENGING BEHAVIOR
IN YOUNG CHILDREN (PTR-F:R)

A Dissertation

Presented to

the Faculty of the Morgridge College of Education

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In Partial Fulfillment

of the Requirements for the Degree

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by

Abby Hodges

August 2022

Advisor: Gloria Miller, Ph.D.

Author: Abby Hodges

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INTRODUCTION

Substantial evidence suggests that symptoms of mental, emotional, and behavioral disorders identified as children grow older begin in the early years of development (Gleason et al., 2016). When challenging behaviors persist and are not addressed with effective interventions, children are placed in more restrictive classrooms or settings and have poorer academic outcomes, experience peer rejection, and experience a general lack of community integration. Increasingly, children are entering school without the emotional, social, and behavioral skills necessary for academic success (Campbell, 1995; West et al., 2000; National Scientific Council on the Developing Child [NSCDC], 2008/2012;).

Involving caregivers in interventions to reduce challenging behaviors in their children is critical, but many families struggle to access this type of behavior support services in their community (Zablotsky et al., 2015; Doubet & Ostrosky, 2016). Currently, when children have persistent challenging behavior school professionals (i.e., behavior analysts, school psychologists) work with the family and classroom personnel to develop and implement a behavior intervention plan that is used in the classroom and families *might* be offered ideas for home intervention (DEC, 2017). Due to COVID-19 pandemic, children are receiving a reduced dosage of evidence-based practices and intervention (Education Commission of the States, 2020; Learning Policy Institute, 2020). Therefore, the need for caregiver-centered support is rapidly increasing as caregivers are asked to help support more of their children's educational and therapeutic

practices. Parents and caregivers play an essential role in young children's social emotional development and the prevention and resolution of challenging behaviors (DEC, 2017). More research is needed on different systems and programs to provide training, coaching, and support for caregivers to implement sustainable, individualized prevention and intervention efforts with fidelity (Manuscript 1).

Following an examination of the current literature base, there is a need to develop and test the remote facilitation of partnering with a family caregiver in the development and implementation of an assessment-based behavior intervention to address challenging behavior in young children. This dissertation includes two interconnected manuscripts exploring behavioral intervention for children engaging in challenging behavior. The first manuscript provides a systematic and quality review of the literature on remote training for caregiver implemented intervention for challenging behavior. Current trends related to the practice are reviewed: (a) child data, (b) caregiver data, (c) study design, (d) intervention and caregiver training procedures, and (e) evidence of outcomes. Notable limitations included a lack of family partnering, gaps in accessing of services and qualified providers, little mention of treatment fidelity on coaching methodologies, lack of manualized protocols and intervention strategies, and unclear experimental evidence on the efficacy of distance delivery based on What Works Clearinghouse Standards (WWC, 2020). At the start of the new millennium, and arguably still relevant now, Lucyshn and colleagues (2000) called for the following three actions to improve services for children with challenging behavior: (a) develop and implement home-based behavioral interventions, (b) expand analysis and intervention to focus on family routines, and (c) encourage building of collaborative partnerships.

This call to research served as the rationale for the second manuscript, which investigated the remote delivery of a research based family-centered manualized intervention, Prevent Teach Reinforce for Families (PTR-F:R). PTR-F:R was facilitated for five caregiver child dyads within a single case research design across dyads framework. The study addressed five research questions: (1) To what extent is there a functional relation between caregiver implementation of the function-based behavior intervention plan developed through the PTR-F:R process and challenging behavior? (2) Does PTR-F:R lead to high levels of caregiver fidelity of implementation of behavior support strategies? (3) How do caregivers rate the social validity of the goals, procedures, and outcomes of PTR-F:R? Secondary research questions focused on the novel use of pre-post intervention measures as a precedent to a future randomized trial: (4) To what extent is the implementation of PTR-F:R associated with caregiver-rated improvements in child behavior, social skills, and adaptive behavior? and (5) To what extent is the implementation of PTR-F:R associated with a reduction in parenting stress and improvements in caregiver well-being? Application of PTR-F:R to the practices of educators provides a means to adapt a manualized intervention approach that can be used efficiently by school personnel and other providers to conduct functional behavioral assessments, design intervention plans, and coach families to implement function based behavior intervention plans to address challenging behavior in home routines.

MANUSCRIPT ONE:
CAREGIVER INVOLVEMENT IN REMOTE INTERVENTIONS FOR CHALLENGING
BEHAVIOR: A SYSTEMATIC AND QUALITY REVIEW

Introduction

As children advance through developmental stages, grow, and learn, they begin to develop social emotional competence. They form relationships, experience and manage emotions, and explore their environments across a multitude of contexts (e.g., family, community, culture; Zero to Three, 2016). As social emotional skills emerge it is not uncommon for them to be accompanied by behaviors that adults find challenging as children experiment with different ways to explore relationships and communicate their needs. Such behavior occurs in response to both individual and environmental variables (Wacker et al., 2014) and are influenced by several factors, including: (a) children's development, (b) children's temperament, (c) environmental factors, and (d) socio-cultural factors (DEC, 2017). When the underlying cause of the behavior is understood, caregivers are better equipped to address the behavior in positive and instructive ways, and the child is more likely to be taught needed social-emotional communication. In the absence of support and intervention, children experiencing social-emotional difficulties might resort to more persistent and disturbing challenging behavior (CB) and can develop more serious mental health disorders over time (NSCDC, 2004).

Smith and Fox (2006) define CB as “any repeated pattern of behavior...that interferes with or is at risk of interfering with the child’s optimal learning or engagement in pro-social interactions with peers and adults” (p. 6). CBs can impede one’s development of appropriate skills and independence (Bromley et al., 2004). CB can also be difficult to define due to the multitude of factors influencing development and behavior, such as the interpretations of children’s behavior and specifically whether or not that behavior is considered challenging (Okonofu & Eberhadt, 2015; Gilliam et al., 2016).

Social emotional competencies and preventative efforts in the realm of CBs set the stage for school readiness and lifelong success (Denham, 2006). The combination of both social-emotional and cognitive skills is necessary for success in school because self-regulation, social interactions, and attention affect learner readiness (Jones et al., 2015). If proper social emotional supports are in place, children experience better outcomes such as emotional literacy, improved friendships and problem-solving skills, and greater sense of community (Henninger & Gupta, 2014). On the other hand, low social emotional competence in children can lead to academic cognitive deficits (Jones et al., 2015), high rates of delinquency (NSCDC 2008/2012), and/or lifelong mental health concerns (DEC, 2017). Although prevalence is difficult to determine due to the variation in childhood behavior disorders, a recent review of the literature suggests that between 10 and 20% of children ages 0-5 are being identified with serious emotional and behavior challenges (Ogundele, 2018).

Children who engage in CBs are of greatest concern to parents, teachers, and other service providers (Hauser-Cram & Woodman, 2016). Parents are often stressed,

depressed (Durand, 2011; Long et al., 2008) and lack confidence in their parenting skills and abilities to manage the CBs effectively (Woodman & Hauser-Cram, 2013). Teachers often lack sufficient access to trained specialists such as behavioral analysts who can support them in addressing such issues, leading to strain, burnout and workforce shortages, and/or children with CB being removed from their classrooms and precluded from learning with their typically developing peers (Drolette, 2019).

Parents and caregivers are the most important factor in young children's social emotional development and the prevention and resolution of CBs during childhood. The competence and confidence with which these caregivers address children's challenges are pivotal to their future success (Dunlap et al., 2006; Lucyshyn et al., 2002; Plienis et al., 1988). Importantly, parent stress and efficacy has been shown to impact children's school readiness (Brauner & Stephens, 2006). Thus, promoting social emotional competence and addressing the needs of children with CB using family-centered supports is paramount to ensure the success of children and their caregivers in schools, homes and communities (DEC, 2017).

Identification of and Intervention for CB

It is generally accepted that CB must be interpreted in light of the following principles: (a) CB is communicative, (b) CBs are maintained by their consequences, and (c) CBs occur in context (Dunlap et al., 2017). Understanding of these principles warrants specific procedures to provide interventions likely to be effective in the reduction of CB and the acquisition of a functionally equivalent appropriate replacement behavior (i.e., serves the same communicative function as the CB once did).

Further, there is consensus in the field that families must find appropriate intervention services for their child who engages in CB as soon as possible to obtain the best possible outcomes. Among various approaches, behavioral intervention (BI) has the strongest and most consistent scientific support as a means of teaching social emotional skills to young children with CBs (Aman, 2005; National Research Council, 2001; Sallows & Graupner, 2005; Simpson, 2005). BI promotes the likelihood that successful outcomes will occur by providing supports necessary that lead to meaningful outcomes (Fox et al., 2002; Joseph et al., 2019).

The pivotal strategy with BI is functional behavior assessment (FBA). This is an individualized practice that is commonly used to address CBs and create effective behavior intervention plans. Based on the principles of operant conditioning, FBA describes the relationship between antecedents, behaviors, and consequences (WWC, 2016). It aids in the determination of antecedent conditions that precede the CB and what consequences or variables in the environment are maintaining it. Research demonstrates that identifying why CB occurs through functional behavior assessment (FBA) followed by function-based interventions can lead to effective reductions in CB and increases in appropriate behavior (Lambert, Bloom, & Irvin, 2012; Wood, Drogan, & Janey, 2014). Further, the Individuals with Disabilities Education Act (IDEA) requires FBAs for children with disabilities whose CB interferes with their daily life.

There are a variety of materials used in the FBA process to gather information about the functional relationship between behaviors and environmental events preceding and following, such as interview protocols, surveys, and observational tools (O'Neil et al., 1997, Dunlap et al., 1993; Kern, Dunlap, Clarke, & Childs, 1994). There are various

methods used to collect and analyze data: indirect data collection, direct observation, summarizing data, and functional analysis of CB (WWC, 2016).

It is considered best practice to implement some form of FBA prior to implementation of an intervention for CB (Machalicek et al., 2009). Unfortunately, research suggests quite a variance in the capacity of practitioners to implement this model and many providers are not fluent in FBA based interventions (Dunlap and Fox, 2011; Fettig et al., 2016). Furthermore, expertise is difficult to transfer to practitioners and families due to limited available resources outlining FBA processes in a simple, manualized way. And, we know there is a shortage of trained professionals to provide these services (Hebbler et al., 2006; National Scientific Council on the Developing Child, 2008; World Health Organization, 2007).

There is also recent evidence to suggest that the COVID-19 pandemic has resulted in children receiving a reduced dosage of evidenced-based practices and intervention. The American Academy of Pediatrics (2020) released a policy statement on the reopening of schools in the fall, declaring, “the impact of loss of instructional time and related services, including mental health services as well as occupational, physical, and speech/language therapy during the period of school closures is significant for students with disabilities.” Students with disabilities may also have more difficulty with the social and emotional aspects of transitioning out of and back into the school setting. Therefore, the need for caregiver-centered support is rapidly increasing as caregivers are asked to help support more of their children’s educational and therapeutic practices. Involving caregivers is critical, but this research remains limited as prior reviews of the literature

only indicate expert determination of and design of function-based intervention plans (McKenna et al., 2015; Walker et al., 2018; Watkins et al., 2019; Wood et al., 2014).

Despite the essential role families and caregivers play in promoting social emotional competence and addressing CB (DEC, 2017; Joseph et al., 2019) and how many children need intervention (CDC 2012), many families struggle to access behavior support services in their community (Doubet & Ostrosky, 2016). More research is needed on different systems and programs to provide training, coaching, and support for caregivers to implement sustainable, individualized prevention and intervention efforts with fidelity (Joseph et al., 2019).

Telehealth/Remote Service Delivery

A recent phenomena in the literature suggests that remote delivery of behavioral assessment and interventions can begin to address this critical need, offering a mechanism to involve caregivers that might otherwise be hard to reach, thus improving children's short- and long-term social, emotional and adaptive outcomes. Telehealth (also known as 'telepractice' or 'telemedicine') is the use of communication technologies (e.g., computer-based video conferencing) to deliver consultation or other services in real-time over a geographical distance (Dudding 2009). Telehealth has been utilized in both homes and schools to deliver coaching to parents and teachers on a variety of strategies pertaining to social emotional development and shown promising outcomes (Shieltz and Wacker, 2020).

For example, telehealth technology to deliver parent training and coaching has shown promise in early childhood (Snodgrass et al., 2017; Hoffman et al., 2019).

Researchers have demonstrated effective use of online training videos for the implementation of mand training (McCulloch et al., 2013), professional development (Marturana et al., 2012; Hamad et al., 2010), and working with children with hearing loss (Houston et al., 2012). Internet-based self-directed distance learning programs have been created to teach caregivers to implement naturalistic BI for increasing skills such as imitation (Wainer & Ingersoll, 2012), promoting social communication development during play (Ingersoll and Berger, 2015; Ingersoll et al., 2016), and other social skills (Vismara et al., 2012; 2013). Bridgman et al. (2016) found standard BI to be as effective as web-based interventions, finding insufficient evidence of outcome differences between standard and experimental webcam treatment. Further, there is evidence suggesting that caregivers report similar acceptability ratings for remote service delivery versus in vivo (Unholz-Bowden et al., 2020; Lindgren et al., 2016; Neely et al., 2017).

Telehealth may be a viable solution to increasing the access to empirically supported interventions for children with CB and their families (Hoffman et al., 2019). The use of telehealth specifically for caregiver implementation of assessment and treatment of children who engage in CB is an emerging area of research. More information is warranted regarding how CB is being assessed and treated and to what extent are caregivers being involved throughout this process. Additionally, more information is needed regarding the fidelity of interventions and coaching mechanisms, social validity, and the quality of existing studies.

Given the benefits of caregiver involvement in assessment and intervention delivery for CB, the purpose of this review is to provide an update on current literature

pertaining to the use of telehealth to provide support to caregivers of individuals exhibiting CB and document training components used as well as procedural fidelity levels and social validity reported across studies. The questions this review seeks to answer are: (a) What are the characteristics of the existing literature base using remote (i.e., tele-practice) coaching for caregiver-implemented intervention studies for children with CB in terms of participants, interventions, training components, and outcomes? and (b) what is the degree of evidence to support the existence of a functional effect between telehealth delivery of function based intervention and reductions in challenging behavior for single case designs or what are the effect sizes reported in group experimental studies?

Method

Search Procedure

The review was conducted following the PRISMA checklist as a guide (Mother et al., 2009). Identified studies were screened by the title and abstract and duplicates were removed. This review consisted of a systematic search and analysis of studies that utilized remote caregiver led interventions for CB. A systematic search of electronic databases using ERIC (ProQuest) through the University library was conducted beginning June 2020 and ending September 2020. On all databases, the following test terms were inserted into the keyword fields in pairs utilizing Boolean operators and truncation: (tele* OR video* OR distance* or virtual*) AND (disabil* OR disorder OR challenging OR disruptive OR problem behavior) AND (intervention OR treatment). A total of 40 term combinations were utilized (e.g., *tele** and *challenging* and *intervention*).

The search was restricted to English language, peer-reviewed journals and was not restricted by year or country of origin. The titles and abstracts were screened to identify studies for inclusion and duplicates were removed, followed by full text screening. For each study meeting inclusion criteria, we reviewed the study's references to identify additional studies as well as reviews on the topic. Finally, hand and author searches were conducted for the journals (i.e., Journal of Applied Behavior Analysis and Journal of Autism and Developmental Disabilities) and the author (i.e., David Wacker) that had published the most identified studies in an effort to identify additional studies to include in this review.

Inclusion and Exclusion Criteria

To be included in this review, studies had to be one of two research designs: either a single case research design where a functional effect could be assessed via visual analysis or group design that included contemporaneous comparable conditions and resulted in a calculable effect size. Additionally, the study must have included (a) children under age 18; (b) caregiver led implementation of an intervention for CB defined as experimenter-controlled changes of the environment to determine a relationship between those changes and an individual's behavior (NIH Grants Policy Statement 2021); (c) description of caregiver coaching procedures; (d) use of telehealth or remote service delivery (i.e., training and feedback regarding a specific intervention); and (e) data reported regarding caregiver led implementation of such intervention. For the purposes of this review, data could reflect the fidelity of caregiver implementation of intervention or child behavior during caregiver-implemented intervention. A caregiver was defined as any individual who regularly looked after the child. Studies were excluded

if (a) the intervention was conducted at any point by someone other than the child's caregiver (i.e., researcher, graduate student, etc.); (b) there was no intervention for CB (e.g., study only included a functional assessment); or (c) a functional effect (single case research design) or effect size (group design) could not be assessed.

In addition to the 1081 articles identified in the electronic database search, 8 studies were identified in ancestry (n = 4), journal, (n = 2), and author (n = 2) searches, resulting in a total of 13 studies included for this review. Main reasons for exclusion during the full text search were either that intervention procedures were not carried out solely in the remote context (n = 10) or the dependent variable did not include child CB (n = 15).

Data Extraction and Analysis

Each potential study was evaluated against the inclusion and exclusion criteria and then data were extracted on (a) child participant demographics, (b) caregiver demographics, (c) study design, (d) intervention procedures, (e) caregiver training procedures, and (f) social validity, and (g) evidence of impact (Table 1). Descriptive coding was conducted by the first author and a trained graduate student in school psychology. Participant characteristics included gender, age, diagnosis, ethnicity, and CB identified by the authors of the study. Caregiver demographics included caregiver role, age, ethnicity, education level, and experience with behavior intervention. Study design parameters included an initial sorting between group and single case design. Following this, characteristics of general designs were identified (e.g., randomized control trial, multiple baseline design across participants, multiple baseline across settings, etc.). Intervention procedures included location of the intervention (i.e., home or school) and

from where remote coaching took place. Intervention procedures also included procedure/intervention that the caregiver implemented, for what duration, maintenance of intervention effects, the dependent variables, coaching/training components, technology used, and treatment fidelity. Caregiver training procedures included the method used based on study author report (e.g., written/verbal instructions, modeling, role play/rehearsal, etc.) and whether treatment fidelity on caregiver training and implementation of treatment was reported. In addition, the inclusion of social validity measures was coded as “yes” or “no.” If “yes,” the type of survey and whether or not the authors reported acceptable (i.e., positive) social validity results was noted.

The first and second author extracted additional information from the studies pertaining to What Works Clearinghouse Standards (WWC, 2020). They reviewed the study using such criteria to determine whether it received a rating of *Meets WWC SCD Standards Without Reservations*, *Meets WWC SCD Standards With Reservations*, or *Does Not Meet WWC SCD Standards*. To be considered as a SCD and eligible for review, designs must have included the following features (a) an individual case is the unit of intervention administration and data analysis; (b) within the design, the case can provide its own control for purpose of comparison; and (c) the outcome variable is measured repeatedly within and across different conditions or levels of the independent variable (i.e., phases; WWC, 2020). Additional criteria included the presence of raw data in graphical or tabular format to permit visual analysis, the independent variable was systematically manipulated, and the outcome variable is measured over time by more than one assessor for at least 20% of data points per condition across phases and meet minimal thresholds for agreement (i.e., 80%).

Further, reversal designs must have had a minimum of four phases per case with at least five data points per phases to be rated *Meets WWC SCD Standards Without Reservations*, at least three data points per phase to be rated *Meets WWC SCD Standards With Reservations*, and phases that have fewer than three data points result in the rating of *Does Not Meet WWC SCD Standards*. Multiple baseline and multiple probe designs must have had a minimum of six phases with at least 5 data points per phase to be rated *Meets WWC SCD Standards Without Reservations*, three data points per phase to be rated *Meets WWC SCD With Reservations*, and phases with fewer than three data points are rated as *Does Not Meet WWC SCD Standards*. There is an additional element of concurrence of implementation of intervention to distinguish the multiple baseline and multiple probe designs from AB designs.

A functional effect, or causal relation between dependent and independent variables, is indicated when the active manipulation of the independent variable consistently results in changes in the dependent variable that were otherwise unlikely to occur at least three times at three different points in time. Additional visual analysis indicators accounted for included the immediacy of effect, presence of overlap in data points, and reason for concern (chart available upon request).

Interrater Agreement

The first author and a trained graduate student in school psychology independently applied the inclusion criteria to 40% of the 1081 articles identified in the initial database search. This resulted in 100% agreement regarding the inclusion or exclusion of those studies.

The first author completed descriptive coding for all studies and then randomly selected 40% of the studies to be coded independently by a second coder to assess inter-rater agreement. Prior to coding the randomly selected studies, the secondary coder was assigned a series of studies to code that were not part of the randomly selected chosen for practice. Once the secondary coder met 90% agreement with the first author across three consecutive studies, they were assigned a subset of the studies to code independently. An agreement was scored if both reviewers recorded the same response for that category. Inter-rater agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements for each item and multiplying by 100 to yield a percentage. The average inter-rater agreement across all descriptive information items was 92% (range 82% to 100%). The reviewers discussed all disagreements to reach a final decision for each item. Concurrence in study ratings across the first and second authors was 100% for designations across *Meets*, *Meets with Reservations*, and *Does Not Meet* WWC Standards.

Results

The systematic review of the literature resulted in the identification of 13 articles. The authors reviewed and synthesized specific study components that included: (a) experimental design, (b) participant characteristics (c) the technology used to deliver training to caregivers, (d) intervention characteristics (i.e., type of intervention delivered to the child and the type of training to caregivers), and (e) dependent variables/measures, and (f) evidence of impact. Table 1 summarizes these 13 studies in terms of child participant demographics, caregiver demographics, intervention components,

experimental design, and evidence of impact. In the following sections, a summary of coded variables and quality measures is presented.

Table 1*Summary of Participant Characteristics, Intervention Components, Dependent Variables, and Evidence of Impact*

Citation	Participants	Intervention components	Dependent Variables	Experimental Design	Determination of Functional Effect; Effect Size and/or WWC Standards Threshold
18 Benson et al., 2018	Interventionists: 2 mothers Children: 2 males, ages 5 and 8; one with cerebral palsy one with ASD	Task analysis for parent coaching; FAI; SDA; FA; FCT	SIB (e.g., head hitting, face slapping); parent fidelity	Reversal	No; Does Not Meet (no return to baseline)
Dimian et al., 2018	Interventionists: parents Child: 7-year-old boy; ASD	FA + FCT	Tantrums	Multiple Probe	Yes; Meets without Reservations
Fettig et al., 2016	Interventionists: early intervention provider	FA + prevention strategies, teaching appropriate	Tantrums, noncompliance, aggression;	MBD Across Strategies	Yes;

Citation	Participants	Intervention components	Dependent Variables	Experimental Design	Determination of Functional Effect; Effect Size and/or WWC Standards Threshold
	Child: 1 female 30 months; ASD	replacement behaviors	provider acquisition of skills		Meets With Reservations (3 data points per phase) No;
Gibson et al., 2010	Interventionists: 2 preschool teachers; Child: 1 male, 3-5 years, ASD	FA + FCT	Leaving area	Reversal	Meets with Reservations (only 2 replications)
Lindgren et al., 2020	Interventionists: parents Children: 38 children ages 21-84 months; ASD	FA, FCT	SIB, aggression, property destruction, severe noncompliance; skill acquisition	RCT	Effect size = 1.57 Does not Meet (Baseline Equivalence Requirement not Satisfied)
Machalicek et al., 2016	Interventionists: parents Child: 1 female, 1 male ages 6-12 years; ASD; 1	FA + FCT	CB: aggression, negative vocalizations, SIB, property	Multielement	No; Does Not Meet

Citation	Participants	Intervention components	Dependent Variables	Experimental Design	Determination of Functional Effect; Effect Size and/or WWC Standards Threshold
	female age 16; ASD		destruction; caregiver fidelity		(no experimental analysis)
Monlux et al., 2019	Interventionists: parents Child: 10 children 3-12 years old with Fragile X	FA + FCT	SIB and aggression; caregiver fidelity	Multielement	No; Does Not Meet (no experimental analysis)
Shieltz et al., 2018	Interventionists: Mothers Child: 1 male <3 years, ASD; 1 female 6-12 years, ASD	FA + FCT	SIB, AGG, property destruction; caregiver fidelity	MBD across participants	No; Does Not Meet (Only 2 participants in design)

Citation	Participants	Intervention components	Dependent Variables	Experimental Design	Determination of Functional Effect; Effect Size and/or WWC Standards Threshold
Simacek et al., 2017	Interventionists: parents Child: 2 females 3-5 years with ASD	FA + FCT and SDA	Occurrence of response; caregiver fidelity	Multiple Probe with embedded reversal	Yes; Meets without reservations
Suess et al., 2014	Interventionist: parents Child: 2 males <3 years PDD-NOS, 1 male 3-5 years PDD-NOS	FA + FCT	SIB, aggression, property destruction; treatment fidelity	MBD across participants	No; Meets with Reservations (large data overlap)
Suess et al., 2016	Interventionists: 1 parent Child: 2 males 3-5 years ASD, 1 male <3 years ASD, 1 female 3-5 years ASD	FA + FCT	aggression, destruction, SIB	Multielement	No; Does Not Meet (only one replication)

Citation	Participants	Intervention components	Dependent Variables	Experimental Design	Determination of Functional Effect; Effect Size and/or WWC Standards Threshold
Tsmai et al., 2019	Interventionists: parents Child: 12 children; ASD; 8 male 4 female; ages 3-18 years	FA + FCT	Responses per minute of CB; caregiver fidelity	MBD across participants	Yes; Meets without Reservations
Wacker et al., 2013	Interventionists: parents Child: 16 male; 1 female; ASD; aged 12 years or younger (3 <3 years old)	FA + FCT	Aggression, SIB, property destruction, screaming, elopement, caregiver fidelity	MBD across participants	No; Meets with Reservations

Note. P = participants; CB = challenging behavior; FA = functional analysis; FAI = functional analysis interview; FCT = functional communication training; ASD = autism spectrum disorder; PDD-NOS = pervasive developmental disorder not otherwise specified, RCT = randomized controlled trial; SIB = self-injurious behavior

Experimental Design

Twelve of thirteen studies used a single subject research design and one (Lindgren et al., 2020) used a group design. Of the single subject research design studies, multiple baseline designs across strategies (Fettig et al., 2016) or participants (Shieltz et al., 2018; Suess et al., 2016; Tsmay et al., 2019; Wacker et al., 2013) were utilized in 54% of studies ($n = 7$). Dimian et al. (2018) and Simacek et al. (2017) used a multiple probe design with embedded reversal. Three studies (Benson et al., 2018; Gibson et al., 2010; Suess et al., 2014) used a reversal design. Machalicek et al. (2016) and Monlux et al. (2019) utilized an AB only design, immediately excluding a rating other than *Not Met*. Lindgren et al., 2020 conducted a randomized control trial (RCT).

Participants

Child Participants

A total of 90 children between the ages of 18 months and 16 years took part in the included studies. Of this group, 68 were male, 18 were female, and gender was not reported for the remaining 10 children. Of the 12 out of 13 studies that reported ages for child participants, most participants were between the ages of 3 and 5 ($n = 66$), followed by 6 and 12 ($n = 20$). The fewest number of participants were below 3 years of age ($n = 8$) or between the ages of 13 and 18 ($n = 2$). The most reported diagnosis was autism ($n = 72$), followed by intellectual disability ($n = 25$), pervasive developmental disability not otherwise specified ($n = 13$), and Fragile X ($n = 11$), with some participants falling into multiple disability categories.

Caregiver Participants

A total of 93 caregivers were included in studies. Of these, the vast majority were parents (n = 89). Other caregivers trained included two preschool staff (Gibson et al., 2010), and one early intervention provider (Fettig et al., 2016). One study (Tsmay et al., 2019) reported that the child participant's brother completed the generalization probe. Of the studies that reported the age and gender of the caregivers, a total of 40 females (37 mothers, 2 preschool staff, one EI provider) and 7 males (6 fathers and 1 brother) took part in the research. The most common age reported was between 18 and 40 years (n = 46) and 6 caregiver participants were above the age of 40. Caregiver age was not reported in 8 of the 13 studies. Nine studies reported the level of caregiver education, which ranged from high school diploma to graduate degree, with majority of adult caregivers having completed a bachelor's degree (59%).

Intervention

Technology

When examining eligible studies, it was apparent that there were commonalities across equipment used (software and technology) due to the technology-based video conferencing nature of remote service delivery. Equipment included computers or iPads, tripods, Logitech video cameras, and headsets. The most commonly cited software utilized was Debut (n = 6 studies), followed by Skype (n = 3 studies) and Google hangouts (n = 3 studies). Other studies utilized Facetime, Polycrom, iChat, and Zoom. It should be noted that sometimes multiple software platforms were used simultaneously (Google hangouts and Debut), and a few studies mentioned the use of data collection software (Lindgren et al., 2020; Wacker et al., 2013).

Training Procedures

All studies included in this review utilized training components within a package. All studies utilized pre-session training components which consisted of providing written or verbal instructions to the caregivers. One study used the term “coaching” (Dimian et al., 2018), but did not specify what constituted as “coaching”. Fettig et al. (2016) used modeling and collaboration to create a behavior support plan. Gibson and colleagues (2010) provided written instructions, modeling, role play, and feedback. Machalicek and colleagues (2016) noted gathering all materials for the caregivers prior to the session in addition to providing written and verbal instructions. In addition to verbal instructions provided pre-session, Monlux et al. (2019) sent text reminders, carried out check-ins to review progress, reviewed procedural fidelity and goals, and offered didactics of basic behavioral principles (e.g., behavior functions, extinction, and positive and negative reinforcement) that contained video examples of other caregivers modeling strategies and pictures showing successful environmental modifications. Shieltz et al. (2018) assessed equipment needs, prepared materials and determined terminal treatment goals prior to sessions. Suess et al. (2014) provided feedback on the homework videos from the previous week prior to the beginning of the session. Tsmay et al. (2019) conducted interpreter training and intake appointments, and Wacker et al. (2013) engaged in review and discussion.

The most used strategies during the sessions were verbal/written instructions (n = 10) followed by feedback (n = 7). Self-monitoring checklists (Fettig et al., 2016), correcting errors (Shieltz et al., 2018), and video modeling (Machileck et al., 2016, Lindgren et al., 2020) were some other notable strategies employed by the researchers.

Similar to pre- and during-session training, written and verbal instructions were provided to participants post-session in several studies (n = 5). Participants were asked to record videos (Suess et al., 2014), complete homework sheets for practice (Suess et al., 2016), and review video clips and graphs (Fettig et al., 2016). Lindgren et al. (2020) noted that they answered questions and explained objectives for the upcoming session, and asked caregivers to practice the strategies discussed for 10-15 minutes each day outside of their sessions.

Of all studies included in this review only 46% (n = 6 studies) included collecting and reporting data regarding treatment fidelity for caregiver training procedures using a task analysis or fidelity checklist.

CB Intervention Procedures

All studies included in this review used functional analysis or functional behavioral assessment coupled with subsequent functional communication training (FCT) as the intervention to reduce challenging behavior. Whereas most studies (n = 11) completed a functional analysis of challenging behavior, Fettig et al. (2016) and Gibson et al. (2010) employed the use of functional behavior assessment with “prevention strategies” and “teaching appropriate replacement behaviors.”

Most studies described the location of the intervention being implemented in the home (n = 10), with a one study taking place in a school, clinics (n = 2), or local telemedicine site (n = 1). Twelve of the thirteen studies reported on where remote training originated: research lab at a university (n = 6), clinic (n = 5), or provider’s office school (n = 1).

Dependent Variables

Data collection for child behavior was conducted via video recorded clips or live stream video conferencing. For the single case design studies, the most reported CB was self-injurious behavior, followed by aggression and then property destruction. Some studies also reported on positive replacement behaviors such as requesting using vocalizations or alternative communication systems. Caregiver dependent variables included acquisition of skills (Fettig et al., 2016; Lindgren et al., 2020) or fidelity of implementation of intervention strategies (Machalicek et al., 2016; Monlux et al., 2019; Shieltz et al., 2018; Simacek et al., 2017; Suess et al., 2014; Tsmay et al., 2019; and Wacker et al., 2013). Fettig et al. (2016) was the only study that included data on maintenance of treatment effects following the intervention, and Tsmay et al., (2019) was the only study that included generalization probes (i.e., different caregiver as implementor).

Social Validity

Almost all studies (77%; n = 10) reported on social validity of the intervention procedures. Components of social validity evaluated included information on caregiver perception of the extent of the CB before and after intervention, the acceptability of the caregiver training procedures, and the acceptability of the intervention and outcomes. In all studies that assessed social validity either a Likert scale or an open-ended questionnaire was used. The most used rating form was the Treatment Acceptability Rating Form (TARF; Reimers & Wacker, 1988). Social validity measures were used post-intervention and no study mentioned caregiver involvement in defining goals and selecting interventions.

WWC Standards and Evidence of Impact

Of the twelve single case research design studies, only three studies received a rating of *Meets WWC SCD Standards Without Reservations*, five studies received a rating of *Meets WWC SCD Standards With Reservations*, and five studies received a rating of *Does Not Meet SCD Standards*. Further visual analysis indicated that clear functional effects were present in four studies. That is, the effect was immediate and yielded little or no overlap in data paths and little variability. Immediacy of effect occurred for all participants in seven studies. All studies except for three demonstrated overlap in data points between phases. The average number of replications across studies was three. For the group design study (Lindgren et al, 2020), the reported effect size was 1.57, providing strong evidence in support of the positive behavioral effects of function-based intervention delivered via telehealth for young children with challenging behaviors. However, the study received a rating of Does Not Meet Standards as the baseline equivalence requirement (p value > 0.25) was not satisfied.

Discussion

The purposes of this review were to (a) identify the characteristics of the existing literature base using remote (i.e., tele-practice) coaching for caregiver-implemented intervention studies for children with CB in terms of participants, interventions, training components, and outcomes? and (b) determine the degree of evidence to support the existence of a functional effect between telehealth delivery of function based intervention and reductions in challenging behavior for single case designs or the effect sizes reported in group experimental studies. This review adds to the existing literature by providing specific details about how caregivers are involved in processes related to the assessment

and treatment of CB when services are delivered remotely. The systematic search identified 12 single case experimental studies and one group experimental design study that met inclusion criteria. Collectively, this group of studies confirm caregiver involvement in remote interventions for CB to be feasible, acceptable, and potentially effective. A major finding of the current review is that while there is some evidence to suggest remote coaching of caregiver implemented interventions for CB can be effective, it is still an emerging practice. A large part of the issue here is the quality of studies, with few meeting WWC standards. There is a paucity in the literature on systematic evaluation of the specific techniques used and the use of social validity throughout the study process. Further, there has only been one experimental group design conducted to date that does not meet WWC Standards as the baseline equivalence requirement (i.e., Baseline Effect Size > 0.25). was not satisfied.

Child participants were primarily male, fell between the ages of 3 and 12, and were diagnosed with autism and/or intellectual disabilities. Caregiver participants consisted of primarily mothers ages 18-40, with education ranging from a high school diploma to a graduate degree. Most remote interventions for CB occurred in the home setting, with a few exceptions (i.e., school, community clinic). Almost all studies involved a form of functional assessment or analysis coupled with functional communication training. Sessions most often occurred weekly ranging from 45 to 120 minutes. Caregiver training methods consisted of written/verbal instructions before the session, modeling and feedback within the session, and some reported homework such as “asked to practice” following the sessions. Researchers used video conferencing technology including Debut and Google hangouts. Whereas treatment integrity was

collected for caregiver implementation of intervention, few studies reported integrity measures for caregiver training. Positive outcomes for children were reported across studies in terms of reduction in CB and positive caregiver outcomes included the acquisition of new skills and/or improved treatment integrity. It is encouraging that almost all studies included a measure of social validity (i.e., TARF), however, no study reported on the degree of caregiver choice of intervention, goodness of fit within their existing structures/routines, or consideration of family satisfaction with the procedures throughout the process.

Due to the high prevalence of CB and limited access to behavioral and mental health supports, caregivers need the tools to address CB and identify effective individualized support strategies (Snell et al., 2011). Consistent with previous reviews (Wood et al., 2014; Gerow et al., 2018), it is notable and concerning that the studies do not include operational descriptions of training strategies utilized to train caregivers throughout the assessment and intervention process. Although many studies included treatment integrity measures for caregiver implementation, four out of thirteen studies included treatment integrity of caregiver training. More research is needed on the training methods and subsequent effects of caregiver training for CB delivered in a remote format.

Limitations of the review should be considered. First, the reviewers attempted to use the author's words when reporting data for all descriptive coding (i.e., procedures, training components) but codes may not be an accurate representation of what occurred during the studies. The studies reviewed focused on caregiver involvement for interventions aimed to decrease CB, rather than the assessment process alone, caregiver

education, or interventions for other things such as skill development. It was difficult to identify specific procedures given limited information reported and the variety of components used by researchers. Future research should consider conducting component analysis of effective caregiver training methods to ensure the most efficient and effective processes.

In sum, this systematic review suggests that remote caregiver training for interventions that target CB is feasible and acceptable, and in a little number of studies shown to produce immediate and large changes in child CB. In accordance with findings from previous reviews (Ferguson et al., 2018), small improvements in research rigor and description of procedures could lead to remote service delivery being delivered more widely and with a greater probability of success. Remote service delivery clearly provides an accessible vehicle for practitioners to reach families who now have limited opportunities for their children with CB. While all of the studies in the review demonstrated positive effects with caregivers and their children, they lacked home/family centeredness, provision of training support, inclusion of family perspectives and goals in the design of the intervention plan, and detailed procedures of training to ensure fidelity of behavior plan implementation. There is an unmet need for an evidence-based program to support the individualized needs of young children with CB that includes each of these key components. Existing manualized approaches (PTR suite of products) should be utilized in order to address the need for more streamlined, yet detailed protocols for the assessment and treatment of CB.

Remote Prevent, Teach, Reinforce for Families (PTR-F:R) answers the call for an effective, research based model that is geared toward all children and families whose lives are impacted by severe and persistent CB. Additionally, PTR-F is described in precise, operational detail and designed so that the assessment and intervention strategies can be implemented with integrity, or fidelity, thereby increasing the likelihood of an efficacious intervention. It also includes self-evaluation measures to ensure readiness to move on to the next step in the process. The process is written in a clear and concise family friendly manner, with family choice in mind to ensure contextual fit within their routines, customs, and values. Although PTR-F has been utilized in vivo (Joseph et al., 2019), it has not been utilized in the virtual, or remote format. There is a need for the development of procedures so that interventionists (i.e., school psychologists, behavior specialists, etc.) can provide support to families to develop and implement individualized function-based intervention plans tailored to family needs and preferences. The development of PTR-F:R meets this unmet need by developing an intervention that can be remotely provided by school personnel to partner with families in addressing the critical needs of young children demonstrating CB.

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MANUSCRIPT TWO:

REMOTE DELIVERY OF PREVENT TEACH REINFORCE FOR FAMILIES (PTR-F:R)

Introduction

As young children grow and develop, they are learning to communicate their wants and needs and regulate their emotions. Due to this typical developmental process, it is not unlikely for children to behave in ways that are confusing or challenging to their parents or caregivers. “Challenging behaviors” are any kinds of actions or behavior patterns that interfere with functioning in daily routines such as mealtimes, dressing, playtimes, and/or bedtimes (DEC, 2017). Some examples of challenging behaviors include excessive crying, property destruction, throwing things, hitting, kicking, pushing, yelling, and elopement. Challenging behavior (CB) may also include persistent lack of cooperation or noncompliance. The term “challenging behavior” is interchangeable with the terms “problem behavior” or “behavior problems”. Regardless of the terminology used or the specific topography of the behavior, these acts impede daily functioning and often persist for months and years without intervention (Dunlap et al., 2017).

Whatever the form, frequency, duration, or intensity of CB it can potentially affect a child’s development, learning, and relationships and can be difficult for families, caregivers, and educators to remedy (DEC, 2017). Without effective intervention, challenging behaviors have been associated with negative family outcomes such as

increased parent stress levels, parent depression and caregiver burden (Baker et al., 2011; Durand, 2011; Long et al., 2008) and impaired relationships with siblings (Orsmond, Kuo, Seltzer, 2009). Parents of children with challenging behavior report that they lack confidence in their parenting skills and abilities to parent effectively (Woodman & Hauser-Cram, 2013). Accordingly, effective interventions for CB should not just focus on reducing CB but also provide adult family members with skills to be effective and confident intervention agents.

Intervention for Challenging Behavior

Fortunately, effective interventions for challenging behaviors are possible because of certain natural laws that determine when and where behaviors occur (Dunlap et al., 2017). There are resources available to support the design and implementation of behavior support strategies that afford an understanding of how, when, and why challenging behaviors occur as well as how they can be resolved. Applied behavior analysis (ABA) is a broad discipline utilized by several professional fields including education, social work, psychology, child development, and business that applies the principles of learning to produce socially significant changes in a person's behavior (Dunlap et al., 2017; Cooper et al., 2019). Positive behavior support (PBS) is derived from ABA and is an evidence-based strategy for addressing CB and promoting quality of life. PBS includes research-based assessment, intervention, and data-based decision making that focusses on building social and other functional competencies and thereby decreasing behaviors that interfere with learning and positive relationships (Kincaid et al., 2016). Of the shared hallmarks of ABA and PBS is the emphasis on being responsive to data and employing preventative practices to elicit socially meaningful behavior

change. For decades, researchers have demonstrated the effective use of procedures (e.g., shaping, functional communication training, choice) grounded in the principles of behavior to increase desired behaviors and decrease CB.

A tenet of both ABA and PBS is functional behavior assessment (FBA). FBA procedures such as functional analysis of CB lead to interventions that are more effective, efficient, and individualized (Dunlap et al., 2017; Filter & Horner, 2009). Further, IDEA mandates FBA for students with disabilities and CB that interferes with their daily life (Hoffman et al., 2019; IDEA). Including FBA is the gold standard in identifying the maintaining variables of CB and efficacy of interventions for CB (Oliver et al., 2015; Hoffman et al., 2019). There is a need to support caregivers of young children in preventing and decreasing CB using family focused, collaborative practices, culturally sustaining and equitable interventions, and comprehensive functional assessment procedures (Dunlap et al., 2017).

Prevent, Teach, Reinforce

Dunlap and colleagues have responded to this need through their development of Prevent, Teach, Reinforce (PTR) suite of products (Dunlap et al., 2010; Dunlap et al., 2013; Dunlap et al., 2017). PTR was developed as an individualized process of PBS that includes FBA and the use of individualized intervention strategies originating from applied behavior analysis. Packaged as manualized protocols, PTR, PTR-Young Children (PTR-YC), and PTR-Families (PTR-F) are distinguished by the precision, step by step forms, and strategies for enhancing fidelity of implementation of function-based intervention (Dunlap et al., 2017).

The PTR model has demonstrated effectiveness in reducing CB and increasing desirable behaviors for school aged children in a randomized control trial with 245 participants (Iovanne et al., 2009). Strain and colleagues (2011) found similar effects with three students with autism spectrum disorders. More recently, Dunlap et al. (2018) investigated differences in outcomes between PTR-YC and typical services provided for preschoolers with CB and revealed statistically significant differences in levels of challenging behavior, engagement, and social skills.

Important research has also demonstrated the use of PTR model in family contexts (Dunlap & Fox, 1999; Fettig & Barton, 2014; Fettig et al., 2015). Involving families in decisions helps to ensure that practices are sensitive to the cultural, linguistic, and diverse needs of children and their families (Ortiz, 2014). Best practice guidelines for promoting family engagement include basic relationship elements such as sincerity, trust, and respect conveyed through interactions and communications (Sheridan et al., 2014). Providers and families must work together to promote social-emotional competence and address CB (DEC, 2017). For children with CB, their caregiver's access to services is a critical need and the impetus for which PTR-F was created.

Prevent Teach Reinforce for Families (PTR-F)

PTR-F is distinguished from the other PTR products by its focus on implementation by parents and other caregivers in homes and community environments. Similar to the other manuals in the PTR suite of products, PTR-F is a specific, manualized model of intervention planning and implementation for helping families to resolve their children's serious CB (Dunlap et al., 2017; Fronapfel et al., 2018). Similar to PTR and PTR-YC, PTR-F is backed by extensive research grounded in positive

behavior supports and applied behavior analysis (Dunlap et al., 2010; Strain et al., 2011; Dunlap et al., 2018).

The manual includes a comprehensive list of strategies for each component of the behavior support plan: *Prevent*, *Teach*, and *Reinforce*. Each strategy is complemented with a thorough description, rationale, examples of how the strategy could be used, steps for implementation, special considerations, and supporting evidence. The user friendly PTR-F framework includes a 5-step process: initiating the PTR-F process, PTR-F assessment, PTR-F intervention, coaching, and monitoring plan implementation and child progress.

During the initial meeting for PTR-F, a team is formed of people who will be involved in the PTR-F process to develop and implement the behavior intervention plan. The team should be comprised of relevant individuals including those who will be implementing the plan such as family members as well as support specialists or therapists who observe and support the child and family around the CB or related skills. Step 1 of the PTR-F process includes a team discussion regarding the importance of family centeredness and working as a team, and agreement on the roles of different team members throughout the process. Both long-term goals and short-term objectives (e.g., parent-child interactions, social emotional development for the child, settings prioritized for intervention, etc.) are identified so that all participants understand the outcomes and agree they are desirable and realistic. Specific short-term behavior goals are outlined for the child regarding CB to target for decrease and a desirable behavior to target for increase. These goals should be achievable in about 2-months' time and are the smaller

steps toward achieving longer-term outcomes. Finally, the team decides upon a strategy for measuring target behaviors for progress monitoring.

During Step 2, an assessment of behavior in the routines that caregivers have described as challenging is completed. The purpose of this assessment is to determine under what conditions CB occurs, also referred to as a functional assessment or FBA. This assessment consists of simple questionnaires completed by the caregivers and a summation of the responses in order to further understand the relationship between events in the environment and the occurrence of challenging and desirable behavior (checklists available upon request).

During Step 3, information from Step 2 is used to formulate an intervention plan that includes at least three strategies: one prevent strategy, one teach strategy, and one reinforce strategy. The “Menu of Intervention Strategies”, provided in the PTR-F manual, is comprised of evidence-based strategies including, but not limited to, using visual supports and schedules, providing choices, embedding multiple instructional opportunities, and providing reinforcement for desirable behavior. This step requires that the team develop a detailed plan that targets the antecedents and consequences of challenging and desirable behaviors which includes planning for the teaching of functional skills that can replace the child’s CB. As part of intervention planning, specific steps are outlined in partnership with the caregivers to maximize the probability of success and ensure the plan is tailored to the individualized needs of the family and child.

Step 4 entails coaching, which is understandably woven throughout the entire process, but due to its importance, warrants its own chapter in the PTR-F manual. Important components such as fidelity of implementation, the importance of the

relationship, the significance of cultural differences, and the process of fading coaching support are described in detail.

Step 5 focusses on the practical and feasible strategies that the family will use to monitor progress and assess the effectiveness of the behavior plan they have developed. There is discussion around using data to improve implementation as well sharing the data with other relevant parties (e.g., school, agencies).

The authors propose the following factors to consider when implementing PTR-F: (a) commitment to successful outcomes, (b) fidelity of implementation, and (c) the relationship between family and supporting professional (Dunlap et al., 2017). PTR-F also urges practitioners facilitating the process to remain family-centered, ensure contextual fit of behavior support plans developed, use a strengths-based approach, recognize the importance of coaching and support, and provide support tailored to family need (Dunlap et al., 2017).

Joseph et al. (2019) examined the effects of behavior support plans developed through the PTR-F process while also examining level of fidelity implementation and social validity ratings. Results indicated that the families implemented the plans with high levels of fidelity and demonstrated functional relations between the intervention and their child's challenging and desirable behaviors. Additionally, satisfaction with target routines and caregiver confidence in implementing the plan improved throughout the process and resulted in high social validity. The authors noted the need for flexibility and availability from the facilitator in order to support the families. For example, the estimated average time spent with each family across study phases was 16 hours, but that did not include travel time to and from participant's homes. When travel time was added,

each home visit involved 3 plus hours. This time burden severely limits the number of families that any single facilitator can assist. Additionally, the authors noted it was difficult for the facilitator to provide support during the actual routines as they occurred in the family home (i.e., early in the morning or late at night). Joseph et al. (2019) called for continuation of the research and dissemination of the use of PTR-F as a meaningful tool for practitioners and families that can impact immediate and long-term child and family outcomes.

Consistent with implications from several previous studies (Lindgren et al., 2020; Bearss et al., 2018; Heitzman-Powell et al., 2014), it is difficult for caregivers to access qualified professionals to deliver quality function-based assessment and intervention. There is a growing, but minimal body of evidence examining the extent to which caregivers can be trained to implement FBA and intervention procedures. There is a need to explore the degree to which caregivers can learn to implement intensive interventions for CB via training models that are accessible (Gerow et al., 2018; Hoffman et al., 2018).

Remote Delivery Potential

Telehealth, defined as the use of communication technologies (e.g., computer-based video conferencing) to deliver consultation or other services in real-time over a geographical distance (Dudding 2009), is one way to address the gap in accessible evidence based practices for the assessment and treatment of CB. Although telehealth has been used as a service delivery model for over 50 years (American Telemedicine Association, 2020), it has become increasingly popular in recent years, with an average annual growth rate of 52% (Barnett et al., 2018). Shieltz and Wacker (2020) allude to synchronous interactions or live videoconferencing as the most common form of

telehealth for the purposes of consultation between providers and the direct assessment of treatment of CB displayed by children.

Hodges et al. (in progress) evaluated the existing literature base regarding telehealth as the service delivery model for caregiver implemented assessment and treatment of CB. The authors summarized results from 13 studies and found most caregivers trained were parents of children with autism spectrum disorder exhibiting CB ranging from noncompliance and tantrums to self-injurious behavior and aggression. An encouraging finding was that most studies employed the use of FBA, particularly functional analysis of problem behavior. Positive outcomes were noted across all studies, including decreases in CB and increases in appropriate replacement behaviors such as requesting desired items. Secondary outcomes included caregiver acquisition of knowledge regarding evidence-based practices and skills. Limitations of the studies included inadequate descriptions of specific caregiver coaching/training methods, particularly considering the complexity involved in a functional analysis and the expert driven determination of the processes utilized. Although treatment acceptability measures indicated that caregivers were pleased with the procedures, little mention was made of the relationship between the provider and caregiver and what the partnership consisted of throughout the assessment and intervention process. There is a need to address the limited and incomplete evaluations of systematic coaching/training methods and social validity as they relate to caregiver implemented interventions for CB, and especially the lack of such evaluation in caregiver led interventions for CB delivered via telehealth (Chung et al., 2020).

Purpose of the Current Study

The purpose of this study was to develop, evaluate, and refine a process for remote application of family-centered intervention for reducing CB and increasing the social skills and engagement of five young children in home settings. Primary research questions included the following:

- (1) To what extent is there a functional relation between caregiver implementation of the function-based behavior intervention plan and reductions in challenging behavior?
- (2) Does PTR-F:R lead to high levels of caregiver fidelity of implementation of behavior support strategies?
- (3) How do caregivers rate the social validity of the goals, procedures, and outcomes of PTR-F:R?

Secondary research questions focused on the novel use of pre-post intervention measures as a precedent to a future randomized trial:

- (4) To what extent is the implementation of PTR-F:R associated with caregiver-rated improvements in child behavior, social skills, and adaptive behavior?
- (5) To what extent is the implementation of PTR-F:R associated with a reduction in parenting stress and improvements in caregiver well-being?

It is hypothesized that:

- (1) Caregivers will learn behavior intervention strategies that decrease challenging behavior while increasing desired behaviors in their children.
- (2) Children of participating families will decrease in the amount of challenging behavior observed.

(3) Following coaching and technical support, caregivers will report positive ratings of social validity of the goals, procedures, and outcomes.

(4) Caregivers will report a reduced rate of CB and improved social skills and adaptive behaviors.

(5) Caregivers will report reduced stress and improved well-being following participation in the PTR-F:R process.

Method

Facilitator

The primary author and researcher served as the PTR-F facilitator for all families who participated in the study. The researcher was White, had a master's degree in education, and was pursuing her doctorate in school psychology. She was a Board Certified Behavior Analyst (BCBA) and had worked in homes and schools for six years.

Participants

Staff at an inclusive childcare center initially shared information about the study with families. Five young children (ages 2 to 5) with CB and their families participated. All young children were White and living in suburban neighborhoods outside of a large, metropolitan city in the Western United States. Each child lived in a two-parent home and both parents participated in the PTR-F:R process. All parents had received a bachelor's degree or higher.

To determine whether or not child participants met inclusion criteria for the study, the facilitator administered the Eyberg Child Behavior Inventory (ECBI; Eyberg & Pincus, 1999). Scores of 131 or higher on the Intensity Scale are considered to potentially

suggest a significant problem, and a score of 15 or higher on the Problem Scale indicates the caregiver is significantly distressed by the child's behavior. These were the cutoff scores for inclusion in the study. Children were eligible to participate in the study provided they displayed CB as indicated on the ECBI below the aforementioned cutoff scores for at least 2 months' time and were between 2 and 5 years of age. Children were excluded from the study if they did not meet the above criteria, their CB warranted significant safety concerns (e.g., danger to self or others) or there was a medical basis for CB as identified during pre-screening. No one that participated in the pre-screening process for this study was excluded.

Family participants/caregivers included any caregiver in the home who regularly participated in daily routines with the child. Eligibility criteria for caregivers included (a) an agreement to be present for all routines in which the CB occurs, (b) availability for sessions that would occur at least once per week for one hour for approximately 2-months, (c) spoke English in the home, and (d) were expected to remain at their current residence for the remainder of data collection.

RP and His Family

RP was a 2-year-old boy when his family enrolled in the study. He attended a nonprofit childcare center 5 full days per week where he received speech and occupational therapy (OT) services. All meetings and sessions took place in the family's home in the areas including the living room, kitchen, and R's bedroom. R's parents, ages 34 and 35, both obtained a college education and were working outside the home. R had no reported diagnoses at the time of the study.

KM and Her Family

KM was a 4-year-old girl when her family began participating in the study. She lived at home with her two younger sisters (ages 2 and 2 weeks), mother and father (both age 37). Her mother referred to herself as a stay-at-home parent and her father worked outside the home as an attorney. KM attended full day preschool 5 days per week where she received speech and OT services. She was diagnosed with Cornelia de Lange Syndrome.

EB and Her Family

EB was a 2-year-old girl when her family began participating in the study. She lived at home with her two older sisters (ages 5 and 8), mother (aged 40), and father (ages 41). Her mother worked full-time as a CEO and her father worked part time in real estate. E attended full day preschool 5 days per week. She did not have a diagnosis.

EL and His Family

EL was a 3-year-old boy who lived at home with his baby brother (13 months old). His mother (age 29) worked part time from home and his father (age 29) worked full time as a pastor. EL attended preschool 2 full days per week where he was receiving speech and OT services. He did not have a diagnosis.

EP and Her Family

EP was a 4-year-old girl who lived at home with her younger brother (age 3), mother and father (both age 38). Both parents were employed full-time outside of the home as attorneys. EP attended preschool 5 full days per week where she received speech and OT services. In addition to the services at school, she had OT once per week and speech once per week. EP was diagnosed with Down Syndrome.

Settings and Routines

All coaching sessions took place in a room in the families' homes with at least six by six feet of available space (e.g., living room, dining room, bedroom). All electronic streaming devices were turned off in the room so as to minimize distractions and improve bandwidth of the selected technology. Environmental modifications were made as necessary and on an individualized basis to ensure safety and increase the effectiveness of the telehealth sessions. At the first visit, the facilitator and caregiver went over action steps that both parties would take in the event of an emergency and completed a technology check to ensure a secure connection, volume, video, and recording capacity.

Steps 1 through 5 of the PTR-F:R process occurred via videoconference between the caregiver and the PTR-F:R facilitator. The facilitator initiated calls from a private office at times selected by the caregiver. The caregiver and child joined all visits from their home. Agendas for each visit are located in Appendix B.

Each family chose a particular target routine (i.e., the most difficult routine of their day) to focus on during the PTR-F:R process. The spaces associated with such routines were the settings for the relevant PTR-F:R steps. Specific settings and target routines for each family are described next.

R and His Family

The setting for R's family consisted of the pathway between his bedroom, living room, and kitchen of the family's home. R's family indicated that the most difficult routine of their day was in the morning when R was getting ready for school. The family indicated that transitions from preferred to nonpreferred activities were always difficult, but that this particular routine was the most difficult due to the time restrictions

associated with their need to leave the house within a certain timeframe in order to arrive on time to school.

K and Her Family

The setting for K's family consisted of the large bathroom upstairs in the family's home. K's mother indicated that the most difficult time of day was following bath time, when her attention was diverted to K's younger sisters. K's mother shared that she typically demonstrates the most challenging behaviors when asked to perform adaptive daily living tasks (e.g., teeth brushing, putting on shoes, putting on clothes) that according to her mother, she can do independently.

E and Her Family

The setting for E and her family consisted of the child table in the kitchen of the family's home. E's family noted that dinner time was the most difficult routine of day. They shared that E was easily distracted during meals, got out of her chair frequently, and as a result, was not consuming an adequate volume of food. The family also indicated that E came home with a full lunch box almost every day, and the facilitator agreed that she would provide support for the lunch time routine at school after the family had completed all of the experimental conditions for the single-case multiple baseline design for the dinner time routine.

EL and His Family

The setting for EL and his family was the living room in their home. EL's family shared that the most difficult routine of the day was in the late afternoon, when EL's brother woke from nap and they were playing together. EL's mother or father always had to be present during these interactions to keep the baby safe.

EP and Her Family

The setting for EP's family consisted of the dining table in the kitchen of the family's home. EP's family indicated that EP exhibited throwing behavior during all routines of the day, but they chose to target table time activities (i.e., end of mealtime and homework time) to facilitate greater consistency in terms of what she was throwing (e.g., homework materials, plates, silverware).

Remote Support Equipment

Each caregiver was provided with a device (i.e., iPad) equipped with built-in webcam, protective case, Bluetooth earpiece, and tripod. Each device was encrypted under the University policy and equipped with HIPPA compliant videoconferencing program (i.e., Zoom) that allowed each caregiver to join sessions in real-time with the PTR-F:R facilitator. The devices were blocked from accessing any additional functions except for Zoom software. Each device was mounted to the tripod in an optimal location in the room of the home so that the caregiver child dyad would be in view of the camera and be clearly seen. During sessions, the family members were asked to disconnect any other devices from Wi-Fi streaming to promote a higher quality of video and audio transfer. The PTR-F:R facilitator used a device equipped with the same videoconferencing software. All sessions across baseline and intervention were recorded via Zoom and stored within a secure drive for later data collection.

Measures

A comprehensive assessment protocol was used to address child outcomes, family outcomes, key parameters of implementation fidelity, and social validity of the

process. All standardized measures selected demonstrated acceptable and published psychometric properties specific to test-retest reliability and concurrent validity and have been used in similar outcome studies (Dunlap et al., 2018; Joseph et al., 2019). Further, they were selected based on the limited response time required from the caregivers in order to answer the proposed study questions. Assessments utilized in the current study followed strict adherence to instructions specified in the testing manuals.

Pre-Screening

The ECBI includes 36 Likert-type scale questions rated by caregivers to indicate the intensity of CB and whether or not the caregiver considers the challenging behavior to be a problem (Eyberg & Pincus, 1999). Each item corresponds with a particular behavior (e.g, “has temper tantrums,” “yells or screams”) that caregivers rate based on the frequency of the behavior from never (1) to always (7). Total Intensity Scale scores, which assesses how often each behavior currently occurs, are considered clinically significant above 131 (range from 36 to 352) and Problem Scale scores, which assess whether or not the behavior is a problem, are considered clinically significant at or above 15 (range from 0 to 36; Eyberg & Pincus, 1999). Previous studies demonstrate the ECBI has adequate discriminant and convergent validity, is sensitive to changes in challenging behaviors, and has been used in previous studies with similar aims (see Joseph et al., 2019).

Demographic questionnaire. A demographic questionnaire (Appendix C) was used to collect descriptive information about each family participating in the study. The measure collected the following information: individuals living in the home, age,

race/ethnicity, education, employment, target child's diagnosis (if any), and the educational and therapeutic services the target child was receiving.

Child Outcomes. Percentage of 10s intervals with CB was recorded by the facilitator during the target routine (Appendix D). Challenging behaviors were defined individually based on information provided by caregivers as part of the PTR-F:R process.

The Social Skills Improvement System (SSIS; Gresham & Elliot, 2008) is a multi-rater screening and assessment tool used to identify strengths and performance deficits in the areas of challenging behavior and social skills. Historically it has been used to identify candidates for intervention services, track progress, and provide longitudinal data for research. This measure takes approximately 15-20 minutes to complete and requires no prior training. Scores are reported as standard scores (mean = 100, SD = 15). Internal consistency is high (.96) as is 6-week test reliability (.90). The SSIS correlates highly with the *Child Behavior Checklist* (.81; Goodman & Scott, 1999). Parent forms of the SSIS were completed by the adult caregiver pre- and post- intervention to assess changes in their child's social skills and CB following implementation of the PTR-F:R process.

Caregiver Outcomes.

The Parenting Stress Index 4th Edition Short Form (PSI-4-SF; Abidin, 2012) is a direct derivative of the Parenting Stress Index (PSI) used for early identification of dysfunctional parent-child interactions, parental stress, and family functioning. Previous research indicates that the PSI-4-SF is related to parent reports of disruptive behaviors (Haskett et al., 2006). The PSI-SF has shown to be a valid and reliable measure with

reported internal reliability coefficients of .80 to .87 for the three subscales. The PSI-4-SF was completed by all caregivers pre- and postintervention to assess their degree of stress.

The Parenting Sense of Competence (PSOC) scale is a 17-item scale used to assess parenting self-esteem (Gibaud-Wallston, 1977). Several studies have demonstrated the importance of parenting self-esteem and its association with both child behavior and parental functioning (Cooklin et al. 2012; Dunn et al. 2012). The measure has strong internal consistency (.80). A higher score indicates a higher parenting sense of competency. There are no average scores or 'cut-offs' for this tool. Adult caregivers completed the PSOC both pre- and post- intervention to determine changes in level of self-esteem related to the task of implementing function-based intervention as prescribed by the PTR-F:R process.

Direct Observation Measurement Details

Live observational data (i.e., percentage of intervals with challenging behaviors, families' percentage of steps implemented, coaching strategies utilized) were collected during weekly Zoom meetings. The occurrence of challenging behavior was scored using individualized operational definitions of the behaviors that were chosen by the family and researcher in Step 1 of the PTR-F:R process. A 10-s partial-interval recording system was used during meetings to calculate percentage of intervals each 5-min block of time. For families 1, 2, and 3, a partial interval recording system was used and for families 4 and 5 a frequency count was used because the behaviors were defined as discrete behavioral responses. Recordings were reviewed later for IOA purposes, further described below. The primary dependent variable in the study was either the percentage of intervals with

challenging behaviors or their frequency of occurrence. The operational definitions used for coding of challenging behaviors consisted of the following:

- R: crying, yelling, screaming, saying “no”, running away to other room, self-injurious behavior (hitting head against hard surfaces), throwing self onto floor
- K: crying, whining, hitting head with hands, flopping to the floor
- EB: engaging in behaviors not related to the routine (e.g., leaving seat, turning entire body away from the table, playing with toys)
- EL: aggression (shoving, pushing, boxing out with body), crying, flopping to ground, grabbing toys out of brother’s hands
- EP: throwing specified materials (e.g., fork, spoon, cup, crayons, etc.) to the ground

Social Validity

The Treatment Acceptability Rating Form (TARF; Reimers & Wacker, 1988) is based on Kazdin’s (1980) original measure of treatment acceptability used to measure parent’s acceptability of clinical interventions and demonstrates high internal consistency (.92). In a systematic review of caregiver involvement in remote interventions for CB, Hodges et al. (in progress) indicated the TARF was the most widely used measure to account for social validity. A modified version of the Treatment Acceptability Form Revised (TARF-R; Reimers et al., 1991; see Appendix E) was used postintervention to measure treatment acceptability.

Procedural Fidelity

Two forms of procedural fidelity were recorded. First, the procedural fidelity of all experimental conditions was documented using facilitator self-checklists after every

visit. These checklists were created for this study to monitor facilitator behavior and determine which adaptations were necessary for the remote facilitation. Second, all sessions were scored using the PTR-F Fidelity of Intervention Checklists to document parent implementation of each child's behavior intervention plan. The checklist included items on each family's behavior intervention plan and were scored as "Yes" (i.e., strategy implemented as intended) or "No" (i.e., strategy not implemented as intended). An overall average of implementation fidelity was calculated by dividing the total number of items marked "Yes" by the total possible items and multiplying the answer by 100.

Interobserver Agreement

The PTR-F:R facilitator served as the primary data collector for the study. The fourth author was the secondary data collector. They held a master's degree in school psychology and were pursuing a doctorate in school psychology. The facilitator trained the secondary data collector on sample video clips until 85% agreement was reached. Interobserver agreement (IOA) for observational data (i.e., child CB, caregiver use of strategies, coaching fidelity) was collected for a minimum of 33% of all sessions across each study phase for each caregiver child dyad. The IOA sessions were randomly determined using a random number generator and the secondary data collector was blind to the phase in which the session occurred. For challenging behavior, an agreement was counted if both raters recorded an occurrence or nonoccurrence of behavior during the trial. For caregiver intervention and coaching fidelity, an agreement was scored if both raters counted the step as implemented or not. IOA was calculated as the percentage of intervals or steps with agreement. Average IOA was 92% for child challenging behavior (range = 83 - 100) and 100% for caregiver intervention and coaching fidelity.

Experimental Design

A single-case multiple baseline design (Baer et al., 1968) across five families was used in order to determine if there was evidence of a functional relationship between PTR-F:R implementation and decreases in CB. The single-case multiple baseline research design has been established in the literature as a feasible design for use with similar populations of children and their families. The multiple baseline design was considered superior for use in this study because it allowed for examination of individualized behavior change across multiple families and contexts. Repeated observations afforded answers to the research questions regarding facilitator implementation, family implementation and response to intervention, and child response to intervention. Consistent with single case intervention research design standards, there were at least 5 data points per phase (Kratochwill et al., 2013) and at least three demonstrations of experimental effect at three different points in time, demonstrating experimental control and evidence of a functional relation between the intervention and the outcomes (WWC, 2020).

Procedures

The length of visits was approximately one hour or less. Prior to Step 1 of the PTR-F:R process, the researcher administered pre-measures (i.e., SSIS, PSOC, PSI-4-SF) as described above. These measures served to inform baseline and intervention data collection and the goal setting discussion at the first planning meeting in alignment with the standard PTR-F process.

Baseline

During baseline sessions, caregivers were encouraged to engage in their typical, existing routine with their child without being given any instruction regarding CB. Baseline observation sessions were recorded and later coded in 10-s intervals for the percentage of CB. All four planning steps in the PTR-F process involved in developing a behavior support plan occurred during baseline, but no intervention implementation occurred until the onset of the intervention phase.

Intervention

Intervention onset for each family followed demonstration of a stable baseline (i.e., minimum of three baseline data points to establish stability; WWC, 2020) and staggered across child caregiver dyads. During intervention planning, the facilitator met with the caregiver to discuss potential function-based strategies generated by synthesizing the results of the FBA checklists. The facilitator provided didactic information on several strategies and guided the caregiver in choosing which strategies they found to be most acceptable and feasible. Following the completion of Steps 1 through 4, the PTR-F:R facilitator met with the caregiver in the first caregiver/child dyad during the target routine chosen by the caregiver and engaged in coaching with the caregiver to support their implementation of the individualized behavior support plan and establish fidelity of intervention. During intervention sessions, the facilitator provided the caregiver with materials necessary for carrying out the intervention strategies described in their child's individualized intervention plan (e.g., timer, visual schedule, social story) and engaged in virtual training on how to implement the strategies. The facilitator provided written instructions, described the steps, and demonstrated each step by role playing with the

caregiver to ensure understanding. The facilitator observed the caregiver in the routine as part of the coaching process and used bug in ear technology to provide in the moment feedback. For a complete description of intervention strategies used for each child, see Table 1 below.

Table 1*Intervention Strategies on the Behavior Support Plans*

Child	Intervention Strategies*
RP	<ol style="list-style-type: none"> 1. Visual schedule 2. Teach to follow schedule independently 3. Teach to tolerate delay of reinforcement 4. Provide choice
KM	<ol style="list-style-type: none"> 1. Read scripted story of calm down strategies prior to the routine 2. Prompt use of a solution when not calm 3. Environmental arrangement
EB	<ol style="list-style-type: none"> 1. Review rules prior to the routine 2. Remove distracting materials 3. Teach to self-monitor using visual supports (i.e., timer, token system)
EL	<ol style="list-style-type: none"> 1. Read scripted story of the routine prior to the routine 2. Teach to choose a solution 3. Increase predictability with visual supports
EP	<ol style="list-style-type: none"> 1. Review schedule and expectations prior to start of routine (social story) 2. Teach active participation in routines 3. Teach to use materials appropriately 4. Teach functional communication training (“all done” or “I need help”)

Note. *“Remove reinforcement for challenging behavior” and “Provide reinforcement for desirable behavior” were included in behavior intervention plans for all children.

After the child behavior data collection sessions, the facilitator engaged in a brief coaching conversation (approximately 15 minutes) with the caregiver. The facilitator

reviewed the steps to ensure caregiver comprehension, determined concerns with implementing the steps as described in the plan, provided feedback, engaged in problem-solving discussion, and/or rehearsed the plan as needed (see Appendix I for operational descriptions of coaching strategies utilized). There was a follow-up email sent to the caregiver immediately following every session, noting what was shared during the coaching discussion and indicating action steps needed prior to the next scheduled session.

Coaching conversations occurred until the caregiver exceeded 80% or greater implementation fidelity. Following coaching, data collection was continued to examine trends and variability of child behavior and maintenance of caregiver implementation strategies. Following the intervention phase once stability in CB was met, post measures were conducted (i.e., SSIS, PSOC, PSI-4-SF, *and* TARF).

The final stage of intervention involved follow-up and support sessions for the caregivers. Specifically, after the data indicated a stable reduction in challenging behavior, the facilitator offered to provide two additional half-hour consultation sessions with the caregivers to answer questions and provide continued support. These sessions were not recorded.

Data Analysis

Visual Analysis

Visual inspection of data, or analyzing specific patterns within and between phases in the data display (WWC, 2020), was used to determine a functional relation between the independent (PTR-F:R) and dependent variables (i.e., child and caregiver outcomes). The level, trend, and variability were analyzed within phases. Level referred

to the average of the data within the condition and will be calculated as both a mean and median, allowing for estimation of the central tendency of the data during that particular part of the experiment. The second dimension of visual inspection that was used was trend, or the best-fit straight line that can be placed over data within a phase. Slope (increasing or decreasing) and magnitude (high, medium, or low) of trend aided in the description of data patterns. The third dimension that was inspected within phases was variability, or the degree to which points deviated from the overall trend, described as high, medium, or low.

Visual inspection also occurred between phases (Kennedy, 2005). First, the immediacy of effect (or rapidity of change) was used to describe how quickly the pattern of data was altered between different phases of the study. The degree of immediacy of effect indicated the strength of a functional relation, if any. Additionally, overlap, or the percentage or degree to which data in adjacent phases share similar quantitative values, was used to indicate the relative strength of the functional relation. Consistent with data analysis in single case research, data were graphed, analyzed, and discussed on a continuous basis over the course of the study. Points at which particular phases of the PTR-F:R process (i.e., goal setting, functional assessment, intervention planning, and coaching sessions) occurred were considered during data analysis.

Results

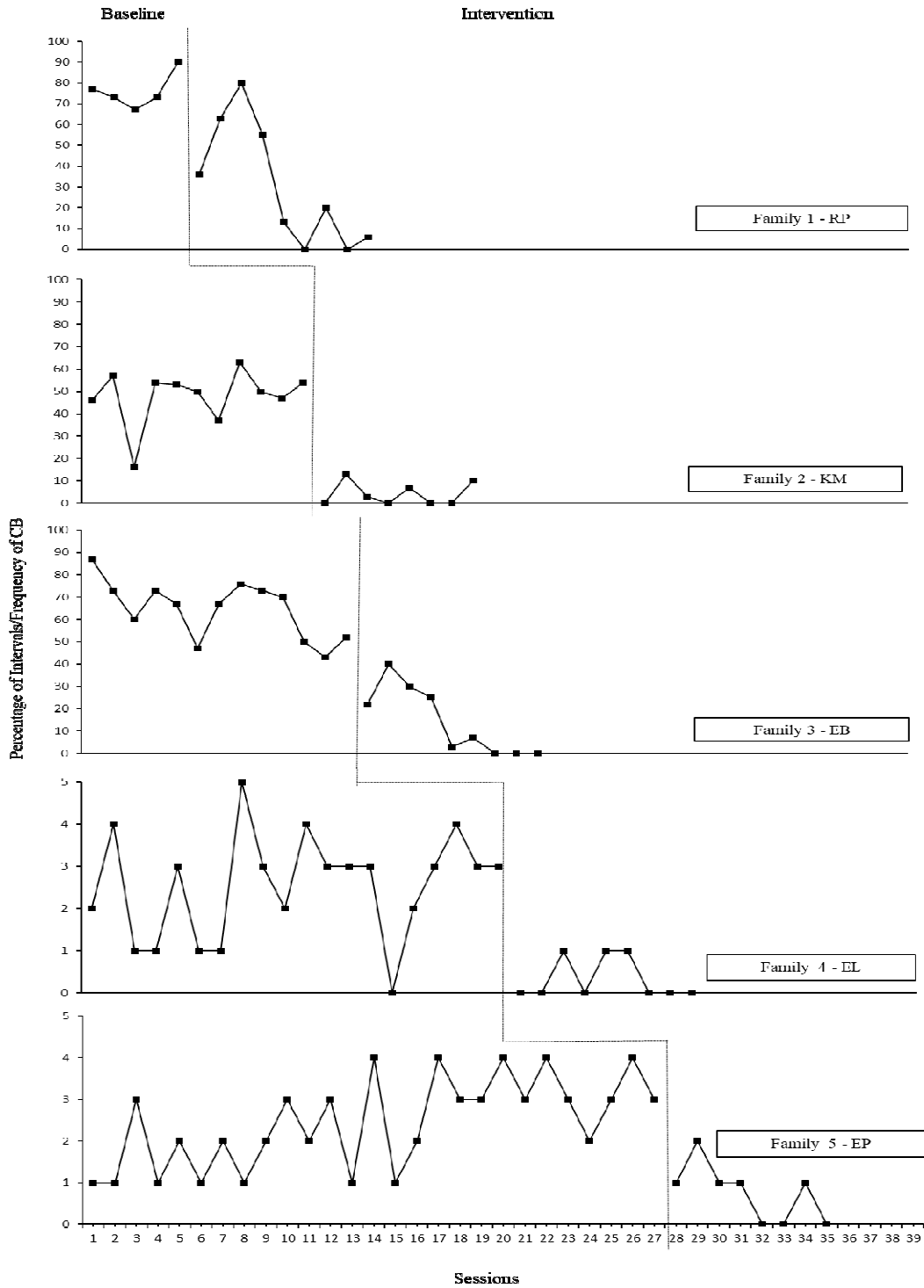
Children's Challenging Behaviors

The impact of PTR-F:R on child challenging behaviors was assessed through visual analysis (WWC, 2020) of the line graph (Figure 1 below). Based on visual analysis

of the data, there was a functional relation between PTR-F:R and child challenging behaviors across all families. In general, the data indicate consistent patterns of challenging behavior across similar phases (i.e., baseline and intervention) and immediate decreases in challenging behavior with the onset of the behavior intervention plan with minimal overlapping data points between phases.

Figure 1

Percentage of Intervals or Frequency of Challenging Behavior During Baseline and Intervention Sessions



RP engaged in elevated rates of challenging behavior ($M = 76\%$, range = 67-90) during the baseline sessions with the final three data points indicating an upward trend. During the intervention phase, R's challenging behavior showed an immediate decrease, and then increased for one data point before descending and leveling out. This variability in the data was primarily due to one session on which he engaged in challenging behavior for 80% of intervals. This data point was the only point of overlap with the baseline condition and may be explained by the low level of treatment integrity at the onset of intervention. Following this initial spike in challenging behavior, the percentage of intervals rapidly decreased to low rates by the end of the phase ($M = 30\%$, range = 0% - 80%).

For KM, challenging behavior occurred during an average of 48% (range = 16% -63%) of intervals during the baseline, with some variability and a stable medium trend. Once the intervention was implemented, K's challenging behavior immediately decreased to an average of 4% (range = 0% - 13%) of intervals, with no overlapping data points with the previous phase.

During baseline, EB engaged in challenging behavior during an average of 64% (range = 43% -87%) of intervals. Although the data show an evident downward trend during baseline sessions, there was no overlap between baseline and intervention data points. In the intervention phase, the slope of the line during intervention was steeper than the baseline phase with less variability. EB's challenging behavior decreased to an average of 14% (range = 0% - 14%) of intervals.

During baseline, EL engaged challenging behavior more frequently than during the intervention sessions ($M = 3$, range = 1-5). When he did engage in challenging

behavior, his mother would often respond by removing his younger brother from the interaction, thus reducing the likelihood that he would have the opportunity to repeat the behavior. During intervention, the rate of challenging behavior reduced to either 0 or 1 occurrence per session and no sibling removals took place.

EP also engaged challenging behavior more frequently during the baseline phase ($M = 2$, range = 1-4). Like EL, once the challenging behavior (i.e., throwing) occurred within the session, she did not necessarily have another opportunity unless there were more objects in her path. Her parents responded to the challenging behavior by removing anything she was likely to throw and putting it up high. During intervention there was some initial overlap with baseline rates of behavior, but the data indicated a downward trend ($M = 1$, range = 1-2). Overall, the level of challenging behavior was lower during the baseline phase.

Procedural Fidelity

The facilitator followed all planned procedures during baseline and intervention conditions and implemented the PTR-F:R process according to the manual using the end of chapter checklists as a guide. A Coaching Reflection Log (Appendix H) was completed following each visit and served as a space to reflect and adapt the format as needed for upcoming visits and future iterations of the remote format. Reliability checks for coaching integrity were conducted using the recordings of each visit.

Regarding caregiver implementation of behavior support plans, each family achieved a preestablished criterion of 80% or greater during the intervention condition. The mean for RP's family's fidelity of intervention was 55% (range = 16% - 83%). KM's family's fidelity of intervention checklist mean occurrence was 81% (range = 75% -

86%). EB's family's procedural fidelity ranged from 71% to 100% ($M = 86\%$). EL's mother's procedural fidelity remained above the 80% threshold for the duration of intervention sessions ($M = 91\%$; range = 83% - 100%). Finally, the mean occurrence for EP's family's fidelity of intervention was 67% (range = 50% - 83%).

Social Validity

All five families favorably rated the PTR-F:R process and the intervention plans that were developed and implemented. On questionnaire items with a rating of 5 indicating the most favorable score, the average social validity ranking across families was 4.7. On questionnaire items with a rating of 1 representing the most favorable score and a rating of 5 the least favorable score, the average ranking across families was 1.3. All caregivers responded affirmatively to indicate the intervention was effective, acceptable, and feasible. Two families (KM's and EP's) indicated that they did not think their family benefited from the PTR-F:R process as well given the remote format as they would have in person. RP's family shared that they "really liked how thorough the process was – from taking time to thoroughly examine his problem behavior, to creating a specific plan that was manageable to implement – really set us up for success. Being remote also freed us up to do our meetings/intervention on our schedule." EL's family shared "the story was very well done and fit our family's values and goals. [Facilitator]'s support, encouragement, and thoughtfulness was incredible. [Facilitator] helped remind me of and teach me tools that really helped."

All five families completed the SSIS, PSI-SF, and PSOC pre- and post-intervention to gauge effects on child behavior and parenting stress and competence. Results of the secondary outcome measures are presented in Table 2 below. Four out of

five families reported improved child social skills, and four out of five families reported decreased CB. These results closely parallel the degree of behavior change seen in prior experimental studies of PTR processes where adults receive live coaching (Dunlap et al., 2018). All five families showed decreases in stress levels and increases in their sense of competence, thus providing further support for the effectiveness of the PTR-F:R process.

Table 2*Pre- and Post-Measure Outcomes for Each Family*

	<u>PSI (total raw score, %)</u>		<u>PSOC (total score)</u>		<u>SSIS (Standard Score, %)</u>	
	Pre	Post	Pre	Post	Pre	Post
Family 1	130, >99%	109, 95-99%	53	78	SS: 65, 2% PB: 105, 66%	SS: 77, 8% PB: 97, 44%
Family 2	95, 90-95%	86, 85%	78	80	SS: 81, 10% PB: 100, 49%	SS: 86, 17% PB: 97, 42%
71 Family 3	80, 75%	78, 70-75%	69	84	SS: 90, 27% PB: 109, 71%	SS: 91, 29% PB: 113, 79%
Family 4	101, 90-95%	92, 90%	71	80	SS: 97, 39% PB: 124, 92%	SS: 101, 50% PB: 121, 90%
Family 5	108, 95-99%	94, 90-95%	66	79	SS: 66, 2% PB: 121, 89%	SS: 59, <1% PB: 118, 86%

Note. PSI = Parenting Stress Index; PSOC = Parenting Sense of Competence; SSIS = Social Skills Improvement Scale; SS = social skills subscale; PB = problem behavior subscale; % = percentile

Discussion

The purpose of this study was to evaluate the impact of PTR-F:R on caregiver implementation of behavior support strategies, child behavior, and caregiver well-being and competence in regards to dealing with their child's challenging behaviors. The following adaptations to the in vivo format were made: (a) use of Zoom technology, (b) electronic submission of forms, (c) didactic presentation of information during behavior intervention planning (i.e., Step 4), (d) adaptation of coaching strategies (e.g., sharing a video of a particular strategy, modeling in a simulated situation to demonstrate use of the strategy, text reminders and within session coaching tips using ear buds, etc.), (e) provision of equipment (e.g., iPads, cases, Bluetooth earpieces, tripods), and (f) guided self-reflection post session for adult family members to inform procedures and quality improvements.

The child behavior data indicate that the above listed modifications resulted in reductions in child CB. This finding is in alignment with a broad literature base supporting caregiver implementation of function-based intervention with their young children with challenging behavior producing desirable outcomes (Wacker et al., 2014; Fettig et al., 2015, Benson et al., 2018; Joseph et al., 2019). It is particularly significant to note that this remote delivery of PTR-F resulted in levels and immediacy of child and family behavior change compared to Joseph et al. (2019) in vivo delivery of PTR-F. The results from this study extend current research by providing evidence of the effectiveness of the PTR-F model specifically when delivered for the first time using remote technology. It is also among the first study of its kind to meet WWC standards in terms of

efficacy (i.e., functional effects, immediacy of effect, overlap in data points, and number of replications).

Second, caregiver's participation in PTR-F:R resulted in high levels of caregiver fidelity of implementation of behavior support strategies. The treatment fidelity data indicate that the above listed modifications resulted in accurate implementation in the training routine for all five families. Coaching strategies used by the facilitator during the process included written and verbal instructions, modeling, role play/rehearsal, problem solving discussion, feedback, and guided self-reflection. These data replicate and extend the findings of Joseph et al. (2019) that reported positive effects for families that use the in-person PTR-F process.. Caregivers' accuracy of implementation in the trained routine increased following coaching and feedback and reached above 80% accuracy within a few sessions. Notably, some families used some of the strategies included in the plan prior to intervention. Additionally, by nature of the PTR-F:R process, questions during the functional behavior assessment step may have yielded an awareness of parent behavior in response to CB. The behavior support plan likely served as a reminder for improved consistency in how caregivers managed CB. Nevertheless, the present study added to the current body of literature by demonstrating that the remote delivery of PTR-F yields similar outcomes pertaining to treatment fidelity as in person delivery.

Third, the social validity findings of this study also support previous studies indicating that families value family-centered behavior support and rate it favorably when responding on social validity measures (Joseph et al., 2019; Fettig et al., 2015). Families responded positively on the TARF regarding their participation in the PTR-F:R process. One family shared how much it meant to them that the intervention strategy used

matched their family's values and goals by incorporating specific language that they frequently used. Further, due to the remote format, the facilitator was able to be more flexible and accommodating to the needs of the families and their schedules. For example, the remote format afforded the opportunity for the facilitator to be present at the time the actual routine occurred (early in the morning or late at night). Families frequently rescheduled, so the facilitator was able to accommodate these requests easily. These aspects of service delivery greatly impacted the efficiency of the process and likely social validity ratings as well.

Fourth, this study demonstrated evidence of caregiver-rated improvements in child behavior, social skills, and adaptive behavior as measured by pre- and post-test ratings on the SSIS. Caregivers rated their child as having lower scores on the Problem Behavior subscale and higher scores on the Social Skills subscale following participation in the PTR-F:R process. These results indicate that PTR-F:R is effective in increasing SSIS social skills and adaptive functioning and decreasing SSIS problem behavior. One out of the five families showed an increase in problem behavior and one out of the five families showed a decrease in social skills, which could be explained by the brevity of the intervention. This is the initial study to demonstrate that parent completed SSIS scores are sensitive to function-based intervention plan implemented in the home.

Fifth, there is evidence to suggest that two behavioral outcomes of the pandemic are an increase in child CB and family stress (UNICEF, 2020). This study demonstrated that participation in PTR-F:R process not only led to reductions in child challenging behavior, it also resulted in decreased parenting stress and improved well-being as measured by the PSI and an improved sense of competence as measured by the PSOC. This is significant

as prior telehealth applications of function-based interventions have only involved expert determination of function and design of intervention plans (Unholz-Bowden et al., 2020). No prior study has utilized PTR-F itself or its methods of full family involvement in the telehealth realm. Given the benefits of caregiver involvement in function-based assessment and intervention delivery, as demonstrated in prior PTR-F studies, there is clearly a compelling scientific need for further replication efforts to establish efficacy of intervention and achieve similar positive outcomes related to caregiver stress, well-being, and competence in managing CB.

Evaluation of intervention effects, fidelity, social validity, and family outcomes were significant in the following ways. First, PTR-F:R is particularly applicable to families during COVID as the telehealth support minimizes face to face contact. Perhaps further illuminated by Covid-19, our typical support processes for putting consumers in contact with evidence-based practice are far too dependent on in person professional delivery (Education Commission of the States, 2020). PTR-F:R can help to fill this national need and expand the literature around remote delivery of evidence-based interventions. Second, and related to point one, an ongoing concern in the field is the intersection between the numbers of qualified personnel to deliver function-based intervention at the early childhood level (Early Childhood Personnel Center, 2019) and children/families receiving an adequate dosage of intervention (Lucyshyn et al., 2002; Joseph and Strain, 2019). A family-mediated intervention approach may well be the key to addressing these convergent concerns, and also lead to reductions in family stress and improvements in their perceived competence. PTR-F:R and its reliance on the family's determination of intervention settings, goals, and strategies directly expands the availability of function-

based interventions delivered with an adequate dosage and fulfills the need for more socially valid function-based intervention service delivery.

Finally, the use of the general PTR process has the potential to provide schools and related providers with an evidence-based model of function-based intervention grounded in applied behavior analysis and the practical strategies of positive behavior support that is consistent in terminology, procedural steps to determine functions, and methods for intervention design and fidelity measurement serving children age 2 to 21. Therefore, the successful completion of PTR-F:R can bridge the pervasive issues around service delivery discontinuities that are so prevalent as children and families transition from Part C to preschool to K-12 systems (Congressional Research Service, 2019; Government Accountability Office, 2005). Moreover, the consistencies across PTR-F, PTR-YC, and PTR hold significant promise for professional development efficiencies as schools strive to build structures to support the high-fidelity delivery of evidence-based practices.

Limitations

This study is not without its limitations. First, for several of the children, the iPads themselves served as triggers for CB. According to adult family members, the iPad caused further disruption in target routines than would have been the case without the iPad. This problem was assuaged by offering bug in the ear technology as a solution. Additionally, due to the nature of the naturalistic observations of target routines, baseline sessions did not always afford occurrence of CB as reported by adult family members. This extended the length of time that families were asked to meet with the facilitator for baseline data collection. This problem could be solved by guiding parents to simulate the contexts in which they described the most frequent and challenging occurrences of CB

(e.g., presenting a nonpreferred activity, prompting to play with a sibling, diverting their attention away from the child, etc.). There were the expected challenges with the technology such as audio delays, tripod malfunction, and child elopement from camera view. An additional limitation of the study worth noting is the brevity of intervention and the inability to determine the long-term benefits or gains from participation in the study. Future studies should consider collecting follow-up data and/or incorporating generalization data probes in additional routines and/or contexts. Certainly, the number of participants in the study, while exceeding both WWC standards and the mean in prior telehealth single case research studies, is insufficient for statistical analyses of the pre/post data. Nevertheless, the direction of results is interesting and certainly point toward the future use of these measures in a sufficiently powered randomized trial. A final limitation of the current study is that no experimental manipulation occurred to determine which strategies from the behavior intervention plan or coaching methodology led to changes in child behavior or adult family member fidelity ratings. It should be noted, however, that the facilitator guided the families each week to determine the most parsimonious plan to effectively manage their child's CB.

Several additional directions for future research have been identified based on these findings and limitations. Research should continue to identify caregiver training methods that result in accurate implementation in a variety of novel situations. Utilizing the PTR-F process in either remote or in vivo format serves as a guide for how to do this, and could be incorporated into a variety of contexts such as staff training, professional development efforts, or clinics, schools, higher education coursework, etc. Future research should continue to identify training methods that require few resources and

provide the maximum benefit to the parent and child by promoting generalization to novel routines, perhaps by conducting component analyses to ascertain the most efficient and effective way to coach adult family members during the PTR-F:R process. Given the positive findings of this study, it is important that the effectiveness of PTR-F and PTR-F:R continue to be studied with young children and families, particularly across children with a variety of disabilities, across families from varying culturally and linguistically diverse backgrounds, and with families of different socioeconomic statuses.

Conclusions

PTR-F is typically used as a tool to assist families to implement individualized positive behavior supports in their home and other relevant settings. Historically adult caregivers using PTR-F have received live coaching followed by technical assistance as needed for several months. This study responded to the call for research aiming to close the gap in access to services via remote service delivery. Additionally, the study addressed the aforementioned need for the evaluation of systematic coaching efforts and emphasized continuous social validity through the systematic involvement of caregivers throughout the intervention process. The data from the present study suggest that PTR-F:R, a manualized approach to caregiver implemented function based behavior intervention plans, is a viable method to decrease challenging behavior and improve caregiver sense of competence when managing their child's challenging behaviors.

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Appendix A

OVERVIEW OF RESEARCH QUESTIONS AND METHODS

Research Question	Variable	Measure	Schedule
Is there a functional relation between remote delivery of Prevent, Teach, Reinforce for Families (PTR-F:R) and caregiver fidelity of implementation of behavior support strategies?	Parent implementation of the intervention plan	Direct observation of family strategy use during targeted routine	Weekly observations
Is there a functional relation between caregiver implementation of the function-based behavior intervention plan and challenging behavior?	Child challenging behavior	Direct observation of child behavior during targeted routine	Weekly observations
How do caregivers rate the social validity of the goals, procedures, and outcomes of PTR-F:R?	Treatment acceptability by caregiver	Treatment Acceptability Rating Form (TARF)	Post intervention
Is the implementation of PTR-F:R associated with caregiver-rated improvements in child behavior, social skills, and adaptive behavior?	Child social skills, challenging behavior, adaptive behavior	SSIS by caregiver, SIBR by caregiver	Pre- and post-intervention
To what extent is the implementation of PTR-F:R associated with a reduction in parenting stress and	Caregiver stress, caregiver sense of competence	Parenting Stress Index (PSI), Parenting Sense of Competence Scale (PSOC)	Pre- and post-intervention

improvements in caregiver well-being?			
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Appendix B

AGENDA FOR EACH REMOTE VISIT

Session Number	Description
Before Visit 1	Consent to participate; Pre-screening measure (i.e., ECBI), caregiver completes additional pre-intervention measures (i.e., SSIS, PSOC, PSI-SF)
Visit 1	Technology and Safety Check Introduction to the PTR-F:R process PTR-F:R Step 1: Initiating the PTR-F process PTR-F:R Step 2: PTR-F assessment
Visit 2	Technology and Safety Check Baseline data collection
Visit 3	Technology and Safety Check Baseline data collection (as needed) PTR-F:R Step 3: Intervention Planning PTR-F:R Step 4: Coaching of Intervention
Visit 4 and beyond (as needed)	Technology and Safety Check

Continuation of PTR-F:R Step 4: Coaching of
Intervention

Final Visit

Technology and Safety Check

PTR-F:R Step 5: Monitoring Plan Implementation and
Child Progress

Caregivers complete post-measures (SSIS, PSOC, PSI-
SF, social validity questionnaire)

Appendix C

CAREGIVER DEMOGRAPHIC QUESTIONNAIRE

Instructions for caregiver: Please provide the following information.

1. List all individuals living in the home:
2. Your age:
3. Your race/ethnicity:
4. Education level attained:
5. Employment:
6. Child's diagnosis (if any):
7. Educational and therapeutic services your child is receiving:
8. Educational and therapeutic services your child has received in the past:

Appendix E

SOCIAL VALIDITY QUESTIONNAIRE

Please score each item by circling the number that best indicates how you feel about the PTR-F:R process, coaching, and application.

1. How likely would it be for you to recommend PTR-F:R to another individual?

1 2 3 4 5
Not at all Likely Neutral Very Likely

2. Do you think you and your family benefited from the PTR-F:R process as well given the remote format as you would have in person?

1 2 3 4 5
No Neutral Yes

3. How acceptable do you find the PTR-F:R model of individualized positive behavior support?

1 2 3 4 5
Not at all Acceptable Neutral Very Acceptable

4. How acceptable do you find the PTR-F:R behavior plan that you developed?

1 2 3 4 5
Not at all Acceptable Neutral Very Acceptable

5. How willing are you to carry out the behavior plan you developed?

1 2 3 4 5
Not at all Willing Neutral Very Willing

6. To what extent do you think there are disadvantages in following the behavior plan?

1 2 3 4 5
None Neutral Many likely

7. How confident are you that the behavior plan is/will be effective for your child?

1 2 3 4 5
Not at all confident Neutral Very Confident

8. How likely is the behavior plan to make permanent improvements in your child's behavior?

1 2 3 4 5
Unlikely Neutral Very likely

9. How much do you like the procedures used in the behavior plan?

1 2 3 4 5
Do not like them at all Neutral Like them very much

10. How willing are other family members to help carry out this behavior plan?

1 2 3 4 5
Not at all willing Neutral Very willing

11. To what extent are undesirable side-effects likely to result from this behavior plan?

1 2 3 4 5
No side- effects likely Neutral Many side- effects likely

12. How well does the behavior plan fit into your existing routines?

1 2 3 4 5
Not at all well Neutral Very well

13. How effective is the intervention in teaching the child appropriate behavior?

1 2 3 4 5
Not at all effective Neutral Very effective

14. How well does the goal of the intervention fit with the family's goals to improve the child's behavior?

1 2 3 4 5
Not at all Neutral Very much

15. What did you like most about the PTR-F:R format?

16. What did you like least about the PTR-F:R format?

17. Do you have any additional comments to make about the intervention and its effect on your child and/or family? For example, does your child seem to do better in other routines not targeted for the intervention?

Appendix F

PTR-F:R COACHING INTEGRITY CHECKLIST

Adapted from Bailey, K. (2013). An evaluation of the family-centered Prevent-Teach-Reinforce Model with Families of young Children with Developmental Disabilities. Graduate Theses and Dissertations. <http://scholarcommons.usf.edu/etd/4862>

Date of Initial Meeting: _____

Facilitator: _____

Data Collector: (who is filling out this form) _____

Task Analysis of Intervention Components	Discussion	Verbal Q & A	Modeling	Role-play/Rehearsal	Observation	Feedback	Facilitator Demonstration	
							Yes	No
Visit 1 (Steps 1 and 2)								
1. Technology check			n/a	n/a	n/a	n/a	Yes	No
2. Welcome and introductions			n/a	n/a	n/a	n/a	Yes	No
3. Overview of Process and Agenda			n/a	n/a	n/a	n/a	Yes	No
4. Explains and Uses Goal Setting Form			n/a	n/a	n/a	n/a	Yes	No
5. Explains and Uses FBA checklist			n/a	n/a	n/a	n/a	Yes	No
6. Explains and sets time to collect baseline data			n/a	n/a	n/a	n/a	Yes	No
7. Check in with caregiver			n/a	n/a	n/a	n/a	Yes	No
Visit 2 (Steps 3 and 4)								
1. Technology check			n/a	n/a	n/a	n/a	Yes	No
2. Goes over baseline data and explains and uses FBA summary table and hypothesis statement			n/a	n/a	n/a	n/a	Yes	No
3. Explains and uses PTR intervention checklist			n/a	n/a	n/a	n/a	Yes	No
4. Develops Intervention Plan			n/a	n/a	n/a	n/a	Yes	No
5. Makes and explains fidelity checklist			n/a	n/a	n/a	n/a	Yes	No
6. Implements training using least to most coaching strategies needed							Yes	No
7. Takes fidelity of implementation data			n/a	n/a	n/a	n/a	Yes	No
8. Check in with caregiver			n/a	n/a	n/a	n/a	Yes	No
Visit 3 and beyond (as needed)								
1. Technology check			n/a	n/a	n/a	n/a	Yes	No
2. Guide intervention implementation							Yes	No
3. Check in with caregiver			n/a	n/a	n/a	n/a	Yes	No
Final Visit								
1. Technology check			n/a	n/a	n/a	n/a	Yes	No
2. Explains and uses self-evaluation and official social validity measure			n/a	n/a	n/a	n/a	Yes	No
Total Number of Correct Steps								
Percentage of Correct Steps								

Appendix G

PTR-F CAREGIVER IMPLEMENTATION FIDELITY CHECKLIST

Routine: Child:

Facilitator: IOA Data Collector:

Instructions: Enter each detailed step that will need to be completed in order to correctly implement the behavior plan, then score yourself or another caregiver as they implement the plan. Add the number of correct steps and divide by the total number of steps in the plan to find out what percentage of time the plan was implemented correctly.

Task Analysis of Intervention	Did the caregiver complete the step?	Did the caregiver complete the step?	Did the caregiver complete the step?
Prevent Steps	Date:	Date:	Date:
1.	Yes No	Yes No	Yes No
2.	Yes No	Yes No	Yes No
3.	Yes No	Yes No	Yes No
Teach Steps			
1.	Yes No	Yes No	Yes No
2.	Yes No	Yes No	Yes No
3.	Yes No	Yes No	Yes No
Reinforce Steps			
1.	Yes No	Yes No	Yes No
2.	Yes No	Yes No	Yes No
3.	Yes No	Yes No	Yes No
Total Correct Steps			
Percentage of Correct Steps			

Appendix H

PTR-F:R FACILITATOR PLANNING AND REFLECTION LOG

Family name: Coaching Session Date:

Target Routine	Time of Routine	Caregiver to coach

A. Progress review (notes from discussion with family):

B. Review of intervention plan (notes from discussion with family):

C. Observation of Routine:

What I observed	What I want to share

D. Coaching strategies I used today:

Observation Role-Play/Rehearsal Problem-solving discussion

Modeling Feedback Environmental arrangement

other (list):

E. Reflection/feedback (notes from discussion):

F. Next steps:

Follow up to family:

___ e-mail ___ phone call ___ text message ___ material provision

___ other (list):

G. Day/time and focus for next session:

H. Self-Reflection

- 1) What went well (e.g., routines, environment, technology, etc.)?
- 2) What did not go well and why?
- 3) Any changes or action steps prior to next session?

Appendix I

Table X. Coaching strategy descriptions (Dunlap et al., 2017) and adaptations.

Coaching strategies	Definition (PTR-F)	Adaptation (PTR-F:R)
Video recording	The facilitator uses a video-recording device to record the intervention routine so that it can be viewed by the family member and facilitator for reflection	The facilitator records all visits so that they can be viewed by the research team for reflection and data collection
Modeling	The facilitator demonstrates how to use the intervention strategy with the child during the intervention routine	The facilitator demonstrates how to use the intervention using extra copy of materials
Role Play/Rehearsal	This strategy might be used when reviewing the behavior support plan before observation or after the observation to practice. Role-playing involves simulating the situation, with the facilitator and the family member each taking a defined role (family member or child) to learn or practice the intervention strategy	The facilitator will simulate the situation with an extra copy of materials to demonstrate the intervention strategy
Problem Solving Discussion	The facilitator discusses a challenge related to the routine, use of intervention strategy, or child's response to intervention plan with the family. The family member and facilitator generate ideas and propose options for addressing the issue and then identify what they will try as a potential remedy	No adaptation
Environmental arrangements	The facilitator might rearrange the physical space, move materials, or hand the family member materials to support the use of intervention strategies	The facilitator will verbally instruct the caregiver to rearrange the physical space or move materials. The facilitator will provide all necessary materials for intervention prior to the visit via snail mail or e-mail to support the caregiver's use of intervention strategies.
Feedback	The caregiver is provided with verbal supports by the	Feedback is delivered through bug in ear

	<p>facilitator. The facilitator might verbally reinforce appropriate strategy use, provide a reminder for a missed strategy, provide instruction/direction, and/or provide a correction</p>	<p>technology. Feedback is also e-mailed to family post session</p>
<p>Self-reflection</p>	<p>The facilitator guides the caregiver through a series of reflection questions such as (a) how are you feeling? (b) what worked well? (c) what are your thoughts about this plan? (d) How did your child respond? (e) What did you notice during the routine? (f) How was this different than before? (g) Why do you think it went well?</p>	<p>At end of visit, the facilitator will ask the caregiver (a) how are you feeling? (b) what worked well? (c) what are your thoughts about this plan? (d) How did your child respond? (e) What did you notice during the routine? (f) How was this different than before? (g) Why do you think it went well? And complete the Facilitator Planning and Reflection Log</p>

Appendix J

FAMILY CONSENT

CONSENT TO PARTICIPATE IN RESEARCH

Study Title: Remote Delivery of Prevent Teach Reinforce for Families (PTR-F:R): A Pilot Study

IRBNet #: 1689321

Principal Investigator: Abby Hodges, M.Ed., BCBA

Faculty Sponsor: Dr. Phil Strain, PhD

Study Site: participant's home

You and your child are being asked to participate in a research study. Your participation in this research study is voluntary and you do not have to participate. Your child's school will not be notified if you decide to participate or not. This document contains important information about this study and what to expect if you decide to participate. Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate.

The purpose of this form is to provide you information that may affect your decision as to whether or not you may want to participate in this research study. The person performing the research will describe the study to you and answer all of your questions. Please read the information below and ask any questions you might have before deciding whether or not to give your permission to take part. If you decide to be involved in this study, this form will be used to record your permission.

Purpose

We (i.e., the research team) want to show the effectiveness of behavioral supports for young children (ages 2 to 5 years) who have challenging behavior (e.g., persistent tantrums, hitting, kicking, throwing, etc.) in the home setting. To do this, we need the help of families who agree to take part in a research study.

The purpose of this study is to find out if the Prevent-Teach-Reinforce for Families (PTR-F) model works with children in their home settings when delivered using a remote format, or video calls. We are asking you to take part in this study because you may have concerns about your child's behavior, and your child is between the ages of 2 and 5 years old. We want to find out more about how to support young children with challenging behavior in the home setting from a distance.

If you participate in this research study, you will be invited to participate in a team-based five-step process to develop a behavior intervention plan during weekly video calls. The process includes discussions, filling out forms, and providing feedback about how it is going for you and your family. For each step of the process, the researcher will assist you

and answer any questions you may have. The researcher will provide demonstrations for you and opportunities for you to practice.

- *PTR-F step 1: Teaming and goal setting.* You will identify a challenging behavior to work on to decrease (e.g., hitting, crying, etc.), and identify a replacement behavior (e.g., communication) to teach your child to do instead.
- *PTR-F step 2: Data collection.* You will learn how to gather more information about the behaviors that you chose to target in step 1.
- *PTR-F step 3: PTR-F assessment (functional behavioral assessment).* You will fill out forms that will aid in developing a plan to decrease the challenging the behavior and increase the replacement behavior.
- *PTR-F step 4: Intervention.* You will create a behavior intervention plan based on all the information that was gathered in the previous steps that will include strategies and supports to help you and your child. The researcher will also provide coaching as needed so you are comfortable with the strategies and supports you select.
- *PTR-F step 5: Evaluation and decision making.* The last step is for the team to ensure that the behavior intervention plan is working for you and your family. If your child's behavior improves, the team will work on continuing that improvement. If your child's behavior does not improve, the team will work to identify why the plan is not working and make any changes necessary in order to see improvement.

Throughout all steps of this process, there will be observations, information gathering, and opportunities to provide your feedback and thoughts about the process and the remote delivery format. In addition, we will ask you to complete the following measures: Eyberg Child Behavior Inventory (ECBI), Social Skills Improvement System (SSIS), Scales of Independent Behavior – Revised (SIB-R), Parenting Stress Index (PSI-4-SF), and Parenting Sense of Competence (PSOC), pre- and post- intervention. You may refuse to answer any question or item on any measure. You may also elect to pause the session or end your participation in the study at any point in time. If for some reason you do not meet the pre-screening criteria to participate (e.g., level of severity of problem behavior), the investigator will provide you with a list of providers that may be better suited to meet your family's needs.

You will be provided with all necessary materials to participate (i.e., ipad, ipad case, tripod) via mail or from your child's school, whichever you choose. Given that the study is conducted entirely via Zoom, it is necessary that you have a reliable internet connection. Each visit will occur once per week for up to one hour over a two-month period of time. We will video record each visit to ensure that the behavior intervention plan is working and that we are helping you as much as possible. These recordings will only be used for research purposes and will not be viewed by anyone other than research team members and stored using University of Denver Microsoft OneDrive, a HIPAA-compliant software system. Any unconsented individual captured on video will not be

included in the video analysis and all attempts to protect their privacy will be implemented by the participants in the home setting.

Risks or Discomforts

There may be unknown or unforeseen risks associated with agreeing to participate in a study. We will take precautions to minimize any potential risks.

Our goal is to help families support their children with their challenging behavior. There may be times when your child feels uncomfortable because routines or interactions are changed to help challenging behavior, because there is a researcher on the screen coaching you, and/or because you are uncomfortable being recorded. There may be visits that you are under external stressors beyond the research study or visit itself. You may experience some loss of privacy due to sessions being recorded. We will make every effort to minimize these discomforts and to schedule our sessions when it is convenient for you, your child, and your family.

The design of this study involves a brief period of time (i.e., maximum of two sessions) prior to creating the behavior intervention plan during which you will not be coached as to how to respond to your child's challenging behavior. Rather, we will ask that you respond to the behavior in the way that you typically would. We will take every precaution to make sure that you and your child are safe and to keep others around them safe during this time.

We will be recording all sessions. We will keep this information secure, private, de-identified, and store it using HIPAA compliant data storage software (i.e., Box). We will store it until the data has been collected (i.e., a maximum of 4 months). Once the data has been collected, we will destroy it. No one outside of the research team will have access to these recordings. Recordings will not be used in subsequent presentations or publications.

Benefits

The benefits which may reasonably be expected to result from this study include that you may learn how to effectively reduce your child's challenging behaviors. This may increase your use of the strategies you learn during other routines. You may also experience reduced stress and an improved outlook for the future of your family and child. Further, you will benefit from access to a service that might otherwise be compromised during this unprecedented time of Covid-19 when you may not be as comfortable allowing providers in your home.

Your child may benefit by increasing their use pro-social skills and they may also start to have improved relationships with family members and their peers. Your child may start to use the skills they learn through your participation in the study during other routines not targeted during the study and in places (e.g., school) in which you have not directly taught the skills.

Given that the purpose of the study is to develop and test the remote application of PTR-F, there is no guarantee the remote application will work for all families. We cannot and do not guarantee or promise that you will receive any benefits from this study.

Confidentiality of Information

Data will be confidential. The link between identifiers and the research data will be destroyed after the records retention period required by state law. Your name will not be used in any report. Identifiable research data will be encrypted and password protected. Your responses on surveys and questionnaires administered will be assigned a code number. The list connecting your name to this code will be kept in an encrypted and password protected file. Only the research team will have access to the file. When the study is completed and the data have been analyzed, the list will be destroyed.

With your permission, sessions will be recorded for later data analysis. Once the research team agrees on the data that was collected, the recording will be destroyed.

Information from this study may be used for future research after obtaining your additional consent.

Representatives from the University of Denver may also review the research records for monitoring purposes. Government or university staff sometimes review studies such as this one to make sure they are being done safely and legally. If a review of this study takes place, your records may be examined. The reviewers will protect your privacy. The study records will not be used to put you at legal risk of harm.

Limits to confidentiality

All the information you provide will be confidential. However, if we learn that you intend to harm yourself or your child, we must report that to the authorities as required by law.

Use of your information for future research

All identifiable information (e.g., your name, date of birth) will be removed from the information or samples collected in this project. After we remove all identifiers, the information or samples may be used for future research or shared with other researchers without your additional informed consent.

Data Sharing

De-identified data from this study may be shared with the research community at large to advance science and health. We will remove or code any personal information (e.g., your name, date of birth) that could identify you before files are shared with other researchers to ensure that, by current scientific standards and known methods, no one will be able to identify you from the information or samples we share. Despite these measures, we cannot guarantee anonymity of your personal data.

Incentives to participate

There will be no cost to you for participating in this research study. You will receive a \$100 gift card for a major retail establishment such as Target as a “thank you” for participating once you have completed the PTR-F process. The gift card will be distributed to you after the final visit and once you have completed all surveys. You can choose whether it be delivered to your child’s school, sent via snail mail, e-mailed to you.

Consent to video / audio recording / photography solely for purposes of this research

This study involves video/audio recording, and/or photography. If you do not agree to be recorded, you can still take part in the study. Please remember, any unconsented individual captured on video will not be included in the video analysis and all attempts to protect their privacy will be implemented by the participants in the home setting.

_____ (initials) YES, I agree to be video/audio recorded/photographed.

_____ (initials) NO, I do not agree to be video/audio recorded/photographed.

Questions

For questions, concerns, or complaints about the study you may contact Abby Hodges, M.Ed., BCBA at abby.hodges@du.edu or 405-808-0575. The faculty sponsor of this project, Dr. Phil Strain, may be contacted at phillip.strain@du.edu or 303-916-0881. If you are not satisfied with how this study is being conducted, or if you have any concerns, complaints, or general questions about the research or your rights as a participant, please contact the University of Denver (DU) Institutional Review Board to speak to someone independent of the research team at 303-871-2121 or email at IRBAdmin@du.edu.

Signing the consent form

I have read (or someone has read to me) this form, and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

_____	_____	_____
Printed name of subject	Signature of subject	Date
_____	_____	_____
Printed name of subject	Signature of subject	Date

CONCLUDING COMMENTS

A passion for family-centered evidence based behavioral intervention, coupled with the reduced dosage of evidence-based practices being offered in light of the pandemic, served as the impetus for these manuscripts. Modifications to an existing evidence-based model of positive behavior support (i.e., PTR-F; Dunlap et al., 2017) were made to explore the feasibility of an innovative mode of service delivery. This dissertation expands the existing literature base on family-centered positive behavior support and acknowledges that positive outcomes for both caregiver and their children have resulted from the remote application of such services.

Manuscript One provided a systematic and quality review of the literature on providing remote support to caregivers of individuals exhibiting CB. The training components, procedural fidelity, social validity, and evidence of impact were summarized and analyzed. Each study was evaluated and rated according to WWC Standards (2020) for single case and group design accordingly. While there exists a good deal of information on the remote implementation of interventions for CB, only a few studies received the rating of *Meets WWC Standards without Reservations*. Identified gaps the the literature included systematic replicable coaching methodologies, emphasis of social validity for the duration of service delivery, and certainly the clear experimental evidence on the efficacy of distance delivery.

PTR-F:R answers the call for an effective, research based model that is geared toward children and families whose lives are impacted by severe and persistent CB. As

illustrated by Manuscript Two, the manualized evidence-based process of PTR-F can be delivered in a remote format given operationalized modifications and adaptations. This study is one of few experimental analyses of remote facilitated support for guiding caregivers in their implementation of function-based behavior support plans for their children that meets WWC Standards *Without Reservations*. The PTR-F:R process resulted in families' high fidelity implementation of the behavior intervention plans, and a functional relation existed between each family's implementation of their child's intervention plan and changes in their behaviors. Families favorably rated the process and the plans that were developed as a result of their participation in the process. Further, this study demonstrated associations between caregivers' participation in the PTR-F:R process and reduced stress and improved competence related to managing their child's CB.

Collectively, these manuscripts support the significance of family-centered behavior support for young children with challenging behaviors and their families. They point to an emerging area of research, that is, remote service delivery and intervention support, serving to optimize outcomes for young children and their families. PTR-F:R offers the modifications necessary to the original model (i.e., PTR-F) so that practitioners are able to do this. The PTR products are described in precise, operational detail and designed so that the assessment and intervention strategies can be implemented with integrity, or fidelity, thereby increasing the likelihood of efficacious interventions. They also include self-evaluation measures to ensure readiness to move on to the next step in the process. Processes are written in a clear and concise family friendly manner, with family choice in mind to ensure contextual fit within their routines, customs, and values.

PTR-F:R is no exception to these characteristics. Continued efforts towards replicating the remote application and disseminating its use with a variety of diverse populations are advised, as this is a meaningful tool for practitioners and families that can be used and implicate positive immediate and long-term child and family outcomes.

There is a need for the development of procedures so that interventionists (i.e., school psychologists, behavior specialists, etc.) can provide support to families to develop and implement individualized function-based intervention plans tailored to family needs and preferences. The development of PTR-F:R meets this unmet need by developing an intervention that can be provided remotely by school personnel to partner with families in addressing the critical needs of young children demonstrating CB.

School psychologists are essential to the social and emotional development of children, particularly when facilitating meetings, planning for intervention, and guiding implementation and decision-making processes. School psychologists have skill sets in various relevant domains including consultation and collaboration, data-based decision making, mental and behavioral health services and interventions, and family collaboration (NASP, 2020). Unfortunately, their role may be impacted by access to families, heavy caseloads, Covid-19 aftermath, and/or qualifications necessary to deliver function-based intervention at the early childhood level. Utilizing a manualized process such as PTR-F:R helps to bridge these gaps and afford school psychologists with a larger role in family school partnerships. PTR-F:R and its reliance on the family's determination of intervention settings, goals, and strategies can directly expand the availability of function-based interventions delivered with an adequate dosage, as well as strengthen the social validity of the provision of services. Rather than depending on in

person service delivery, PTR-F:R helps to fill a national need to expand the evidence around remote delivery of evidence based interventions. This project was designed with scale up potential in mind, providing a platform or process for school personnel to partner with families whose children engage in CB, thereby establishing a strong foundation and partnership in the early years of their schooling, and set the stage for sustained partnerships throughout their child's education. On a systems level, this project provides additional support for the PTR suite of products and their significant promise for professional development efforts as schools build structures to support systems wide quality positive behavior support, such as widespread adoption of streamlined function-based strategies for children with CB.

The author's hope is that the two manuscripts presented in this dissertation are first and foremost a nod to caregivers everywhere and their unwavering desire to support their children as well as the impetus for more socially valid family-centered service delivery at all levels.