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**Using the Prevent-Teach-Reinforce Model to Reduce Challenging Behaviors in Children with Autism Spectrum Disorder in Home Settings: A Feasibility Study**

Malena Argumedes, Ph.D.

Université de Sherbrooke

Marc J. Lanovaz, Ph.D. and Serge Larivée, Ph.D.

Université de Montréal

Antonia R. Giannakakos, Ph.D.

Manhattanville College

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Correspondence concerning this article should be addressed to Malena Argumedes, Département de psychoéducation, Université de Sherbrooke, 2500 Boul. de l'Université, Sherbrooke, Qc, J1L 2L8

Email: malena.argumedes.charles@usherbrooke.ca

Phone: 1 819-821-8000 #66739

### Abstract

**Background.** Children with autism spectrum disorders (ASD) often engage in high levels of challenging behaviors, which can be difficult to reduce for parents in home settings. The purpose of our study was to address this issue by examining the effects of adapting the Prevent-Teach-Reinforce model (PTR) to support parents in reducing challenging behaviors in children with ASD in a feasibility study. **Method.** We conducted a non-blinded randomized trial to compare the effect of the PTR to a business as usual, less intensive intervention (i.e., 3-hr training) on challenging and desirable behaviors (N = 24). **Results.** The PTR and the 3-hr parental training both reduced challenging behaviors and increased desirable behaviors. Moreover, parents implemented the PTR model with high fidelity and rated it highly for social acceptability. **Conclusions.** This feasibility study showed that it is possible to compare the PTR with families to a less intensive intervention in a future trial. However, research with a larger sample is essential to determine whether the PTR is more effective than less intensive treatments (e.g., parent training).

*Keywords:* Autism spectrum disorders, challenging behavior, family-centered intervention,  
PTR model

### **Using the Prevent-Teach-Reinforce Model to Reduce Challenging Behaviors in Children with Autism in Home Settings: A Pilot Trial**

Children diagnosed with autism spectrum disorder (ASD) show impairments in social skills and communication, and demonstrate repetitive, stereotyped, and restricted patterns of behaviors (American Psychiatric Association, 2013). These social and communication deficits increase their risk of developing challenging behaviors (McClintock et al., 2003). Challenging behaviors can be defined as any abnormal behavior, in such intensity, frequency or duration, that it may compromise the integrity of the person or others (Emerson, 2001). The presence of challenging behaviors can limit a child's participation in common educational, social, and leisure activities. Many studies have reported high prevalence of challenging behaviors in children with ASD, including aggression, tantrums, property destruction, self-injury, and repetitive behavior (Jang et al., 2011; Matson et al., 2010; Murphy et al., 2009). When repetitive or stereotyped behaviors are included in the definition of challenging behaviors, nearly 95% of children with ASD emit at least one form of challenging behaviors (Jang et al., 2011).

Multiple behavioral interventions have been validated to reduce challenging behaviors in children with developmental disabilities (Carr et al., 2009; Horner et al., 2002; Kern et al., 2006; Machalicek et al., 2007). However, these interventions are not typically tested within standardized programs, making their application challenging and their selection somewhat arbitrary. To address this issue, Dunlap et al. (2010) developed the Prevent-Teach-Reinforce (PTR) model, a standardized intervention to reduce challenging behaviors and increase desirable behaviors in school settings for children with and without disabilities. Standardization in the PTR is possible because of the main 5-step procedure is mandatory for all participants. At the same time, the PTR is an individualized intervention because all the mandatory steps are based on participant's characteristics (for example, the functional behavioral assessment). The authors define desirable behavior as any positive social and communicative behavior that the intervention team targets for increase. The PTR model was specifically developed so non-specialized school staff could implement it under the supervision of a behavior consultant. The model is based on the Positive Behavior Support (PBS) principles, a tiered approach providing assessment and comprehensive support to modify the person's environment to reduce challenging behaviors and increase prosocial behaviors (Sailor et al., 2009). The PTR is a third-tiered model, designed to offer a standardized, effective and

feasible intervention package for school staff, based on scientific and clinical recommendations on treating challenging behavior (Dunlap et al., 2015). It includes a functional assessment, as well as intervention strategies proven to be effective in reducing challenging behaviors (to modify the antecedents provoking the behaviors, to teach a functional alternative behavior and to reinforce the alternative behavior, Dunlap et al., 2015).

In the first and most comprehensive study on the PTR model, Iovannone et al. (2009) conducted a randomized control trial of the model to reduce challenging behaviors for children in classroom settings. In addition to showing that the PTR model led to positive changes in prosocial and challenging behaviors in school-aged children, their study demonstrated that teachers and educators could implement the behavioral practices with high fidelity. In a replication including only children with ASD, Strain et al., (2011) used single-case experimental designs to examine the effects of the model on three children, aged between five and nine years old. Levels of challenging behaviors decreased from 70% to near 0% for all three participants and their academic engagement went from 20% to near 100%. Integrity of implementation was also very high (near 100%) for the teachers.

Although these results are promising, challenging behavior is not a phenomenon exclusive to school-based settings. Families also often struggle with challenging behaviors that may occur in home settings (Hastings, 2002). To this end, Sears et al. (2013) adapted the PTR model for home settings and examined its effects on two families of children with ASD. The five core steps of the model (see Procedures for details) remained the same, but the routines and contexts were adapted to fit with the family routine. The duration of the program was also shortened, reducing the pre-intervention phase (i.e., teaming and goal setting). The fidelity of implementation was higher than 80% and both children's level of challenging behavior decreased to near-zero levels. These results suggest that the PTR model would be a desirable intervention to reduce challenging behaviors for children with ASD in family settings.

In a more recent study, Bailey and Cho Blair (2015) used the PTR family adaptations provided by Sears et al. (2013) to reduce challenging behaviors in three children with developmental disability (e.g., autism, language delay, sensory processing issues). Their goal was to assess the effectiveness of PTR in reducing challenging behaviors and increasing desirable behavior within a nonconcurrent multiple baseline design, but also to evaluate if the parents could take data with high fidelity. The PTR model was

successful in decreasing challenging behaviors and increasing desirable behavior for all children. Parents implemented the PTR with high fidelity (range: 54% to 100%) and social validity scores were high for all three families. The same positive results were present in a study with three Hispanic families of children with ASD aged from 3 to 6 years old and presenting challenging behaviors (Santiago, 2018). The manualized PTR for Families manual was used (Dunlap et al., 2017), adding a specific coaching method to facilitate model implementation by the parents.

These previous studies suggest that the model may be effective in reducing challenging behavior in children with ASD in home settings, but the low number of participants (i.e., 8 families) limits conclusions that may be drawn from the data. The next logical step for us was to conduct a feasibility study, comparing the PTR for Families to a parental training (business as usual) with larger numbers, in order to study the feasibility of conducting a confirmatory study further along (Mubashir et al., 2010). As stated by the authors, a feasibility study is useful when one intent is to study a programme with a more flexible methodology, prior to a pilot trial or a more extensive study (Mubashir et al., 2010). A Pilot trial would be possible if the current study demonstrates that the comparison of PTR with a business as usual is possible in our services (for example, with good retention of participants).

As our services for families typically involve a parental training, we found it would be important to compare PTR with this less expensive and intensive alternative (e.g., a one-time training). Therefore, the main research question was 1) Is the PTR model more effective than a business-as-usual intervention (i.e., a 3-hr individualized training) in reducing challenging behaviors and increasing desirable behaviors in children with ASD in home settings? A second research question was 2) Can parents implement the PTR model with a fidelity of at least 70%? And the third research question was 3) Will parents rate the PTR's social validity as being high? We hypothesize that PTR model will have a bigger effect size on challenging behavior and on desirable behavior than the business-as-usual parental training. We also hypothesize that parental fidelity of implementation will be higher than 70% and that they will rate the PTR as having a high social validity.

## Method

### Recruitment

To be eligible to participate in the study, children had to be a) 12 years old or younger, b) have a diagnosis of ASD (provided by an independent multidisciplinary team not involved in the study), c) engage in at least one serious and frequent challenging behavior at home (as evidenced by the Behavior Problems Inventory-01), and d) receiving no other treatment or intervention for challenging behaviors at home during the study. Initial participant screenings for eligibility were conducted over the phone. Participants were recruited from four agencies in Montreal, Canada. Each of these centers provides either publicly or privately funded services to children with ASD and their families. Twenty-four families of children with ASD completed their participation in the study. Figure 1 presents the participant flow for all the steps of the study, following the Consolidated Standards of Reporting Trials guidelines (CONSORT; Schulz et al., 2010).

### Participants and Setting

Table 1 presents the characteristics of the children with ASD participating in the study. The children who completed their participation were between the ages of two and ten ( $M = 4.3$ ,  $SD = 1.9$ ). Three participants had a concomitant disorder (i.e., hyperactivity or speech delay). The scores on the Childhood Autism Rating Scale-Second Edition (CARS2; Schopler et al., 2002) completed by the first author indicated that ten children presented minimal symptoms of ASD (44%), four children presented mild-to-moderate symptoms of ASD (13%), and ten children presented severe symptoms of ASD (44%). Most of the sample was either receiving early intensive behavioral interventions or occupational therapy at the time of enrollment in the study.

Regarding the parents, mothers predominantly participated in the project ( $n = 18$ ), with five fathers and three couples comprising the rest of the sample. More than half of the families earned less than \$ 29,999 per year (57%), four families earned between \$30,000 and \$49,999 (17%) and nine families earned more than \$50,000 (39%). Most of the sample was born outside of Canada (56% of all parents), principally being born in Bangladesh, Haiti or India. Most parents had completed a university degree (61%), while 61% of mothers stayed home and 48% of fathers worked full-time jobs. All the

assessments and intervention sessions, regardless of the assigned group, were held in the family's home. The services were provided in either French or English, depending on the parent's preference. The current study was run by the first author, as a requirement for her Ph.D. degree in psychoeducation, while having more than six years of experience working with children with ASD. The first author did all the assessments and provided all services (PTR or home training) for all the participants. The first author received a 3-day certified group training on the PTR process with Glen Dunlap (including theoretical and practical training with videos). She was also part of Dr. Dunlap's research team for 6 months prior to this study, where she implemented the PTR in preschool settings. The current study received ethical approval from our university and the centers that participated in the study.

### **Randomization**

As each family was recruited for the study, they were randomized into one of the treatment groups. The randomization process was completed by the first author. Families were randomly assigned to either the PTR intervention group or to the 3-hr training group (comparison group). Assignment was done through simple randomization, by drawing a slip of paper from a box containing 20 PTR group papers and 20 3-hr training group papers. The paper selected dictated to which group the family was assigned. Of the 24 families recruited, 13 were assigned to the PTR group and 11 were assigned to the 3-hr training group.

### **Measures**

**Socio-demographical data.** All the parents completed a socio-demographic questionnaire during the pre-intervention phase to collect information on child and parent characteristics (e.g., child diagnosis, place of birth, parent occupation).

**Treatment fidelity.** The current study measured parent treatment fidelity as well as treatment fidelity on the first author's implementation of the treatment programs. The first author observed parents implementing the intervention at each meeting and completed a fidelity checklist based on the child's behavior intervention plan. The first author also completed self-fidelity checks by filling up a checklist with the different steps of the program during implementation. For both checklists, the total percentage of fidelity was calculated by dividing the number of correctly implemented steps by the total number of steps and multiplying it by 100%.

**Child assessments.** The severity of autistic symptoms for each child was evaluated using the CARS2 (Schopler et al., 2010). The CARS2 is a 15-item questionnaire on the symptoms of autism for children 2 years and older. Each item describes a characteristic, ability or behavior that the examiner rates on a 4-point scale. The CARS2 has an overall discrimination index value of .93, and sensitivity and specificity values of .81 and .87, respectively. The CARS2 was administered and interpreted by the first author, who had the required credentials and experience to use the tool.

The first author assessed the presence of challenging behaviors using the Behavior Problems Inventory-01 (BPI-01; Rojahn et al., 2001). This 52-item questionnaire was developed to evaluate the presence of challenging behaviors of children with developmental disabilities, as perceived by their parents in the last two months prior to the assessment. Parents are asked to evaluate the behavior's frequency (never, monthly, daily or hourly) and its severity (mild, moderate or severe). The BPI-01 reliability coefficient for internal consistency is .83 and the test-retest reliability .76.

The social competence scale of the Nisonger Child Behavior Rating Form (NCBRF; Aman et al., 1996) was administered to assess pro-social behaviors. This questionnaire evaluates the presence of desirable behaviors in children with developmental disabilities. The social competence scale contains 10 items, divided in two different subscales (compliant/calm and adaptive social), rated on a 4-point scale from *not true* to *always true*. Parents must complete the questionnaire using their observation from the last month. The NCBRF internal consistency coefficient is .78.

**Individualized behavioral rating scale.** Parents either recorded frequency counts or used the individualized behavioral rating scale (IBRS) to collect data on challenging and desirable behaviors on a daily base. The first author provided information on both methods and the final choice was made as a team, making sure the data collection method was appropriate for the selected behaviors and for the parent's abilities. The IBRS is a perception type of data collection method, with a five point-scale (from 1 to 5). Parents can choose to evaluate one out of five dimensions of behavior: frequency, duration, intensity, percentage of time or percentage of opportunities. They also chose what values are associated to each point-scale. As such, five was the highest score for some parents whereas one was the highest for others. The IBRS was completed once daily, for both challenging behaviors and desirable behaviors.



The IBRS has an internal integrity coefficient of .80 for problem behavior ratings and .69 for appropriate behavior ratings (Iovannone et al., 2014).

**Social validity.** When assigned to the PTR group, the parents had to evaluate the program's social validity at the end of the eight-week intervention. The Treatment Acceptability Rating Form (TARF-Revised; Reimers & Wacker, 1988) was used to assess PTR's social validity: its effectiveness, its acceptability, the time it takes to implement it, the disruption it causes and the willingness to keep implementing it. Parents had to rate the 21 items on a 6-point scale (e.g. 1 = not at all acceptable, 6 = very acceptable).

### **Procedures**

**Pre-intervention.** Once families provided permission for the research team to contact them, the first author made an appointment to explain the research project, obtain informed consent from the parents, and have the parents complete the socio-demographic survey. Then, the parents completed the BPI-01 (Rojahn et al., 2001) to assess for eligibility. If the child had a frequency score of at least *daily* or *hourly* and a severity score of *medium* or *severe* for one behavior, the family could participate in the research project. Participating families then completed the other pre-test assessments (i.e., NCBRF). While parents completed the questionnaires, the first author played with the child to collect observational data for the severity of ASD symptoms assessment with the CARS2 (Schopler et al., 2002). If any items could not be observed during the meeting, parents were asked to provide information in order to complete the questionnaire (e.g. item on food selectivity). As soon as the pre-intervention assessments were completed, the first author proceeded to randomization. Families entered the project in a staggered manner about five at a time, so the first author could run the assessments and provide intervention for all of them. Right after randomization, the first author called the parents to inform them of their group assignment, either to begin the PTR implementation or to complete the 3-hr training. The intervention was provided as soon as the parents were available to do so (usually a week after the randomization occurred). For some families in the PTR group, intervention phase occurred later in the process, because it took the team more sessions to write and practice the behavioral plan before implementation (range of 2 to 4 120-min sessions). As a result, their baseline had more session than other participants.

**Prevent-Teach-Reinforce group.** All the families assigned to the PTR model group followed the five standardized steps, as stated in the manual (Dunlap et al., 2010): 1) goal setting; 2) data collection 3) functional behavioral assessment; 4) PTR intervention; and 5) using data to make decisions. For this study, the PTR model was implemented with some minor adaptations, similar to those reported by Sears et al. (2013). New versions of the functional behavioral assessment (FBA) and menu of interventions were used, as provided by Dr. Glen Dunlap. These were unpublished forms, showing adaptations for a better fit with the family setting, meant for the future *PTR with families* manual (published after the end of this research in 2017). Notably, the FBA asked questions related to common family routines, like dinner time, taking a shower or going to bed. The family-centered model also offered less intervention strategies than the school version of the PTR in order to only keep strategies that would be easy enough to implement for a parent while dealing with everyday life situations.

The PTR's five standardized steps were divided through an eight-week period and families were met once per week for about 2 hr, unless a second meeting was necessary. This second meeting was intended for families having issues with any of the required steps, needing more than one meeting to master the interventions, for example. Goal setting, data collection and functional behavioral assessment were typically covered in a weekly meeting each, in which the first author explained the different choices to the parents and then, as a team, decisions were made on the methods to use. The functional behavioral assessment was run by questionnaire and led to a behavioral hypothesis, leading to choosing functional intervention strategies for the behavior plan. Once the behavioral plan was agreed on, parents were expected to implement the behavior plan daily for a specific amount of time which varied for each family. Parents were also taking daily data with the IBRS. Table 2 presents the PTR's five implementation steps. The first author made sure all the steps were implemented as planned in the manual and that all decisions were taken as a team. The first author provided corrective feedback to the parents in the intervention phase following the recommendations in the PTR book (Dunlap et al., 2010), specifically going through the intervention steps with the parents and practicing the interventions steps in vivo with them. Intervention ended after eight weeks of home visits with the families, regardless of individual results. Parents received written recommendations on how to continue the behavioral interventions after the end of the project.

**Training comparison group.** All the families assigned to the comparison group received a 3-hr individualized training at home. The training was developed by the first author and was similar to services usually provided by rehabilitation centers in Montreal to parents of individuals with ASD dealing with challenging behaviors. The content was similar as the one presented in the PTR model, but was presented to the parents in one 3-hr session rather than over the course of 8 weeks with in vivo training. More specifically, parents received information on taking data on challenging behaviors, identifying the behavioral function (with observational data), choosing an intervention based on the behavioral function and implementation information. The first author served as the trainer during the home trainings and followed the same framework for all participants. The parents received a folder with the written content at the beginning of the training, so they could take notes on what the trainer said. The first author provided real-life examples based on the behaviors that the parents indicated as problematic, to facilitate comprehension. While providing the training, the first author used a fidelity checklist to ensure that the same content was covered with all the participants. The child participants were not present during the training. Following the 3-hr training, parents were provided with the email and phone of the first author and were encouraged to call if they had any issues. No parents contacted the trainer.

**Post-intervention and follow-up.** After eight weeks of intervention (or eight weeks after receiving the 3-hr training), one post-intervention assessment session occurred for all the families. During the session, the first author re-administered the BPI for challenging behaviors and the NCBRF for desirable behaviors and had families receiving the PTR intervention complete social validity. A follow-up assessment was conducted three months after the post-intervention assessments (i.e., BPI for challenging behaviors and NCBRF for desirable behaviors).

### **Analyses**

To compare the effects of the PTR implementation and the training on challenging and desirable behaviors, we first measured group equivalence on child characteristics (age, sex and severity of diagnosis) using *t* tests and chi-square tests for independent groups. Group equivalences were also run to detect differences between dropouts and participants. Then, to answer our first research question, mixed between-within design analysis of variance (3 x 2 ANOVA) were conducted, combining the repeated measures (three assessments) and the treatment groups (PTR vs. 3-hr training). We also did a

descriptive analysis of the model implementation (research question #2) and of fidelity of implementation (research question #3). It should be noted that the individualized monitoring by parents (with the IBRS) are available in the Supplementary Material but were not submitted to analysis because of the absence of any reliability measures.

## Results

### Recruitment

As shown in Figure 1, 7 families did not receive allocated intervention after randomization (4 in training-group and 3 in PTR-group) because they didn't call back the first author. At follow-up 1, 9 families either didn't answer when called or were not interested in participating in the project anymore because they were too busy (4 in training-group and 5 in PTR-group). At follow-up 2, 2 families did not call back to participate (1 in training-group and 1 in PTR-group). Recruitment began in January 2015 and the last follow-up assessment was conducted in September 2016 (termination of the trial because of end of the first-author's Ph.D.)

### Group Outcomes

Eleven families completed the 3-hr training group and fourteen families received the PTR intervention, leading us to the results for research question #1. All families had to have completed data on all repeated measures to be included in the analysis. There was no statistical difference ( $p > .05$ ) between groups on age ( $t = .54, p = .59$ ), severity of symptoms ( $t = 1.36, p = .19$ ), family income ( $t = .54, p = .59$ ), sex of child ( $\chi^2 = .98, df = 1, p = .32$ ), levels of challenging behaviors on the BPI-Frequency ( $t = .29, p = .79$ ), on the BPI-Severity ( $t = 1.14, p = .26$ ) and levels of desirable behaviors ( $t = -0.15, p = .88$ ). There was no statistical difference between dropouts and participants on age ( $t = 3.09, p = .60$ ), severity of symptoms ( $t = 1.19, p = .09$ ), family income ( $t = 2.18, p = .11$ ), levels of challenging behaviors on the BPI-Frequency ( $t = 1.22, p = .33$ ) and on the BPI-Severity ( $t = 0.35, p = .50$ ).

Results on the BPI-01 (Rojahn et al., 2001) demonstrated a significant main effect of time on the frequency scores  $F(1,22) = 4.85, p = .01$ , partial  $\eta^2 = 0.188$  and on the severity scores  $F(1,22) = 6.15, p = .005$ , partial  $\eta^2 = 0.226$ . There was no significant interaction effect for the group, indicating that challenging behaviors decreased for children in both groups on the frequency scores  $F(1,22) = .47, p =$

0.63, and on the severity scores  $F(1,22) = .61, p = .55$ . Results on the NCBRF (Aman et al., 1996) demonstrated a significant main effect for time on desirable behaviors  $F(1,22) = 7.94, p = .001$ , partial  $\text{Eta}^2=0,274$ . There was no significant interaction effect for the group, indicating that desirable behavior increased for children in both experimental groups  $F(1,22) = .02, p = .98$ . Partial  $\text{Eta}^2$  gives a measure of effect size for repeated measures, with a value higher than 0,26 described as large (Bakeman, 2005). Figure 2 shows that the means of total frequency and severity of challenging behavior were higher for children receiving the PTR intervention (but not statistically different) at pre-test and that challenging behaviors decreased for both groups across time. Visual inspection, but also a slope calculation was done and the results show that the decrease in challenging behaviors (both frequency and severity) was greater in the PTR group than in the Training group ( $\Delta\text{Pretest to Post test 1} - \text{PTR group, BPIFrequency score} = 10,08; (\Delta\text{Pretest to Post test 1} - \text{Training group, BPIFrequency score} = 4,39)$ ).

### **Treatment Implementation and Fidelity**

Participants in the training group received a mean of 2.5 hr of training (range: 2 hr to 3 hr) the times varied as a result of the parent modeling component. Participants in the PTR group received six (8%), seven (23%) or eight (69%) sessions of intervention. Mean duration of total PTR hours of intervention was 8.5 hr (range: 6 hr to 11.5 hr). Table 3 presents the target measures to monitor progress on challenging and desirable behaviors in the PTR group as well as the percentage of fidelity of the parents ( $n = 14$ ). Note that Luke's data was not included in our group analyses as we had incomplete data for the final follow-up. To answer our second research question, results on treatment fidelity for the fourteen parents implementing the behavioral strategies from the PTR shows that 64% of the sample ( $n = 9$ ) had fidelity scores higher than 70% (range: 50% to 100%). The lowest fidelity score was 50% for two parents, regardless of the corrective feedback given by the first author through the sessions. Their main issues were providing reinforcement on time, when appropriate behaviors were emitted by the children.

Quality of parental participation scores showed that 71% of parents received a mean score of 16/20 for their participation in the meetings or in the trainings ( $n = 17$ ). All parents implementing the PTR ( $n = 14$ ) completed the TARF-R (Reimers & Wacker, 1988) with a mean score of 4.8 on a total of 6 ( $SD =$

.4), indicating high overall acceptability of the PTR intervention (research question #3). Results from the implementation fidelity of the program for the PTR facilitator show that the complete planned process for the number of sessions was respected for nine families out of the total sample of fourteen (64%). One family received 6 sessions of PTR intervention due to personal problems and three families (21%) received 7 sessions, due to the Holiday season break.

### **Discussion & Implications**

Overall, this feasibility study shows that the PTR can be implemented in home settings with high fidelity. There was no significant difference between groups for challenging behaviors or desirable behaviors. Challenging behaviors were lower for both groups after participating in the present study, whereas desirable behaviors were higher for both groups, up to five months following training. Since no comparison group was part of this research design, the behavioral changes may be due to maturation. Interestingly, the decrease in both severity and frequency of challenging behaviors decreased faster for participants in the PTR group than for the ones in the Training group. Further research would be needed to investigate those differences further. Results of fidelity of implementation showed that most parents were able to implement the model with high fidelity. In addition, families found the PTR to be a socially appropriate intervention.

The failure to observe differences across groups was expected since this was a feasibility study, but unexpected given that brief training alone is not typically effective in teaching parents to reduce challenging behaviors (Nigro-Bruzzi et al., 2010; Seiverling et al., 2012; Vanselow & Hanley, 2014). At least two factors may potentially explain this lack of consistency. First, our main measures may not have been sensitive to changes in individual behavior. The BPI-01 (Rojahn et al., 2001) is designed to monitor multiple challenging behaviors (i.e., 52) simultaneously; as such, it may not be adequate to detect behavioral changes when targeting one specific behavior for intervention. In the future, it would be relevant to use a more specific and direct measure of challenging behavior. Second, our attrition rate was higher than expected, which significantly reduced the power of our analyses. For example, a t-test on this sample size (N = 23) would only detect moderate and large effect sizes approximately 20% and 45% of the time, respectively (Faul et al., 2013). Additionally, participants in the PTR group presented more

severe and frequent challenging behaviors than participants receiving the 3-hr training, which may also explain the lack of differentiated statistical results.

Interestingly, behavioral changes were still observed for children whose parents had lower fidelity scores, highlighting the question of how much fidelity is enough to ensure desirable changes in behavior. Future research on parental behavioral intervention could manipulate fidelity to examine its effects on child behavior (see Vollmer et al., 2006). Finally, examining parental characteristics related to higher fidelity of implementation would provide crucial data on what type of parent responds best to multi-component behavioral interventions like the PTR model.

Albeit tentative, our results may have some implications for practice. For example, individual data inspection from the individual graphs (IBRS charts) show that PTR was effective in reducing targeted challenging behavior and in increasing targeted desirable behavior for most participants. The PTR could be implemented with families while they wait for services (as in the case of the participants in this study), which would provide parents with effective and validated behavioral strategies they could implement at home. Furthermore, agencies could offer a 3-hr individualized parental training, like the one in the current study, to families on the waiting list, enabling parents to reduce challenging behaviors but more data is needed to confirm these results.

As this was a feasibility study, the first author was alone in completing all the research steps, from the randomization phase to the analysis, introducing risk of bias. A blinded randomization by a third party could reduce the risk of bias in a future study but would also require more resources. Also, the group analysis of the present study was run with an “analysis by treatment analysis or per-protocol”. Meaning that only the participants that received treatment were analyzed. The use of an “intend-to-treat analysis” would therefore be recommended for a future trial.

One limitation of the study is the lack of interrater agreement on parental ratings of child behavior as for ratings in fidelity of implementation of the PTR process. Future trial on the PTR could follow the same procedure as Bailey and Blair (2015), in which the facilitator filmed the follow-up meetings to rate the child’s behavior and compare it to the parental ratings. The video recordings could also allow for interrater agreement on the assessment of the facilitator’s treatment integrity during the treatment conditions. Another limitation of this study is the high level of attrition in both intervention groups. The

attrition rate was higher than the expected 20% usually experienced in similar studies. For parents, everyday events may be incompatible with the visit of a behavior consultant once or twice a week for two months. Some parents were difficult to reach for the follow-up assessment meeting (three months after the end of the PTR process or the training). Furthermore, the lack of a control group, receiving no intervention at all, may also be a limitation of the current study. Future research using the same population could work with an intent-to-treat design to compare the PTR effects to a group of children not receiving any type of treatment. Family vacations, involvement in extra-curricula activities, sickness of child or other family member were factors that delayed recruitment or treatment delivery (for both groups). A future trial (for example, a pilot or definitive trial) should include ways of facilitating the families' participation in order to prevent so many dropouts. Maybe allocating a financial reward at the end of every testing round could help or making sure parents understand the amount of time required in their participation to the trial, and thus, for every testing time.

Future research on PTR for families could measure the effects of implementing the model with more than one child in the home. For six families of the intervention group, some behavior strategies included siblings. For example, when a behavioral chart was implemented to reinforce the use of calming down strategies for Ian, his parents decided to teach the same strategies to his younger sister and reinforce her behavior as well. For the family, it was a matter of being consistent in their parental practices. This inclusive strategy is based on the positive behavior support principles of providing behavioral strategies that are ecologically grounded and comprehensive (Sailor et al., 2009).

In sum, the current study showed promising results on the feasibility of implementing the Prevent-Teach-Reinforce model, when used in family settings for children with ASD diagnosis to improve challenging behaviors. Parents can be effective behavioral change agents when coached by a behavioral specialist. However, research with a larger sample is essential to determine whether it is more effective than less intensive treatments (e.g., parent training).



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**Table 1***Sociodemographic Characteristics of the Child Participants*

Characteristics	Total Sample (N = 23)	
	n	%
Sex		
Male	18	78
Female	5	22
Severity of symptoms (based on CARS-2)		
Minimal symptoms of ASD	10	44
Mild-to-moderate symptoms of ASD	3	13
Severe Symptoms of ASD	10	44
Ethnicity		
Caucasian	9	39
Black	2	9
Other	12	52
Language at Home		
French	13	57
English	7	30
Other	3	13
Attending daycare	12	52
Attending school	8	35

Note. CARS-2 = Childhood Autism Rating Scales (2nd ed.). The CARS-2 was not used to diagnose the participants in the study.

**Table 2***Description of the PTR Model Implementation of Standardized Steps*

Week	PTR meeting	Implementation steps	Description
1	1	1. Goal setting	Parents and facilitator choose the challenging behavior to reduce and the desirable behavior to increase
2	2	2. Data collection	Parents are coached on collecting data for both challenging behavior and desirable behavior Parents are asked not to change the way they interact with their child
		3. Functional behavioral assessment (FBA)	Parents and facilitator respond to the FBA questionnaire for the three components: Prevent-Teach-Reinforce
3	3	4. Behavior intervention plan (BIP)	Facilitator presents the FBA summary and the hypothesis statement Based on the hypothesis statements, parents and facilitator choose at least one intervention strategy per component for the BIP (Prevent-Teach-Reinforce) Parents are coached on implementing the BIP strategies until mastery
4 to 8	4 to 8	5. Using data and next steps	Every week, the facilitator observes the parental intervention to evaluate the implantation fidelity. Corrective feedback is provided if needed and data collection is monitored.

*Note.* A second meeting could be scheduled every week if the family needed more support

**Table 3***Summary of Challenging and Desirable Behaviors and Parental Fidelity for PTR Participants*

Fictitious name	Age	Challenging behavior measure	Desirable behavior measure	Fidelity (%)
Julian	4.5	Frequency of toy washing	Frequency of functional play	88
Chris	8	Frequency of jumping	Frequency of functional communication	100
Ryan	10	Frequency of banging on walls	Frequency of making requests	78
Luke	6	Duration of attention span	% of washing himself alone	100
Adam	4	Frequency of verbal opposition	Frequency of answering questions	100
Colin	4.5	Frequency of aggression	Frequency of functional play	83
Ian	6	Frequency of aggression	% of occasions for calming down	82
Mia	4.5	Frequency of elopement	Frequency of functional communication	67
Liam	2	Duration of sleep routine	Frequency of functional communication	100
Leah	3.5	Frequency of elopement	Frequency of functional communication	100
Anna	3	Frequency of elopement	Frequency of dressing herself alone	50
Alan	6	Intensity of asking questions	Frequency of engagement	50
Luis	3	Minutes past bedtime	Frequency of functional play	59
Faith	4.5	Duration of sitting to eat	Frequency of functional communication	50

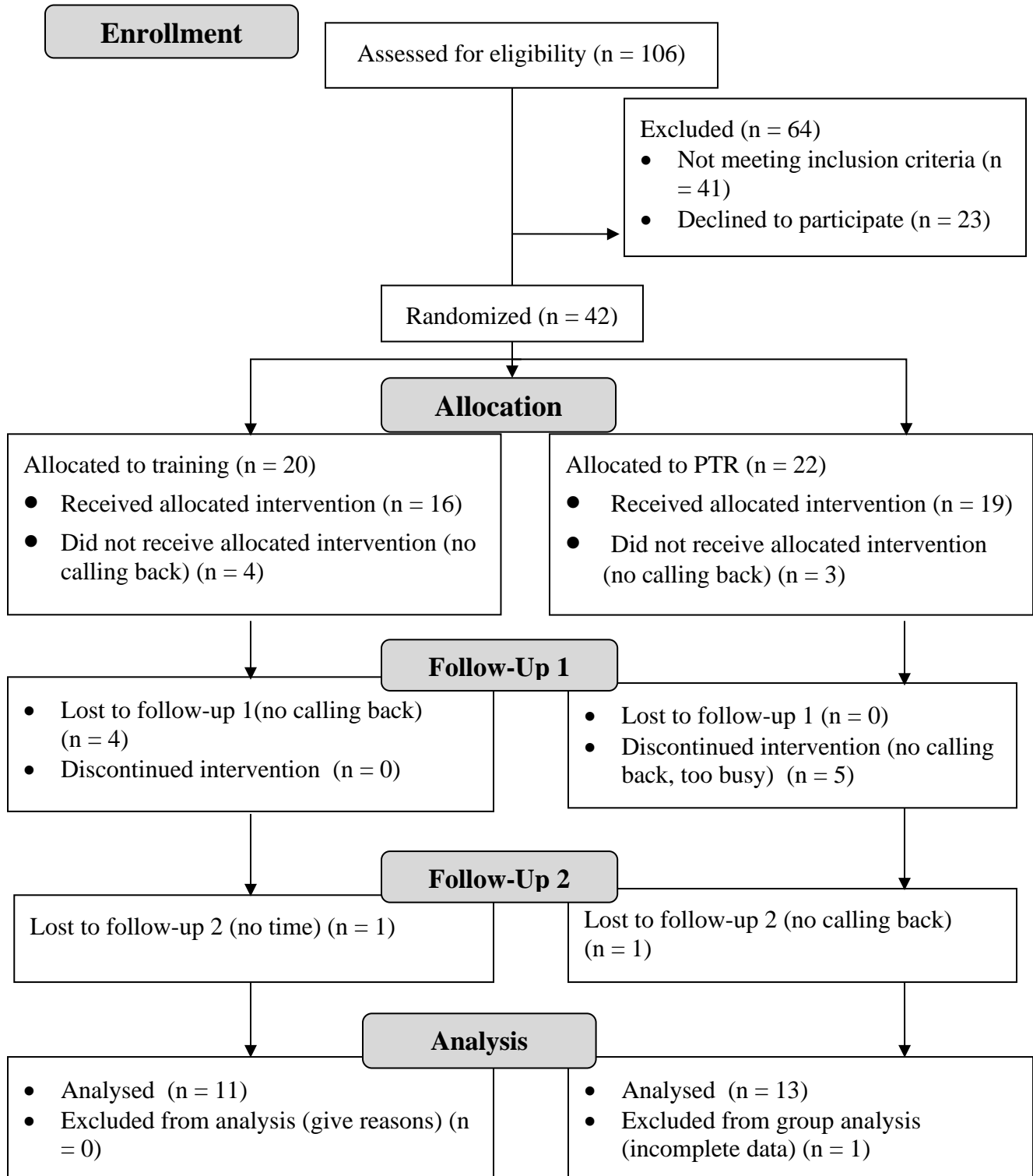


Figure 1. Participant flow for the PTR evaluation study



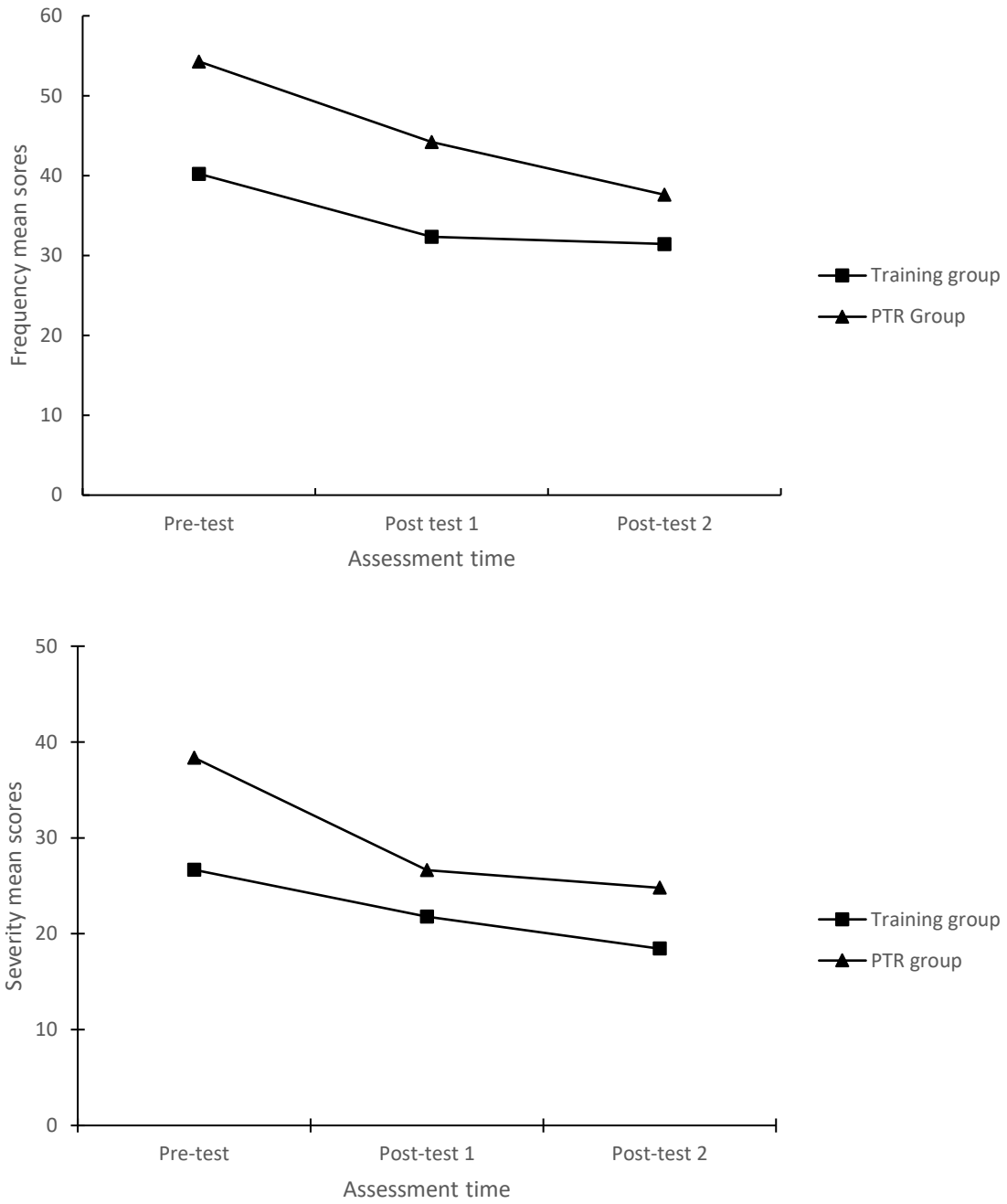


Figure 2. Mean frequency and mean severity of total scores for challenging behaviors on the BPI-01 over time