Parent Treatment Integrity Across Multiple Components of a Behavioural Intervention

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PARENT TREATMENT INTEGRITY FOR A MULTI-COMPONENT INTERVENTION

Abstract

Children with a diagnosis of autism spectrum disorder (ASD) often present with challenging behaviours such as aggression, extreme tantrums, non-compliance, or self-injury, which are associated with increased family stress. Behaviour analytic interventions are considered evidence-based practice for decreasing these challenging behaviours; however, most effective, multi-component interventions are implemented in-clinic by trained professionals, and treatment effects do not automatically generalize to the home. The literature is lacking on parent-implemented multi-component interventions in the home environment, and little research has reported on the levels of treatment integrity with which such interventions are implemented. Treatment integrity is crucial to both intervention outcomes, as well as confidence in the validity of the results. As such, it is important to select effective training procedures that may enhance treatment integrity, such as behavioural skills training (BST). BST is an evidence-based training procedure that is widely used in behaviour analysis to train complex skills. The present study sought to determine whether BST can be successfully used to train a parent of a six-year old child with ASD to implement a multi-component intervention in the home environment, while carefully monitoring treatment integrity levels for each treatment component, as well as impact on child behaviour. Results support the use of BST for this purpose, and implications for future research are discussed.

Keyword(s): autism spectrum disorder, behavioral skills training, parent training
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# Table of Contents

Introduction.................................................................................................................. 1

Treatment of Challenging Behaviours for Children with ASD................................. 2
  Antecedent Strategies............................................................................................. 3
  Teaching Replacement Behaviours....................................................................... 4
  Consequent Strategies........................................................................................... 5

Multi-Component Interventions................................................................................ 7

Meaningfully Involving Parents in the Treatment of Challenging Behaviours............. 7
  Planning for Generalization.................................................................................. 7
  Identifying Barriers to Treatment Integrity....................................................... 8
  Providing Evidence-Based Training.................................................................... 9
  Maintaining High Levels of Parent Treatment Integrity......................................... 10

Extending the Current Research............................................................................ 11

Purpose..................................................................................................................... 12

Method...................................................................................................................... 13
  Participants........................................................................................................... 13
  Settings and Materials......................................................................................... 16
  Functional Behaviour Assessment....................................................................... 16
    Questions About Behavioral Function.............................................................. 17
    Open-Ended Functional Assessment Interview............................................... 17
  Functional Analysis.............................................................................................. 17
  Independent Variables.......................................................................................... 19
  BST Training.......................................................................................................... 19
  Parent Behaviour 1 (Antecedent Strategy)............................................................ 19
  Parent Behaviour 2 (Replacement Skill)............................................................... 20
  Parent Behaviour 3 (Consequent Strategy)........................................................... 23
PARENT TREATMENT INTEGRITY FOR A MULTI-COMPONENT INTERVENTION

Measurement........................................................................................................... 24
Primary Dependent Variable........................................................................... 24
Secondary Dependent Variables.................................................................... 24
Duration of Tantrum Behaviour...................................................................... 24
Correct and Incorrect Mands.......................................................................... 25
Correct and Incorrect Wait Trials................................................................. 25
Quality of Life Impact...................................................................................... 25
Interobserver Agreement................................................................................. 26
Experimental Design......................................................................................... 26
Procedures........................................................................................................... 27
Staff and Parent Training............................................................................... 27
  Staff Training.................................................................................................. 27
  Parent Training............................................................................................... 27
Re-Training Criterion......................................................................................... 28
Phase 1............................................................................................................... 28
Phase 2............................................................................................................... 28
Phase 3............................................................................................................... 29
Phase 4............................................................................................................... 29
Introduction of “Wait” Component................................................................. 29
Ongoing Parent Coaching............................................................................... 30
Transfer of Procedures to Treatment Team................................................... 30
Results............................................................................................................... 32
  Functional Behaviour Assessment (FBA)....................................................... 32
  Questions About Behavioral Function........................................................ 32
  Figure 1......................................................................................................... 33
  Open-Ended Functional Assessment Interview.......................................... 33
Parent Treatment Integrity Across Multiple Components of a Behavioural Intervention

Autism spectrum disorder (ASD) is a neurodevelopmental disorder characterized by deficits in social communication and interaction, and restricted, repetitive patterns of behaviour (American Psychiatric Association, 2013). While challenging behaviours such as aggression, disruptive behaviours (e.g., extreme tantrums), and non-compliance are not part of the diagnostic criteria for ASD, these types of behaviour problems are common in children with this diagnosis (Bradley, Summer, Wood, & Bryson, 2004; Brereton, Tonge, & Einfeld, 2006; Hartley, Sikora, & McCoy, 2008; Kaat & Lecavalier, 2013). In fact, large-sample research, involving a clinical sample of 400 children (ages 2-16.9 years) with ASD, indicated that one in four children with ASD present with clinically significant levels of aggressive behaviour (Hill et al., 2014). Aside from being associated with increased medical interventions, such as the use of psychotropic medication (Hill et al., 2014), these types of challenging behaviours are a great source of family stress and dissonance (Baker et al., 2003; Lecavalier, Leone, & Wiltz, 2006). Another large-sample study interviewed parents and teachers of children with ASD and found that conduct problems specifically were identified as a source of stress (Lecavalier et al., 2006). By contrast, deficits in adaptive skills were not significantly associated with caregiver and teacher stress. Similarly, Baker et al. (2003) reported that parenting stress was higher in parents of children with developmental delays than without developmental delays, but parents reported that the stress was associated with the extent of behaviour problems rather than the developmental delay itself. Given the significant negative impact of challenging behaviours on parental stress and the home environment, it is important to select evidence-based treatment to address these behaviours effectively.
Applied behaviour analysis (ABA) is the science of human behaviour and the application of its principles to the treatment of individuals with ASD is considered evidence-based practice for the treatment of a diversity of skill deficits and behaviour excesses (Wong et al., 2015). In fact, principles of ABA have been used to effectively reduce challenging behaviours such as physical and verbal aggression toward others (e.g., Foxx & Meindl, 2007; Van Camp, Lerman, Kelley, Contrucci, & Vorndran, 2000), property destruction (e.g., Doughty, Poe, & Anderson, 2005), self-injurious behaviour (e.g. Braithwaite & Richdale, 2000), and stereotypic behaviours (e.g. Liu-Gitz & Banda, 2010; Luiselli, Ricciardi, Schmidt, & Tarr, 2004), among many others. Importantly, effective ABA interventions are function-based, meaning that they are informed by a functional behaviour assessment (FBA; i.e., an assessment by which the function of the target behaviour is identified), and seek to alter the target behaviours by attending to their function rather than their topography. Function-based interventions have been found to be more effective compared with non-function-based interventions (e.g., Ingram, Lewis-Palmer, & Sugai, 2005; Newcomer & Lewis, 2004), and they often make use of fewer punitive components (e.g., Pelios, Morren, Tesch, & Axelrod, 1999). The importance of the FBA process in the treatment of challenging behaviour is highlighted by Powers, Palmieri, D’Eramo, and Powers (2011), who suggest that any intervention that is not preceded by a FBA should be regarded with skepticism.

In order to accurately identify the function of a behaviour, FBAs may be comprised of a combination of indirect and direct assessments. Indirect assessments may include structured and unstructured interviews, informant reports, and questionnaires. Examples of indirect assessments include the Questions About Behavioral Function (QABF; Matson & Vollmer, 1995) questionnaire, the Functional Analysis Screening Tool (FAST; Iwata, DeLeon, & Roscoe, 2013),
the Motivation Assessment Scale (MAS; Durand & Crimmins, 1992), and the Open-Ended Functional Assessment Interview (Hanley, 2002). Each of these tools is designed to pinpoint a possible function of behaviour or to inform further assessments. Direct assessments may involve direct observation of the client, descriptive, or antecedent-behaviour-consequence (ABC) recording (i.e., recording the events that occurred before and after a behaviour of interest), and experimental functional analyses.

Experimental functional analyses (EFAs) are considered by many to be the gold standard in terms of functional behaviour assessments (Iwata & Dozier, 2008), as the experimental manipulation of environmental conditions associated with the challenging behaviour leads to: a) the identification of the maintaining consequences of the challenging behaviour, b) the ability to predict when a challenging behaviour will or will not occur, c) the identification of methods for preventing the challenging behaviour from occurring, and d) the ability to design a function-based intervention that will efficiently and effectively reduce the challenging behaviour by addressing its function (Horner & Carr, 1997). Behavioural interventions can be categorized as antecedent strategies, consequent strategies, or strategies designed to teach a replacement skill.

**Antecedent Strategies**

Antecedents are environmental events that precede a behaviour of interest. Interventions that focus on antecedent strategies may alter these environmental events such that the challenging behaviour no longer occurs. Some commonly used antecedent strategies in the literature include noncontingent reinforcement (e.g., Ingvarsson, Kahng, Hausman, & Carr, 2008; Smith, Gadke, Stratton, Ripple, & Reisener, 2018), choice making (e.g., Cole & Levinson, 2002; Kern & Clemens, 2007; Peck Peterson, Caniglia, & Royster, 2001), demand fading (e.g., Penrod, Gardella, & Fernand, 2012), the removal/altering of the aversive stimuli or aversive
context associated with problem behaviour (e.g., Smith, 2011), and manipulation of motivating operations (e.g., Horner, Day, & Day, 1997; McComas, Hoch, Panoe, & El-Roy, 2000).

Motivating operations (MOs) are responsible for momentarily altering the value of a consequence as a reinforcer or punisher, as well as the probability of behaviours associated with those consequences (Michael, 1993). Establishing operations (EOs) momentarily increase the value of a reinforcer and the frequency of behaviours associated with that reinforcer, while abolishing operations (AOs) decrease the value of the reinforcer and the frequency of those behaviours. The manipulation of MOs can be effectively used as an antecedent strategy to increase desirable behaviours (e.g., O’Reilly et al., 2012) or decrease challenging behaviours (e.g., Horner et al., 1997; McComas et al., 2000), by making the maintaining reinforcer more or less desirable in that moment.

**Teaching Replacement Behaviours**

Interventions that focus on teaching a replacement behaviour are crucial in ABA, as it is important to teach learners appropriate behaviours that allow them to access the same contingencies as maladaptive behaviours. One of the most common interventions for teaching a functionally equivalent alternative behaviour is functional communication training (FCT). FCT refers to teaching an alternative communicative response to replace an inappropriate response, using functional equivalence (Carr, 1988). The first step to implementing a FCT procedure is determining the consequences that are maintaining the challenging behaviour (i.e., the reinforcer that maintains it) through a functional behaviour assessment. Following this, an appropriate communicative response is taught that will allow the learner to contact the same consequences as the challenging behaviour, effectively providing a replacement behaviour. This procedure has
been found by a literature review to be the most commonly used intervention for reducing problem behaviours in children with ASD (Matson, Dixon, & Matson, 2005).

**Consequent Strategies**

Consequences are environmental events that follow a behaviour of interest, that can increase or decrease the likelihood of the future occurrence of that behaviour. Reinforcement procedures are used to increase the future occurrence of a behaviour under similar stimulus conditions, while punishment procedures are used to decrease the future occurrence of a behaviour under similar stimulus conditions. The current approach in ABA research and clinical practice is to prioritize reinforcement-based interventions in order to reduce the use of aversive stimuli or the restriction of preferred items and activities when possible (The Behavior Analyst Certification Board Professional and Ethical Compliance Code for Behavior Analysts, 2017). In the literature there is a notable increase in reinforcement-based interventions since the rise of functional analysis as a method of identifying the function of target behaviours (Pelios et al., 1999). Despite these changes, some research also highlights the need for punishment-based procedures in some situations, and the increased effectiveness of some interventions when a punitive component is included (Hanley, Piazza, Fisher, & Maglieri, 2005; Lerman & Toole, 2011). Consequence-based interventions are the most common in the treatment of challenging behaviours in individuals with ASD (Matson et al., 2005), and some examples include differential reinforcement of other behaviour (DRO; e.g., Hammond, Iwata, Fritz, & Dempsey, 2011; Heffernan & Lyons, 2016), differential reinforcement of alternative behaviour (including FCT; e.g., Athens & Vollmer, 2010; LeGray, Dufrene, Sterling-Turner, Olmi, & Bellone, 2010), time-out procedures (e.g., Wolf, McLaughlin, & Williams, 2006), and extinction (e.g., Smith et al., 2018).
Extinction is a procedure in which access to the reinforcer that previously followed a behaviour is discontinued (Cooper, Heron, & Heward, 2007). This serves to sever the relationship between a behaviour and its maintaining consequence(s), resulting in a decrease in that behaviour. There is an important distinction to be made between procedural extinction (i.e., ignoring the behaviour), which is often ineffective, and functional extinction (i.e., discontinuing the maintaining reinforcer). For the latter, an FBA is required to identify the maintaining consequence associated with the target behaviour, which often leads to a much more effective extinction procedure (Cooper et al., 2007). Extinction can be effectively used in combination with reinforcement procedures for behaviours maintained by positive reinforcement (e.g., Thompson, Fisher, Piazza, & Kuhn, 2013), negative reinforcement (e.g., Voulgarakis & Forte, 2015) and automatic reinforcement (e.g., Rincover & Devany, 1982). However, the abrupt discontinuation of the maintaining reinforcer can often result in an initial increase in the frequency, magnitude, intensity, or duration of the behaviour targeted for reduction, which is termed “extinction burst”. Implementers must be aware of, and plan for, the extinction burst, including implementing safety measures if the behaviour poses a risk to the individual or those working around him/her. For this reason, extinction is often combined with other procedures such as differential reinforcement, which may increase the overall effectiveness of extinction and help to mitigate some of the side effects of extinction (Cooper et al., 2007). FCT, described above, is commonly used in combination with extinction (Hagopian, Fisher, Thibault Sullivan, Acquisto, & LeBlanc, 1998). These combinations typically result in powerful procedures that aim to teach and reinforce an appropriate, communicative response, while simultaneously discontinuing reinforcement for an inappropriate response.
Multi-Component Interventions

Research studies sometimes evaluate the effectiveness of ABA strategies in isolation (e.g., Athens & Vollmer, 2010). However, there is a growing body of evidence showing how combinations of these strategies may be necessary in order to effectively treat challenging behaviours (e.g., Smith et al., 2018; Waters, Lerman, & Hovanetz, 2009; Wong et al., 2015). The multiple components of these interventions support each other in the reduction of challenging behaviour when one procedure alone is insufficient or inefficient in producing behaviour change. Often, multi-component interventions include a combination of antecedent strategies, consequent strategies, and strategies designed to teach replacement behaviours. However, although effective in decreasing challenging behaviours, multi-component interventions are often conducted by clinicians in clinical settings. Very little research has evaluated parent-implemented, multi-component interventions (Fettig & Barton, 2014). As generalization to the home environment may not occur, parents may not see the benefits of these interventions. Training parents to implement these strategies in the natural environment thus becomes an important step towards decreasing challenging behaviours in the home.

Meaningfully Involving Parents in the Treatment of Challenging Behaviours

Planning for Generalization

One of the critical characteristics of ABA is generality (Baer, Wolf, & Risley, 1968). A behavioural change has generality if it persists over time, transfers to new environments, or influences other related behaviours. Children with ASD who receive ABA interventions in a clinical setting may greatly benefit from the new skills and appropriate behaviours that they develop. However, while generalization can be systematically programmed into behavioural
interventions using a variety of strategies, generalization to a different environment cannot be guaranteed or assumed; in fact, some research has found that operant renewal (i.e., re-emergence of previously treated behaviour when the context changes) may commonly occur when the individual returns to a setting that differs from that in which the treatment was conducted (e.g., Kelley, Liddon, Ribeiro, Greif, & Podlesnik, 2015; Saini, Sullivan, Baxter, DeRosa, & Roane, 2018). Situations in which desired behaviour change does not generalize, or problem behaviour “re-emerges”, in the home environment, may be a great source of family stress. Thus, training parents to alter the home environment and their own behaviour in order to reduce their children’s challenging behaviours in the home is a critical step towards achieving the same treatment outcomes in the home that are seen in the clinical setting. Additionally, it is important to adequately train parents such that they are implementing these procedures with a high degree of treatment integrity.

**Identifying Barriers to Treatment Integrity**

The degree to which an intervention is implemented in the way it was designed is termed “treatment integrity”. Treatment integrity has been directly linked to treatment success in the literature, in that the greater the treatment integrity, the better the treatment outcomes (Arkoosh et al., 2007; Radley, Jenson, Clark, & O’Neill, 2014). As such, evaluating and ensuring high levels of treatment integrity is important to any behaviour change program. There are several factors that can negatively affect treatment integrity, which should be carefully monitored and mitigated whenever possible. Some factors identified in research related to treatment integrity in learning disabilities intervention research include: treatment complexity (i.e., the more complex the treatment, the greater the likelihood of poorer treatment integrity), available time and resources to implement the treatment, accurate definitions of treatment components, and
therapist drift (Gresham, MacMillan, Bebbe-Frankenberger, & Bocian, 2000). Additional factors which have been hypothesized to present barriers to treatment integrity include complexity of the skill that the trainee is required to learn, weak rule following by the trainee, instructional techniques used to teach the trainee, and competing contingencies found in the natural environment (Allen & Warzak, 2000). While Allen and Warzak (2000) identified these factors as they relate to treatment adherence (i.e., whether the treatment is being implemented at all) rather than treatment integrity, they could certainly apply to the latter as well. These factors may particularly negatively affect third-party treatment implementers, such as teachers and parents (Gresham et al., 2000).

Further, an examination of the behavioural parent training literature to-date has identified various contextual factors that may similarly negatively impact treatment integrity and adherence, as well as drop-out from, behavioural programs designed to treat and prevent child and adolescent problem behaviours. The most commonly identified factor in the literature is family socioeconomic status, in that greater socioeconomic stress leads to poorer parent training outcomes, and greater probability of drop-out from services (Shaffer, Kotchick, Dorsey, & Forehand, 2001). Additional factors include parental psychopathology, degree of marital conflict, parental depressive symptoms, and parent expectations of child behaviour (Shaffer et al., 2001). It is important to remember these types of contextual variables when designing parent training programs, as they may impact the extent to which parents can successfully implement behavioural interventions.

**Providing Evidence-Based Training**

Given the importance of treatment integrity to ensuring best treatment outcomes, choosing the most effective training method is essential. One training procedure that is evidence-
based and commonly used in ABA is behaviour skills training (BST). BST is a behavioural training method that has proved to be efficacious in training a variety of skills to children, parents, individuals with disabilities, and their caregivers (Gross et al., 2007; Johnson et al., 2006; Miles & Wilder, 2009; Miltenberger et al., 1999; Sarokoff & Sturmey, 2004). BST consists of four main components: instruction, modeling, rehearsal, and feedback (Ward-Horner & Sturmey, 2012). Instructions can be presented in written or oral form, following which, the trainer models the skills to the trainee. The trainee then rehearses the skill and receives feedback from the trainer until the skill is demonstrated with the desired level of integrity. Parents and caregivers have been successfully trained using BST to implement a variety of interventions from guided compliance (Miles & Wilder, 2009) to treating food selectivity (Seiverling, Williams, Sturmey, & Hart, 2012). Feldman, Condillac, Tough, Hunt, and Griffiths (2002) successfully used BST to train mediators, including parents, to implement multi-component interventions in order to maintain the reduction of challenging behaviours in individuals with developmental disabilities.

**Maintaining High Levels of Parent Treatment Integrity**

Once the trainee has received adequate training using an evidence-based training method such as BST, it is important to ensure that treatment integrity remains high during the implementation of the intervention. Some research from various fields such as social work and education has attempted to discover the best ways to maintain high levels of treatment integrity following training, and several studies and reviews have found that ongoing coaching and support of the trainee in real time may be necessary to achieve this goal (e.g., Goense, Boendermaker, & van Yperen, 2016; Kretlow & Bartholomew, 2010). A study that performed a social validity assessment to determine the most accepted training methods for special education...
service providers found that performance feedback (during implementation of the procedures) was both the most acceptable and the most highly rated by participants for improving treatment integrity (Strohmeier, Mulé, & Luiselli, 2014). Similarly, a study in which teachers received continued performance feedback after being trained to implement antecedent and consequent strategies in the classroom found that this type of ongoing support helped to increase treatment integrity across both strategies, and the results were maintained over time (Coddington, Feinberg, Dunn, & Pace, 2005). Although this research was conducted with special education providers, it is reasonable to believe that parents may benefit similarly from ongoing coaching and support in the form of performance feedback. This type of ongoing support may help maintain high levels of treatment integrity for parents implementing multi-component interventions in the home, which would, in turn, lead to more effective treatment outcomes.

**Extending the Current Research**

The behaviour analytic literature includes numerous studies focusing on parent training. Parents have been successfully trained to implement a variety of interventions with their children with ASD including DRO (Niemeyer & Foxx, 1990), social skills training (Radley et al., 2014), Picture Exchange Communication System (PECS) training (Ben Chaabane, Alber-Morgan, & DeBar, 2009), script fading (Reagon & Higbee, 2009), among many others. However, with few exceptions (e.g., Feldman et al., 2002) parent training often focuses on teaching one specific skill. Overall, little research has looked at the implementation of multi-component interventions by parents in the home setting (Fettig & Barton, 2014). Since multi-component interventions have been shown to be effective in the clinical setting for the reduction of challenging behaviours, exploring methods to effectively train parents to implement multi-component interventions in the home would constitute a significant contribution to the literature. This type
of research could help lead to strategies that mitigate operant renewal of challenging behaviours in the home.

In addition to the limited research on parent-implemented multi-component interventions, behaviour analytic literature is also lacking in its careful monitoring and reporting of treatment integrity. A 2015 review of the behavioural literature found that, over the years, the percent of studies that report treatment integrity of independent variables has followed an increasing trend, with 59% of studies in 2012 reporting treatment integrity. (Neely, Davis, Davis, & Rispoli, 2015). However, of these studies, only 30% collected treatment integrity data on a minimum of 20% of sessions throughout the study, which was considered the quality threshold for sufficient data collected (Neely et al., 2015). Additionally, the review conducted by Fettig and Barton (2014) found that, out of the four identified studies that trained parents to implement a multi-component intervention consisting of an antecedent strategy, replacement skill, and consequent strategies, none reported treatment integrity for the parent. The lack of treatment integrity data in the literature is concerning, since the correct application of the independent variables is a necessary step towards drawing conclusions related to the functional relationship between the independent and the dependent variables.

**Purpose**

Great advances have been made in the treatment of challenging behaviour, including functional analysis technology and the increased use of reinforcement-based strategies. Further, research has demonstrated the effectiveness of multi-component, behavioural interventions in the treatment of challenging behaviour (e.g., Horner & Carr, 1997, Marcus & Vollmer, 1996; Vollmer, Ringdahl, Roane, & Marcus, 1997; Wong et al., 2015). Despite these advances, little evidence exists related to the effective implementation of these types of interventions within a
major consumer group, namely parents and caregivers. As such, little is known about the level of
treatment integrity with which these interventions are implemented in the home environment by
parents. Further, little is known about the effectiveness of BST in training parents to implement
these interventions with fidelity. The present study aimed to fill these gaps in the literature by
training a parent of a child with ASD to implement a multi-component behavioural intervention
in the home environment; more so, this study actively monitored and collected data on the levels
of treatment integrity for each intervention component, and provided ongoing staff coaching and
support in an attempt to mitigate barriers related to maintaining a high level of treatment
integrity throughout the intervention. The present study sought to answer the following research
questions:

1) Is BST an effective method for training parents to implement a multi-component
intervention with ongoing coaching, as evidenced by high levels of treatment integrity
in each treatment component?

2) What is the treatment integrity for each of the three main components of a
behavioural intervention (antecedent strategies, consequent strategies, and
replacement behaviours), when implemented by parents at home, with ongoing
coaching?

3) How does each treatment component impact the child’s target behaviour?

Method

Participants

Participants were recruited from one community-based school/ABA clinic in Brantford,
Ontario. The clinic’s directors shared information about the study (i.e., study poster and parent
information letter) with families that fit the study’s inclusion criteria, and whom they considered to be eligible candidates for parent training based on an expressed interest in parent training or the occurrence of child challenging behaviour in the home. Families were selected for participation in the study based on the following child criteria: a) ASD diagnosis, b) between 4 and 9 years of age (i.e., kindergarten/primary school aged), and c) challenging behaviour identified by parents (e.g., aggression, severe non-compliance, and extreme tantrums).

The student researcher met with interested parents in order to review the purpose and procedures of the study. Parents were provided with an information letter and consent form. Parents were given the opportunity to read the consent form and ask questions to ensure free and informed consent. The student researcher met with, and interviewed, five families for the study. One family withdrew from the study prior to the completion of the EFA. Three additional families were either unable to meet the requirements for the study, or during the completion of the FBA it was identified that their child did not meet the inclusion criteria. One parent-child dyad completed the intervention, described below.

Olivia was a 6-year-old female with a diagnosis of ASD, as confirmed by a review of her diagnostic report. At the time of her participation in the study, she had been receiving both in-clinic and in-home ABA intervention for approximately 23 months. Olivia was non-verbal and communicated using the Picture Exchange Communication System (PECS; Frost & Bondy, 2002). She was proficient with Phase IV of PECS (i.e., building sentences using “I want” and a picture of the item being requested) in-clinic; however, use of PECS at home and school was variable. The target behaviour for reduction was termed “tantrum behaviour” and was operationally defined as any instance of guttural screams, yelling, swiping items off surfaces, throwing items, hitting, and/or scratching another person, as well as any attempts to hit and
scratch, that are either dodged or blocked by others. Olivia’s typical after-school routine included arriving home, immediately changing into a diaper (even though she was fully toilet trained), a pair of pyjamas, and obtaining a soother. Additionally, Olivia insisted that her mother, Karen, also change into her own pyjamas at this time. It was reported that tantrum behaviour frequently occurred in association with this routine, especially when her mother declined to wear pyjamas for various reasons such as having to go to work later that day or run errands outside the home. The challenging behaviour that occurred within this particular routine (i.e., demanding her mother wear pyjamas) was chosen for intervention in consultation with the family and the clinical treatment team. Karen chose this behaviour due to its significant negative impact on family quality of life. Although Karen noted that she did not mind wearing her pyjamas at times, and she did not mind Olivia asking her to put on her pyjamas, always having to wear pyjamas was disruptive to the family. Tantrum behaviour that occurred in association with access to other tangible items, to escape demands, or due to changes in routine, were not targeted in the present study.

Karen was trained to implement the intervention with Olivia as the target behaviour was most likely to occur with Karen. Karen was the primary caregiver for Olivia and her 3-year-old brother, and also worked part-time outside the home. Olivia’s father worked during the day and was not involved in the intervention during the study.

Megan was the member of Olivia’s treatment team that was selected as the primary parent coach for Karen throughout the duration of the study. Megan was Olivia’s lead therapist, and she had a well-established professional relationship with Olivia, Karen, and the family. She had previously provided parent coaching to Karen to facilitate generalization of targets mastered in IBI, including PECS training, and was tasked with providing performance feedback to Karen.
during each research session. At the time of the study, Megan was working towards her
Registered Behavior Technician™ (RBT®) certification, and had extensive experience working
in the field of ABA (i.e., she had worked under the supervision of Clinical Psychologists and
Board Certified Behaviour Analysts (BCBAs®) for over 11 years).

Settings and Materials

Parent training and implementation of the intervention occurred in the home
environment. The intervention began as soon as Olivia and Karen arrived home from school and
walked through the front door. The intervention was also conducted in the kitchen area, living
room area, and Olivia’s bedroom. The environment was set up in a manner that was consistent
with the family’s regular routine (see section on Parent Behaviour 1, and Appendix A). Staff
training was conducted at the ABA clinic in Brantford, Ontario.

Research sessions occurred three times weekly. Megan and the student investigator
arrived at Olivia’s home between 2:45 and 3:15 on Tuesdays, Wednesdays, and Thursdays for
the duration of the study. All sessions were filmed using a Canon VIXIA HF R800 video camera.
Data were collected in vivo using pen and paper, and were graphed using Microsoft® Excel.
Videos from the camera’s SD card were uploaded to a secure Sync account (an encrypted cloud
storage platform) after each research session.

Functional Behaviour Assessment

Prior to designing a multi-component intervention to address Olivia’s target behaviour, a
comprehensive FBA was conducted with Olivia and Karen. The FBA consisted of indirect
assessments including the QABF and the Open-Ended Functional Assessment Interview, and a
direct assessment in the form of an EFA.
Questions About Behavior al Function (QABF). Olivia’s mother completed the QABF, which is a questionnaire designed to identify the function(s) of a target behaviour. It consists of 25 items categorized by five different potential functions of behaviour: automatic, attention, escape, access to tangible items, and physical discomfort. Each question offers a scenario in which the behaviour may occur (e.g., “Engages in the behaviour when asked to do something”) and is then scored on a rating scale from 0 (“never”) to 3 (“often”) with regard to the frequency of the behaviour in that particular situation. The sum of ratings for questions that fall into each functional category represents the likelihood that the behaviour is maintained by that particular function. Some research has demonstrated that the QABF can reliably identify the function of a behaviour (Watkins & Rapp, 2013). For the present study, the QABF was used to inform the conditions of the FA.

Open-Ended Functional Assessment Interview. The Open-Ended Functional Assessment Interview (Hanley, 2002) is an open-ended interview that gathers information by allowing the interviewee to elaborate on 19 questions related to the target behaviour, and the target individual. In general, open-ended indirect assessments offer the potential benefit of gathering useful information as a result of a conversation with the interviewee, rather than the questions themselves (Fryling & Baires, 2016). The interview includes questions about the topography of the target behaviour, the main priorities for treatment, and any antecedent and consequent events associated with the target behaviour. The interview was conducted with Karen, in order to gain further insight into the variables associated with Olivia’s target behaviour, and to build rapport with Karen.

Functional analysis (FA). Using the information gathered through indirect assessment, a trial-based functional analysis was designed to experimentally test whether Olivia’s tantrum
behaviour was maintained by access to tangible items, in the form of pyjamas. Trial-based FAs were first introduced by Sigafoos and Saggers (1995) and constitute a variation on the traditional FA, whereby discrete trials are conducted in the individual’s natural environment. Each trial consists of a control segment in which the EO for the target behaviour is absent (i.e., the reinforcer is freely available) and a test segment in which the reinforcer is withheld and the EO is present. Segments are generally brief (i.e., a maximum of 1 to 2 minutes in length) and are terminated contingent upon the occurrence of the target behaviour (Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011; Larkin, Hawkins, & Collins, 2016). Some research has supported the use of trial-based FAs in the classroom setting, especially due to their brevity and relative ease of implementation (e.g., Lambert, Bloom, & Irvin, 2012; Larkin et al., 2016). Additionally, research that has compared outcomes of trial-based FAs to those of traditional FAs has found significant correspondence between the two FA variations (Bloom et al., 2011; LaRue et al., 2010; Wallace & Knights, 2003).

A trial-based FA was chosen as the researchers believed it would be an efficient method to identify the function of the behaviour, which was hypothesized to be socially-mediated positive reinforcement in the form of access to Karen wearing pyjamas, as suggested by the previously-described indirect data. In the control segment, both Olivia and Karen were wearing pyjamas, and were sitting on the sofa in the living room. In the test (tangible) segment, Karen was wearing regular clothing. In both segments, the environment was set up to mimic Olivia’s daily environment, including having the TV on, and some toys and snacks easily accessible. That is, the only variable that changed between the control and test segments was Karen’s clothing. Each segment began when Karen entered the living room and came within view of Olivia, and ended either when two minutes had elapsed, or when tantrum behaviour occurred. Five trials
(where one trial consists of one control-test pair of segments) were conducted. Data were collected on the occurrence or non-occurrence of tantrum behaviour in each segment and were graphed as a percent of segments with tantrum behaviour for the test and the control conditions. This was calculated by adding the number of segments in which tantrum behaviour occurred, dividing by the total number of segments conducted, and multiplying by 100. The calculation was done separately for control segments and for test segments.

**Independent Variables**

The present study involved two independent variables: 1) BST training, which was provided to Karen in order to train each component of the multi-component intervention, and 2) the multi-component intervention that Karen implemented with Olivia in order to reduce the occurrence of child challenging behaviour.

**BST training.** The primary independent variable for this study was BST parent training for three parent behaviours: implementation of an antecedent strategy, implementation of strategies designed to teach a replacement skill, and implementation of a consequent strategy. Each intervention component (i.e., antecedent strategy, replacement skill, consequent strategy) was developed based on the results of the FBA in consultation with Karen. Karen reviewed each intervention component and was given the opportunity to provide input. Once Karen’s input was integrated she provided written consent for each intervention component prior to parent training and implementation.

**Parent Behaviour 1 (antecedent strategy).** The antecedent strategy (Appendix A) was designed to prevent the occurrence of tantrum behaviour by having the desired tangible item (i.e., Karen wearing her pyjamas) readily available upon arrival home. Additionally, the home
environment was enriched by having Olivia’s favourite TV show, snacks, and activities easily accessible, as well as her own pyjamas available for her to change into upon arrival home. This was done to minimize the likelihood that Olivia would engage in tantrum behaviour in order to gain access to other tangible items. Karen was instructed to turn the TV on, and to place some toys in the living room and snacks on the kitchen counter, before going to pick Olivia up from school. She was also instructed to place a pair of her own pyjamas on the bench by the front door, and to have Olivia’s pyjamas available in the bathroom, along with diapers and a soother, which coincided with Olivia’s routine of putting pyjamas on after school. As soon as Karen and Olivia walked through the front door, Karen was instructed to pick up her pyjamas and state “Ok, Olivia, I am going to go change now” (or something similar), and to head to her bedroom to change into her pyjamas. While Karen changed, Megan helped Olivia take off her boots and coat. Upon her return, Karen offered Olivia the chance to change into her own pyjamas, if she wished. The antecedent strategy was only practiced once per session, upon arrival home, and was termed “the antecedent trial”. This was done for logistical reasons, as walking into the house and picking up the pyjamas from the bench by the front door occurred only once per session within the natural routine. The antecedent trial began when Olivia and Karen crossed the threshold of the front door, and ended when Karen began walking down the hall to change into her pyjamas. Parent Behaviour 1 was considered mastered when Karen achieved a score of 80% or higher on the treatment integrity checklist for the antecedent strategy (Appendix D), across three consecutive sessions. Following mastery, Karen’s implementation of the antecedent strategy continued to be monitored each session.

**Parent Behaviour 2 (replacement skill).** In order to teach Olivia to request that her mother put on pyjamas in a socially acceptable manner, Karen was taught to prompt Olivia’s use
of PECS to mand for pyjamas. During the antecedent trial (i.e., the first trial of each session, which occurred when Karen and Olivia first entered the home), Karen implemented the replacement skill procedures (Appendix B) in addition to the antecedent strategy procedures (described above). Upon entry into the home, Karen no longer picked up the pyjamas and immediately went to change; rather, she first prompted Olivia to correctly mand for pyjamas using PECS, and went to change into her pyjamas only in response to a successful mand. Following the antecedent trial, between one and five additional manding trials were conducted each session to aid in skill development. Each manding trial required Karen to change back into regular clothing, and to ensure that Olivia’s PECS binder was easily accessible. Each of these trials began when Karen emerged from her bedroom wearing regular clothing, and ended when she began walking down the hall, to her bedroom, to change into her pyjamas. During the first step of the replacement skill protocol, Karen prompted Olivia to mand for pyjamas using PECS, then immediately honoured the request by going to change into pyjamas. For a PECS exchange to be considered correct, Olivia was required to build the sentence “I want pyjamas” by picking up the “I want” picture and placing it on the sentence strip, then picking up the “pyjama” picture and placing it on the sentence strip to the right of the “I want” picture. Following building the sentence, Olivia was required to remove the sentence strip and hand it to Karen, then point to each picture as Karen read the words “I want pyjamas”. Karen was required to stand close to Olivia and facilitate the PECS exchange by implementing a prompt hierarchy as needed. The prompt levels in the hierarchy consisted of:

- Hand-Over-Hand prompt (Place your hand over Olivia’s hand and guide her through the motion of picking up each picture)
- Partial Physical Prompt (Gently touch Olivia’s hand or wrist to encourage her to move her hand towards the appropriate pictures)

- Gestural Prompt (Point to each picture and allow Olivia to independently pick up each picture).

The level of prompt used was left to Karen’s discretion on each trial; however, when necessary, parent coaching was immediately provided in-vivo, to ensure that the mand was completed correctly on every trial (i.e., to reduce the occurrence of errors). Karen was also required to correct any errors by resetting the mand trial and using an increased prompt level to ensure success. Additionally, she was specifically instructed never to use verbal prompts during the PECS exchange, in accordance with the PECS protocol (Frost & Bondy, 2002) and to ensure that the steps performed by Olivia remained under the appropriate stimulus control. Karen’s implementation of the teaching strategies for the replacement skill was considered mastered when she achieved a score of 80% or higher on the treatment integrity checklist for the replacement skill across three consecutive sessions. When this mastery criterion was reached, the researchers continued to monitor Karen’s implementation of the replacement skill, as well as Olivia’s percent of correct manding, which informed advancement through the steps of the replacement skill protocol.

Following Olivia’s mastery of the PECS exchange (80% correct exchanges across three consecutive sessions), the replacement skill advanced to Step 2 of the protocol which included a “wait” period. The aim of this step was to systematically increase the amount of time that Olivia could wait in the absence of tantrum behaviour following a request for pyjamas. For this step, following a correct PECS exchange, Karen was instructed to state “Ok, you just have to wait a second” and time the correct number of seconds. For “wait” periods greater than 9 seconds,
Karen was given a timer; however, for shorter times she was allowed to count in her head for ease of implementation. Following the “wait” period, Karen was instructed to announce “Ok, I will go change now” and honour the request for pyjamas. “Wait” times were systematically increased as Olivia reached a mastery criterion of 80% correct waiting (i.e., waiting for the specified period of time in the absence of tantrum behaviour) across two consecutive sessions. The terminal goal of the program was to eventually deny Olivia’s requests for pyjamas, while maintaining low rates of challenging behaviour.

**Parent Behaviour 3 (consequent strategy).** The consequent strategy (Appendix C) that was added as the third intervention component for Olivia was extinction. In order to break the contingency between tantrum behaviour and access to Karen wearing pyjamas, Karen was instructed to withhold access to her pyjamas when tantrum behaviour occurred, and to only honour correct mands for pyjamas in the absence of tantrum behaviour. If tantrum behaviour occurred at any time before the mand for pyjamas, during the mand, or during the “wait” period following the mand, Karen was instructed to reset the sentence strip by replacing the “I want” and the “pyjama” pictures back on the cover of the PECS binder, wait for five seconds of “calm behaviour” (i.e., absence of tantrum behaviour), then restart the trial by prompting the mand again. Karen was to repeat this process until a correct mand and correct waiting occurred, in the absence of tantrum behaviour. Karen also blocked access to the PECS binder while tantrum behaviour was occurring, to avoid the occurrence of several mands that would not be reinforced. Karen’s implementation of the consequent strategy was considered mastered when she achieved a score of 80% or higher on the treatment integrity checklist for the replacement skill across three consecutive sessions.
Measurement

**Primary dependent variable.** The primary dependent variable for the study was Karen’s implementation of the intervention components on the first trial of each session, which constituted a probe of Karen’s performance of each intervention component. This was measured in percent of steps implemented correctly on each treatment integrity checklist (Appendix D). During implementation of the intervention on the first trial of each research session, Karen received a “+” or “-“ for each step on treatment integrity checklists for each of the three intervention components. The data were converted to a percent of steps implemented correctly by adding the number of steps implemented correctly (i.e., scored as a “+”), dividing by the total number of steps, and multiplying by 100. This was done separately for each intervention component. Data continued to be collected for the remaining trials of each research session (up to six trials per session), although these data were not used for treatment/research decisions.

**Secondary dependent variables.** Child data were collected throughout the study and constituted the secondary dependent variables. Data were collected on duration of tantrum behaviour, correct and incorrect mands, and correct and incorrect waiting during the “wait” trials (Appendix E).

**Duration of tantrum behaviour.** Duration of tantrum behaviour was collected from video by starting a timer when the tantrum behaviour started and stopping the timer when the tantrum behaviour stopped for three seconds. The timer was started again upon the next occurrence, and data collection continued in this manner until a measure of total duration of tantrum behaviour was obtained for each trial. Mean duration of tantrum behaviour per trial was obtained by summing the durations for each trial, dividing by the total number of trials conducted in that
session, and multiplying by 100. Mean duration was chosen as it was believed to most accurately represent Olivia’s performance across each session and each phase of the study.

**Correct and incorrect mands.** Correct and incorrect mands were scored by marking a “+” or a “-” for three separate steps of a mand: approaching the binder, building the sentence “I want pyjamas”, and exchanging the sentence strip. A “+” was scored if Olivia performed the steps independently (i.e., in the absence of any prompts from Karen), and all steps required a “+” for the mand to be considered correct for that trial. A “-” was scored if Olivia required prompting to complete a step. The data were converted to a percent of correct mands per session by adding the number of correct mands, dividing by the total number of trials conducted that day, and multiplying by 100.

**Correct and incorrect wait trials.** Finally, correct and incorrect waiting was scored by marking a “+” if Olivia waited for the duration of the specified wait period in the absence of tantrum behaviour, or a “-” if Olivia engaged in tantrum behaviour during the wait period. The data were converted to a percent of correct wait trials by summing the number of correct wait trials, dividing by the total number of wait trials conducted that day, and multiplying by 100.

**Quality of Life Impact.** The Quality of Life Impact questionnaire (Feldman et al., 2002; Appendix F) contains eight questions regarding the impact of the target behaviour on different aspects of the individual’s and the family’s life. Each question is rated on a scale from 1 (“minimally”), to 7 (“extremely”), depending on the impact of the target behaviour on that item. The questionnaire inquires about the individual’s ability to learn new skills (e.g., “Does this behaviour interfere with opportunities for learning?”), the individual’s ability to integrate into the community and participate in daily routines (e.g., “Does this behaviour interfere with opportunities for community integration or going out in the community?”), and the impact of the
target behaviour on the family and the home environment (e.g., “Does this behaviour interfere with opportunities of the family/group home to invite friends into the home?”, and “Does the behaviour cause the family/group home to feel stressful?”). This questionnaire was used as a pre- and post-measure to determine the impact of the intervention on the family’s quality of life, and as a measure of the social validity of the intervention.

**Interobserver agreement.** Interobserver agreement (IOA) was collected for all dependent variables including parent treatment integrity, duration of tantrum behaviour, correct and incorrect mands, and correct and incorrect waiting. Data were collected from video by a trained research assistant on 36.84 to 38% of sessions.

**Experimental Design**

A multiple baseline design across parent behaviours was used. This design allows researchers to evaluate the effects of an independent variable across multiple behaviours, without the need to withdraw the treatment in order to demonstrate experimental control. The three parent behaviours for this study, described above, consisted of parent implementation of the antecedent strategy, strategies designed to teach the replacement skill, and the consequent strategy. This research design was chosen to clearly show the level of treatment integrity for each intervention component, and whether treatment integrity was affected by the introduction of new intervention components. The study consisted of initial staff and parent training, then four phases of data collection/intervention (i.e., phase 1 corresponded with baseline, during which all behaviours were in baseline, and phases 2-4 corresponded with the sequential introduction of each intervention component), ongoing parent training, and transfer of treatment procedures to the treatment team.
Procedures

**Staff and parent training.** Behaviour skills training (BST) was used to train the parents on the implementation of each component of the intervention, and to train the staff on effective parent coaching strategies for each intervention component.

**Staff training.** Staff training using BST occurred prior to parent training for each treatment component. Several individuals were present to ensure adequate training: Megan (the parent coach), the student investigator, and one or two other confederates who assisted with the role play. A written description of the intervention component was provided to Megan, in addition to the treatment integrity checklist. The researcher modeled correct parent coaching and data collection in a variety of situations, with the help of confederates who played the roles of Olivia and Karen. Following the model, Megan was given the opportunity to practice parent coaching and data collection, while the student investigator provided feedback and collected IOA data. Role playing continued until Megan demonstrated proficiency with parent coaching (i.e., above 80% coaching integrity), as well as data collection (i.e., 80% or better IOA between Megan and the student investigator).

**Parent training.** Parent training occurred prior to the implementation of each new intervention component. Karen was given a written protocol for each component and asked to read it thoroughly. The researchers then inquired about the feasibility of the intervention for Karen and her family and solicited suggestions from Karen on any potential adjustments that would make correct implementation more likely. When Karen’s questions regarding the protocol had been adequately answered, and her suggestions incorporated into the protocol, the student investigator modeled correct implementation of the intervention component in a variety of situations (e.g., presence/absence of tantrum behaviour, variations in manding performance, etc.)
with the help of a confederate. Following the model, Karen was given the opportunity to practice the skill and receive feedback from the student investigator until she demonstrated the skill with above 80% accuracy. Training sessions typically lasted between 30 and 40 minutes.

**Re-training criterion.** The criterion for re-training during the implementation of the intervention was two consecutive sessions in which treatment integrity for in-vivo implementation of the intervention component was lower than 80%, on the first trial of the session.

**Phase 1.** In Phase 1, Parent Behaviours 1, 2, and 3 were in baseline conditions. Karen was instructed to do what she would typically do during the routine of arriving home, while the student investigator videotaped and collected data on Karen’s implementation of all three intervention components. Six trials were conducted during each baseline session, with the first trial always being the antecedent trial (i.e., arrival home from school and entering the home). The study was in Phase 1 until stability in the data was observed.

**Phase 2.** In Phase 2, Karen began implementing the antecedent strategy (Parent Behaviour 1), following BST training. This was done during the antecedent trial only. One additional trial was conducted in each session, in order to continue collecting baseline data on Parent Behaviours 2 and 3 for the multiple baseline. During these trials, Karen changed back into regular clothing and was instructed to do what she would typically do in response to Olivia’s behaviour. Phase 2 continued until Karen scored 80% or higher on the treatment integrity checklist for Parent Behaviour 1 for three consecutive sessions, which was considered the mastery criterion for this behaviour.
Phase 3. In this phase, Karen implemented both the antecedent strategy and the strategies designed to teach the replacement skill (Parent Behaviours 1 and 2). The antecedent trial now consisted of the antecedent strategy and the replacement skill combined. Additional trials (between one and four) were conducted inside the home, for the purposes of a) practicing the replacement skill multiple times, and b) continuing to collect baseline data on Parent Behaviour 3. During Phase 3, Karen was instructed to do what she would typically do to manage any tantrum behaviour, since the consequent strategy was not yet in effect. Phase 3 continued until Karen scored 80% or higher on the treatment integrity checklist for Parent Behaviour 2 for three consecutive sessions. Data collection for Parent Behaviour 1 also continued, to ensure that treatment integrity remained at acceptable levels.

Phase 4. In Phase 4, Karen was implementing a complete multi-component behavioural intervention following the addition of the consequent strategy (Parent Behaviour 3). During the antecedent trial, Karen was now implementing all three intervention components, as needed. Additional trials (between one and four) were conducted inside the home, in order to continue practicing the replacement skill, and to allow the opportunity to implement the consequent strategy when needed. Karen’s implementation of Parent Behaviour 3 was considered mastered when she achieved 80% or higher treatment integrity across three consecutive sessions; however, all three parent behaviours continued to be monitored throughout the remainder of the study, to ensure that treatment integrity remained at acceptable levels.

Introduction of “wait” component. When all three intervention components were in place and Karen was implementing a complete, multi-component intervention on each trial, the remainder of the research sessions focused on Olivia’s advancement through the replacement skill protocol; specifically, the introduction of the “wait” period following the mand. When
Olivia’s manding reached 80% correct across three consecutive sessions, the next research session contained a “wait” baseline. Karen was instructed to implement all intervention elements as previously trained, with one notable exception: following Olivia’s mand for pyjamas, Karen was instructed to state “Ok, you just have to wait a second”. The student investigator then started a timer and stopped the timer when tantrum behaviour occurred. This was done across two trials during that session. Additional baseline trials were not conducted due to Karen’s request to end the research session early that day. The baseline data were used to establish a starting point for the “wait” period, which was introduced in the next session at 5 seconds. The wait time was systematically increased each time Olivia waited in the absence of tantrum behaviour for 80% of trials across two consecutive sessions.

**Ongoing parent coaching.** In order to maintain appropriate levels of treatment integrity across all three parent behaviours, Megan was present during each research session to provide parent coaching as needed. She interrupted errors and provided immediate feedback, such that Karen always implemented the procedures exactly as written. Megan also provided encouragement and support during each research session, as well as overall feedback at the end of the session. To ensure that parent coaching was also provided accurately (i.e., above 80% parent coaching integrity), and at the correct times, the student researcher collected data on Megan’s parent coaching, and provided immediate feedback to Megan as needed.

**Transfer of procedures to treatment team.** After the wait time had increased to 45 seconds, and after the data demonstrated that Megan was proficient in providing parent coaching to maintain treatment integrity, the student investigator’s presence in the home was faded from three sessions to one session per week. This decision was made for several reasons. First, the goal was to fade the intervention and coaching provided to the family to the natural mediators in
the community (i.e., the treatment team). Further, the family was preparing to move to a new home and attempts were made to reduce the disruption in the family home, while maintaining support to the family. As such, parent coaching duties were transferred exclusively to Megan. Megan continued to attend research sessions three times per week, while the student investigator only attended one session per week for two consecutive weeks, to conduct a weekly probe.

Approximately six weeks following the family’s move to the new home, intervention resumed following a request from Karen for assistance with the implementation of full extinction of pyjamas (i.e., Olivia’s attempts to access her own pyjamas, or have Karen put on her pyjamas, either through manding or challenging behaviour, were denied until bed time). A program revision was created by the treatment team and the research team (Appendix G), and the student researcher attended two weekly sessions to train Karen using BST, and to observe and collect data. Karen continued the intervention daily, with support and coaching from the treatment team. The protocol required Karen to acknowledge Olivia’s first mand for pyjamas each day, by stating the rule “Pyjamas are only available at bed time”. All subsequent requests for pyjamas were ignored, and pyjama-related tantrum behaviour was placed on extinction. Data were collected on Karen’s implementation of the extinction procedure during the two weekly sessions using a treatment integrity checklist (Appendix H). In order to accurately and reliably capture the occurrence of problem behaviour across longer sessions (i.e., seven hours), which were partially designed to provide additional support to the family as they implemented full extinction, two-minute partial interval recording (PIR) was used to collect data on Olivia’s tantrum behaviour. This interval was chosen to make it feasible for the treatment team to collect data on pyjama-related tantrum behaviour, while also conducting the session and managing tantrum behaviour. A “+” was scored if Olivia engaged in pyjama-related tantrum behaviour at any time during the
two-minute interval, and a “-“ if Olivia did not engage in pyjama-related tantrum behaviour at all during the interval. The percent of intervals with occurrence of pyjama-related tantrum behaviour was calculated by summing the number of intervals scored as “+”, dividing by the total number of intervals, and multiplying by 100. Data were also collected on the frequency of mands for pyjamas during the seven-hour session, and duration of tantrum behaviour following the first mand for pyjamas.

Results

Functional Behaviour Assessment (FBA)

The FBA conducted with Karen and Olivia consisted of both indirect and direct assessment methods. The indirect assessment tools used were the QABF, and the Open-Ended Functional Assessment Interview. The direct assessment consisted of a FA.

Questions About Behavioural Function. The scores in each category of the QABF, based on parent report, were 13, 10, 5, 5, and 5, for the tangible, escape, attention, non-social, and physical conditions, respectively. This indicated that, according to Olivia’s mother, Olivia may engage in tantrum behaviour in order to gain access to preferred items and activities, and to escape unwanted situations or demands. The results indicated that Olivia was not as likely to engage in the tantrum behaviour in order to gain access to attention, as a form of self-stimulation, or to indicate that she felt ill or was experiencing pain or discomfort.
Figure 1. Results of QABF questionnaire across the categories corresponding with five behavioural functions: tangible, escape, attention, non-social, and physical.

Open-Ended Functional Assessment Interview. The results of the interview, conducted with Olivia’s mother, indicated that tantrum behaviour may have been multiply controlled, and context-specific. Some antecedent events that were identified by Olivia’s mother were arriving home from school, being at someone else’s house (i.e., a new situation), changes in routine, not being able to communicate her wants effectively, and not getting her way, including access to highly preferred items. Karen reported that the family usually managed the tantrum behaviour by attempting to prompt Olivia to mand for what she wants, or redirecting Olivia to a different activity, including other preferred activities. If the tantrum behaviour persisted to levels that were unmanageable, the family sometimes provided access to the item or activity Olivia desired, in order to minimize any risks associated with ongoing tantrum behaviour.

Functional analysis. Figure 2 shows the results of the trial-based FA. Tantrum behaviour never occurred in the control segment. Specifically, 0% of intervals contained tantrum behaviour.
in the control segment. By contrast, 80% of trials contained tantrum behaviour in the test (tangible) segment.

Figure 2. Trial-based functional analysis results for Olivia.

**Multi-Component Intervention**

**Parent behaviour.** At baseline, Parent Behaviour 1 was implemented with low treatment integrity (range of 0-14%). Following BST training, treatment integrity increased to an average of 92.3% (range of 71 to 100%) across Phase 2, and met mastery criteria (i.e., 80% correct over three sessions) within six sessions. Treatment integrity remained in the range of 83 to 100% for the remainder of the study.

Parent Behaviour 2 was also implemented with low treatment integrity at baseline (range of 0 to 25%). Following BST training, treatment integrity for Parent Behaviour 2 increased to an average of 90% across Phase 3 (range of 60 to 100%), and met mastery criteria (i.e., 80% correct over three sessions) within four sessions. Treatment integrity for this behaviour also remained high (range of 80 to 100%) for the remainder of the study.
Treatment integrity for Parent Behaviour 3 was low at baseline (range of 0 to 50%). The increase to 50% during baseline is an artifact of the data collection system. One item on the treatment fidelity checklists (i.e., Karen immediately putting on her pyjamas following a mand) was included on all three checklists (i.e., antecedent strategy, Step 6; replacement skill, Step 8; consequent strategy, Step 6). As the intervention progressed from Phase 2, to Phase 3, to Phase 4, Karen engaged in this behaviour at different times. For this reason, the behaviour was scored on different checklists depending on the phase of the intervention. Once Karen was trained on the implementation of teaching the replacement skill (Phase 3), she learned to immediately comply with the mand for pyjamas. However, since the consequent strategy was still in baseline conditions, Karen’s behaviour of immediately complying with the mand was scored both in the replacement skill (current phase), as well as the consequent strategy (to assess baseline). This led to a slight increase in treatment integrity for the consequent strategy during baseline. However, treatment integrity for the consequent strategy was never higher than 50% in Phase 1. Following BST training, treatment integrity for Parent Behaviour 3 increased to 70% during the first probe of the first session, then 100% at the next opportunity, and remained high (i.e., above 80%) for the duration of the study.
Child behaviour. At baseline, Olivia’s mean duration of tantrum behaviour per trial ranged from 22 to 77 seconds (Figure 3). Following introduction of the antecedent strategy, the mean duration of tantrum behaviour decreased below baseline levels (range of 0 to 11.5
seconds), with the exception of one session (i.e., session 8). During this session Karen was unable to put her pyjamas on as she had to go to work following the last trial of the session. Consequently, she put on her work uniform and told Olivia that pyjamas were not available (i.e., extinction). Since Parent Behaviours 2 and 3 were still in baseline conditions at that time, Karen was told that this was acceptable as it constituted the typical routine of having to go to work.

During this session, the mean tantrum behaviour was 40.5 seconds. In Phase 3 (introduction of the replacement behaviour), the mean duration of tantrum behaviour remained at near-zero levels (range of 2.25 to 5.8 seconds). Phase 4 (introduction of the consequent strategy) showed a slight increase and variability in the mean duration of tantrum behaviour (range of 0 to 35.6 seconds), which may reflect an extinction burst. For the remainder of the study, the mean duration of tantrum behaviour remained close to near zero levels (range of 0 to 146 seconds) with a few exceptions during sessions 19, 26, 29 and 31 (session 19 included the initial introduction of the “wait” strategy).

At baseline, Olivia waited for 1.5 minutes during the first trial, and only 6 seconds during the second trial. Both trials were scored as “-“ for waiting in the absence of tantrum behaviour, resulting in 0% of trials with correct waiting. Percent of trials with correct waiting quickly increased to 100% during the 5 second wait phase (range of 75 to 100%) and remained in the range of 80 to 100% for the remainder of the study, with the exception of sessions 29 and 31.
Manding performance remained variable for the duration of the study. At baseline, Olivia was manding correctly on 20 to 50% of trials. During Phase 2, independent manding decreased to 0% for the duration of this phase, which was expected as the requirement to mand was removed given the use of the antecedent strategy. From Phase 3 on, manding performance remained variable, but at an overall level higher than baseline (range of 60 to 100%). The only exceptions were sessions 25 and 31 during which manding was correct on 50% of trials.

**Figure 4.** Mean duration of tantrum behaviour per trial, and percent of correct waiting per session.

**Figure 5.** Percent of correct mand trials per session.
Interobserver Agreement

IOA data were collected on 36.84% of sessions for the first trial of all three parent behaviours. Mean IOA was 94.71% for Parent Behaviour 1 (implementation of the antecedent strategy), 90.11% for Parent Behaviour 2 (teaching the replacement skill), and 96.14% for Parent Behaviour 3 (implementation of the consequent strategy). IOA data were collected for 36.84% of sessions for duration of tantrum behaviour and manding, and the mean IOA was 96.88% and 87.14%, respectively. Finally, IOA data were collected for 38.1% of sessions for waiting, and the IOA was 92.50%.

Extinction in the New Home

Baseline data were not collected on either parent or child behaviour in the new home; however, the treatment team and the family reported that the family did not continue the multi-component intervention in the new environment. Further, tantrum behaviour re-emerged in the new home to levels that were unmanageable for the family. Two weekly observations were conducted following implementation of full extinction in the new home. During the first observation, Karen implemented the extinction procedure with 100% accuracy. Olivia manded for pajamas 10 times, and engaged in 785 seconds (i.e., approximately 13 minutes) of tantrum behaviour following the first mand for pyjamas. Across the seven-hour observation, Olivia engaged in pyjama-related tantrum behaviour during 20% of intervals. During the second observation, the use of extinction by Karen was not required, as Olivia did not mand for pyjamas, and did not engage in pyjama-related tantrum behaviour (i.e., zero seconds of pyjama-related tantrum behaviour occurred, and 0% of intervals contained pyjama-related tantrum behaviour).
Quality of Life Impact

Prior to the start of the intervention, Karen’s ratings for questions 1 to 7 averaged 3.43 (range of 1 to 5). This suggested that the target behaviour moderately impacted Olivia’s opportunities for learning and community involvement, as well as her daily functioning in the home environment. Questions 3 and 6 were scored the highest (i.e., a score of 5), indicating that tantrum behaviour negatively affected Olivia’s opportunities for creating friendships, as well as the family’s opportunities to attend functions outside the home. Following the implementation of the multi-component intervention, and full extinction of pyjamas in the new home, Karen’s ratings for questions 1 to 7 averaged 1 (i.e., each question was rated as “1”). This indicates a significant decrease of the impact of the tantrum behaviour on Olivia and the family, especially for questions 3 and 6, the scores for which decreased from ratings of 5 to 1. The results for the pre- and post-measures for the Quality of Life Impact questionnaire are depicted in Table 1.
Table 1

*Pre- and post-measures on the Quality of Life Impact questionnaire.*

<table>
<thead>
<tr>
<th>Question</th>
<th>Pre-Intervention Score</th>
<th>Post-Intervention Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Does this behavior interfere with opportunities for learning?</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>2. Does this behaviour interfere with opportunities for community integration or going out into the community?</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>3. Does this behaviour interfere with the individual’s opportunities to develop friendships?</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>4. Does this behaviour interfere with this person’s opportunities to become involved in daily activities and routines?</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>5. Does this behaviour interfere with opportunities of the family/group home to invite friends into the home?</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>6. Does this behaviour interfere with opportunities of the family/group home to attend social functions outside the home?</td>
<td>5</td>
<td>1</td>
</tr>
<tr>
<td>7. Does the behaviour cause the family/group home to feel stressful?</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>8. When you take him/her out, do other people respond positively to him/her?</td>
<td>4</td>
<td>6</td>
</tr>
</tbody>
</table>

Rating scale: 1 = “minimally”; 7 = “extremely”. Please note Question 8 is worded in contrast to the other questions.
Discussion

The present study demonstrated that BST with ongoing coaching was effective for teaching a parent of a child with ASD to implement a multi-component behavioural intervention, consisting of antecedent and consequent strategies, as well as an intervention designed to teach a replacement behaviour, in the home environment with good treatment integrity. Across all phases of the study (i.e., baseline/Phase 1, introduction of the antecedent strategy/Phase 2, introduction of the replacement skill/Phase 3, and introduction of the consequent strategy/Phase 4), treatment integrity increased to mastery criteria for each parent behaviour following BST training. Importantly, treatment integrity for all three treatment components remained above mastery criteria for the remainder of the study as additional demands were placed on the parent to implement an increasingly complex, multi-component intervention.

The parent-implemented multi-component intervention itself had a positive effect on Olivia’s mean duration of tantrum behaviour, which decreased to consistently near-zero levels following Phase 4. Additionally, Olivia learned to consistently wait for reinforcement for brief periods of time (i.e., 1 min, 15 sec) in the absence of tantrum behaviour. A limitation of the present study consists of the limited baseline data collected on Olivia’s ability to wait in the absence of tantrum behaviour following her mand for pyjamas. Only two baseline trials were conducted, and Olivia was able to wait for 1.5 minutes during the first trial, which was longer than the terminal wait time. However, since Olivia only waited for 6 seconds in the absence of tantrum behaviour during the second baseline trial, the researchers decided to start the wait time at 5 seconds, to ensure success. Had additional baseline data been collected, it is possible that the wait time could have been longer to start, leading to a more socially significant terminal wait time. Related to this, a second limitation of the study is that the intervention was discontinued.
due to the family’s move to a new home. Had the intervention been continued, it is likely that the terminal wait time could have increased to a more socially significant length of time.

Olivia’s ability to mand correctly for Karen’s pyjamas remained variable for the duration of the study. This represents a third limitation of the present study. Data were not collected on Karen’s implementation of prompts and error correction for any mands that occurred outside of research sessions, or between trials in the same session. There is the potential that incorrect mands, and/or challenging behaviour, continued to be intermittently reinforced, which may have contributed to Olivia’s slow acquisition of correct manding using Phase IV of PECS.

Additionally, PECS training was not conducted using the typical PECS protocol (i.e., using a second individual as a back-up prompter when Olivia did not approach the PECS binder independently), which also may have contributed to Olivia’s slow progress for this particular skill. Karen may have also benefited from additional coaching on systematic prompt fading procedures, to promote errorless learning for Olivia. However, although Olivia’s manding performance remained variable, the intervention ensured that only correct mands for pyjamas were reinforced during research sessions, since Karen always corrected errors and prompted the correct manding sequence. Further, the use of extinction ensured that inappropriate behaviour did not result in access to reinforcement during research sessions.

An unexpected but positive outcome of the study was that, following training of all intervention components, and more specifically following training on the use of extinction, Karen independently implemented extinction in two untrained situations: Olivia’s access to soothers and diapers, both of which she requested each day upon arrival from school. Although this was not formally monitored, Karen anecdotally reported that she decided to remove access to soothers for Olivia as they were no longer age appropriate, and that since Olivia was toilet
trained during the day, she would only be allowed to wear diapers at bed time. Any requests or attempts to access soothers, as well as tantrum behaviour associated with these items, were placed on extinction. Similarly, any requests or attempts to access diapers prior to bed time were also placed on extinction. Although it is not possible to attribute these changes in parent behaviour directly to the parent training and intervention, the timing of the use of extinction may indicate that Karen generalized this strategy to other behaviours of concern. This may provide useful information regarding parent preference for a specific intervention component (i.e., extinction), as there was no evidence of additional antecedent strategy use, or replacement skills taught by Karen. Future research should systematically explore parents’ ability to generalize learned strategies to additional behaviours and situations and identify parent preference for various intervention components in the treatment of challenging behaviours. Research of this nature could inform clinical practice by highlighting strategies that parents might be more partial to, or those they might implement with greater fidelity, which could impact their willingness to adhere to the treatment, and/or implement the treatment with high levels of fidelity.

In addition to independent implementation of extinction for soothers and diapers, Karen also requested full extinction of pyjamas in the new home. The multi-component intervention was not continued by the family throughout the move, which highlights the need for continued parent coaching to maintain treatment integrity, as well as adherence, particularly during times of increased stress and change (e.g., a move). Additionally, this indicates that BST alone may not be sufficient for the maintenance of the trained skill across time, or its generalization across settings. Although more research is required to generalize these findings across multiple participants, the clinical implications of this finding are that the “train and hope” method, in which little to no additional support is provided following training, may not be an effective
method for achieving parent behaviour change. In addition, since the intervention was discontinued before a meaningful level of behaviour change was achieved, this also indicates that such short-lived interventions, which are common in ABA due to lack of resources or funding, may be ineffective or insufficient for meaningful long-term behaviour change that is maintained in the natural environment. Future research should further examine the maintenance of trained interventions across time and environments, and the level of support needed by parents to ensure treatment adherence and high treatment integrity.

Strengths of the Present Study

The present study presented with a few notable strengths. First, it helped to partially fill two major gaps in behaviour analytic research: lack of research investigating parent-implemented multi-component interventions in the home, and lack of research monitoring and reporting on parent treatment integrity.

Second, the researchers attempted to mitigate some of the factors identified by Gresham et al. (2000) that commonly impact treatment integrity in a negative way, including treatment complexity, available time and resources to implement the treatment, accurate definitions of treatment components, and therapist drift. Karen was only trained on one intervention component at a time, and the three intervention components were introduced sequentially. This helped to reduce the complexity of the skill that she was learning by breaking it down into manageable parts. Availability of time and resources was insured by a) conducting the research sessions during the time frame that the behaviour was likely to occur (i.e., the “arriving home” routine), and by b) providing active parent coaching and support in the home during this time. Although Megan attended each research session in the capacity of parent coach, she also helped with other aspects of the routine such as helping Olivia take off her coat and boots while Karen was
changing, providing Olivia’s younger brother with a toy to keep him busy during the research session, or letting the dogs out or in while Karen was changing in her bedroom or helping Olivia change into her own pyjamas. These small acts helped to alleviate some of Karen’s duties, and helped her to remain focused on the correct implementation of each intervention component. This may be an important consideration for clinical practice regarding the level of support needed to allow parents to successfully learn to implement a behavioural procedure while still managing their other daily responsibilities. Over time, parents will certainly need to manage these competing contingencies while implementing intervention components. However, during the learning phase these supportive actions may enhance parent success and “buy-in”. Karen was also provided with detailed protocols explaining each intervention component, as well as a copy of each treatment integrity checklist. This helped to ensure that the intervention was well defined, and the expectations were clear. Finally, drift was addressed by having parent coaching constantly available during each research session. If Karen committed an error, Megan quickly offered error correction in the form of coaching.

Third, the researchers tried to be aware of, and sensitive to, Karen’s multiple roles as intervention implementer, mother, pet owner, and much more. Each time a new protocol was presented, Karen was asked for input into its feasibility, and changes were made accordingly. If Karen indicated that she would like to reduce the length of the research session for various reasons, her request was honoured. It is notable that this happened on fewer than 3 occasions. Additionally, the treatment integrity checklists were carefully tailored such that Karen’s parenting responsibilities and other matters of immediate concern did not automatically result in a “-“ on any particular step. For example, for items on the treatment integrity checklists that contained the word “immediate”, the meaning of the word for data collection purposes was
tailored to allow Karen a few additional seconds to perform necessary tasks, such as instructing her young son to do something. Another example is related to Karen’s spontaneous discontinuation of soothers and diapers for Olivia. These items had been included in the treatment integrity checklist for the antecedent strategy as they had previously been a part of Olivia’s routine, and thus the protocol had to be altered in response to Karen’s new strategy. Overall, supporting Karen throughout the study and ensuring that the intervention was feasible for the family was a high priority for the researchers, which may have been important contributors to the high levels of treatment integrity as well as good rapport with Karen and the family.

Finally, follow-up data were collected on Karen’s implementation of the full extinction protocol, and Olivia’s mands and pyjama-related tantrum behaviour, in the family’s new home across seven-hour observation periods. This represents a strength of the present study, as observations of this length are not common in research. However, this was done in order to gather socially valid data that accurately reflected Olivia and Karen’s behaviour across their day.

Limitations of the Present Study

Some general limitations of the present study are worth noting. First, since there was only one participant, it is difficult to draw conclusions related to the generality of the findings. Future research should implement similar procedures with several families to test their effectiveness with different parents in different routines/situations. Second, only one very specific situation was targeted for intervention (i.e., access to tangible items specifically related to pyjamas). The results of the functional behaviour assessment indicated that the tantrum behaviour may have been multiply controlled, and, in addition, the tantrum behaviour related to access to tangible items occurred in relation to a wide variety of items, in addition to pyjamas. Tantrum behaviour
that was related to items other than pyjamas was not targeted or monitored, and it is possible that the same behaviour (i.e. tantrum behaviour), with the same function (i.e., access to tangible items) could have been intermittently reinforced in other situations (i.e., desired access to a different tangible item). Future investigations might attempt to compare two approaches to targeting challenging behaviours in the home: 1) targeting only one situation at a time, as in the present study, and 2) targeting the entire functional response class simultaneously. This type of research could shed light on the relative importance of reducing the complexity of the intervention for ease of implementation versus ensuring consistent application of the intervention across situations. Third, it is possible that Megan’s constant presence in the home during the implementation of the procedures may have negatively impacted Karen’s ability to generalize the intervention to the family’s new environment, as evidenced by the fact that the intervention was not continued in the new home in Megan’s absence. Steps to fade the staff member’s presence should be taken in future research, and strategies to promote generalization and maintenance should be added to ensure ongoing treatment fidelity.

Finally, while the present study attempted to mitigate some of the procedural factors that may negatively impact treatment integrity (e.g., reducing treatment complexity and providing ongoing coaching), contextual variables that may have impacted Karen’s ability to implement the intervention (e.g., parent expectations of child behaviour, parent psychopathology, etc.) were not taken into consideration. Future research should explore the presence of these types of contextual variables, and their role as potential barriers to maintaining high levels of treatment integrity.
Conclusion/Future Research

In conclusion, the present study contributes to the existing ABA literature by systematically evaluating parent treatment integrity during the implementation of a multi-component behavioural intervention. The findings of the study highlight the effectiveness of BST as a training approach for parents learning to implement multi-component interventions. Further, the results highlight the importance of continued parent coaching and support throughout the implementation of the intervention in order to maintain high levels of treatment integrity and ensure the best possible outcomes. Future investigations could extend the current research by training several parents using the same procedures, or by training the same parent to implement an intervention across various situations, while continuing to carefully monitor treatment integrity for each intervention component.
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Appendix A

Treatment Step 1
Antecedent Intervention
Pajamas Available

Learner: Olivia  Date: February 15, 2018

Target Behaviour: Tantrum Behaviour is defined as any instance of guttural screams, yelling, swiping items off surfaces, throwing items, hitting, and/or scratching another person, as well as any attempts to hit and scratch, that are either dodged or blocked.

- Guttural scream = short vocalization at a volume above conversational level
  - EXCLUSION: guttural screams will not be counted if they are accompanied by a smile
- Yelling = sustained vocalizations at a volume above conversational level
- Hitting = using a closed or open hand to make forceful contact with any part of another person’s body
  - Attempt to hit = open or closed hand forcefully projecting toward another person’s body. Exceptions: high 5, hand flapping, stretching, reaching for an item
- Scratching = fingernails making contact with another person, either stationary or with a dragging movement across the person’s skin
  - Attempt to scratch = fingernails reaching toward another person
- Swiping items = using hands to displace items from a surface onto the floor
  - EXCLUSION: swiping items will not be counted if it is accompanied by a smile
- Throwing items = picking up an item and throwing it forcefully
  - EXCLUSION: throwing items will not be counted if Olivia is throwing items around during play time and is accompanied by a smile

Rationale

The purpose of this intervention component is to reduce Olivia’s target behaviour to zero by having Mom put on pajamas immediately when Olivia arrives home from school, before Olivia engages in tantrum behaviour.

Materials

- Treatment protocol
- Preferred pajamas that Olivia usually chooses for Mom
- Moderately preferred activities and snacks

Session Set-up

- Set up an area (e.g., the living room) with a few moderately preferred activities. Have the area ready for when Olivia comes home from school, so that she may start engaging with the items immediately
- Turn the TV on prior to picking up Olivia from school
- Place snacks on the counters, available within Olivia’s reach
• Lay out Mom’s pair of pajamas by the front door. Mom is to choose those pajamas that Olivia currently prefers, based on her knowledge from previous days
• Hang two different pairs of pajamas for Olivia to choose from, in the bathroom.

Procedure

Check the treatment protocol prior to each session to find out the current step. Always double check to make sure the correct step is being implemented. Refer to steps below.

Steps

<table>
<thead>
<tr>
<th>Step</th>
<th>Parent Behaviour</th>
<th>Child Behaviour</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Lays out pajamas by the front door and sets up the living room environment before going to pick up the kids. Upon entering the house, picks up pajamas, states “I’m going to put my pajamas on now”, and goes to change immediately (OR in accordance with Replacement Skill protocol, if relevant). When Mom’s pajamas are on, Mom returns and tells Olivia “Now let’s go put your pajamas on” and takes Olivia to the bathroom to change.</td>
<td>No specific child behaviour required during this treatment component</td>
</tr>
</tbody>
</table>

Next steps will be trained as Step 1 is mastered Long-term plan is to fade pajamas back to the bedroom

Additional steps and components may be added depending on Olivia’s progress, which will be monitored closely by the research and clinical teams.

Mastery Criteria

Advance to the next step of the program after three successful days including all of:
• 80% treatment fidelity on the Parent Treatment Integrity Checklist
• 0% tantrum behaviour after Olivia walks through the door

Revision Criteria and Criteria for Additional Training

Revise the protocol following 2 sessions in which:
• Child tantrum behaviour occurs on 40% of trials or higher
• Independent manding using PECS falls below 80% of opportunities

Provide additional parent training following 2 sessions in which:
• Parent performance on the Treatment Integrity checklist falls below 80%
Consequence for Tantrum Behaviour

If Olivia starts engaging in tantrum behaviour, please respond as you typically would. You will be trained on a new way to react to this behaviour in the Consequence Strategy portion of the treatment.

Data Collection

Data will be collected by the student investigator from video, and will include:

- Parent Behaviour:
  - Percentage of steps performed correctly on the Treatment Integrity checklist
- Child Behaviour:
  - Occurrence/non-occurrence of target behaviour per trial/opportunity

I have read and understood the above protocol, and all of my questions have been adequately answered. I consent to the use of this intervention, and agree to participate as described.

Name: __________________________

Date: __________________________

Signature: _______________________

Page 3 of 3
Appendix B

Treatment Step 2
Replacement Skills
Requesting Appropriately With PECS & Waiting/Accepting Denied Access

Learner: Olivia  Date: March 5, 2018

Target Behaviour: Tantrum Behaviour is defined as any instance of guttural screams, yelling, swiping items off surfaces, throwing items, hitting, and/or scratching another person, as well as any attempts to hit and scratch, that are either dodged or blocked.

- Guttural scream = short vocalization at a volume above conversational level
  - EXCLUSION: guttural screams will not be counted if they are accompanied by a smile
- Yelling = sustained vocalizations at a volume above conversational level
- Hit = using a closed or open hand to make forceful contact with any part of another person’s body
  - Attempt to hit = open or closed hand forcefully projecting toward another person’s body. Exceptions: high 5, hand flapping, stretching, reaching for an item
- Scratching = fingernails making contact with another person, either stationary or with a dragging movement across the person’s skin
  - Attempt to scratch = fingernails reaching toward another person
- Swiping items = using hands to displace items from a surface onto the floor
  - EXCLUSION: swiping items will not be counted if it is accompanied by a smile
- Throwing items = picking up an item and throwing it forcefully
  - EXCLUSION: throwing items will not be counted if Olivia is throwing items around during playtime and is accompanied by a smile

Rationale
The purpose of this intervention component is to teach Olivia to:

a) request appropriately with PECS for Mom to put on her pajamas in lieu of engaging in the target behaviour, and;

b) wait for longer periods of time before the Mom puts on her pajamas at Olivia’s request, ultimately tolerating denial of this request.

While she waits, it is desirable for Olivia to be able to select an alternative activity and to engage with it appropriately for the duration of the wait period. In this phase of the program, Olivia will be required to use PECS to request for Mom to put on her pajamas. She will be free to select an alternative activity (for example, puzzles, books, blocks, other toys, a snack, etc.) and busy herself while she waits for Mom to comply with her request.

Materials
- Treatment protocol
- Timer
- PECS binder and additional pictures of pajamas
- Alternative activity for Olivia to engage with (e.g., puzzle, different book, blocks, trains, a snack, etc.)

Session Set-up
- Set up an area (e.g., the living room) with a few moderately preferred activities. Have the area ready for when Olivia comes home from school, so that she may start engaging with the items immediately
- Turn the TV on prior to picking up Olivia from school
- Place snacks on the counters, available within Olivia’s reach
- Have several copies of the “pajamas” picture available in different locations in Olivias PECS binder, to ensure easy access
- Have an additional “pajamas” picture on the wall by the front door

Procedure
Check the treatment protocol prior to each session to find out the current step. Always double check to make sure the correct step is being implemented. Refer to steps below.

<table>
<thead>
<tr>
<th>Step</th>
<th>Wait Time</th>
<th>Parent Behaviour</th>
<th>Child Behaviour</th>
<th>Access Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>None</td>
<td>Mom will ensure that the PECS binder is placed on the kitchen counter prior to each trial, and that the sentence strip is clear of any pictures from earlier that day, or from previous trials. After changing back into regular clothes and coming within sight of Olivia, Mom immediately (i.e. within 2-3 seconds) prompts Olivia through the sequence of requesting pajamas using PECS: 1) Approaches binder 2) Places “I want” picture on sentence strip 3) Places “Pajama” picture on sentence strip 4) Exchanges sentence strip</td>
<td>Olivia stands for Mom to put on pajamas using PECS, either independently, or with prompts from Mom</td>
<td>5 minutes</td>
</tr>
</tbody>
</table>
- Using a hand-over-hand prompt or a light touch to the hand as necessary to ensure completion of the sentence

Mom will stand beside Olivia and prompt as necessary, until the PECS exchange is complete. Upon accepting the sentence strip from Olivia, Mom immediately complies with the request to put on her pajamas. No demands or questions are to be introduced to Olivia between accepting the sentence strip and going to put on pajamas.

**The prompt level will be faded across treatment sessions, to eventually reach independence in manding. Mom will be coached on the level of prompt that will be considered acceptable for a particular session by the staff member present, and the researcher. An anticipated prompt fading sequence may include:

- Session 1: use a gestural or physical prompt on every step
- Session 2: only use gestural prompts on every step, unless the beginning of an error is noticed, in which case the prompt level may be increased to promote errorless learning
- Session 3: no prompts, unless the beginning of an error is noticed**

<table>
<thead>
<tr>
<th>4</th>
<th>TBD</th>
<th>Following Olivia’s mand for pajamas, Mom tells Olivia to “wait”, and waits _____ seconds before putting on pajamas. <strong>Mom will still offer to take Olivia to put on her own pajamas in the meantime. This applies to wait periods of 1+ minutes</strong></th>
<th>Olivia mands for Mom to put on pajamas using PECS, then waits _____ seconds in the absence of target behaviour</th>
<th>5 minutes</th>
</tr>
</thead>
</table>

Additional steps will be added to gradually increase the wait time. These will be determined based on the progress of the program. The terminal wait goal will be 1 hour.

Additional steps and components may be added depending on Olivia’s progress, which will be monitored closely by the research and clinical teams.

Mastery Criteria
Parent Behaviour:

- 85% correct steps on the Treatment Integrity checklist

Child Behaviour:

- 80% independent mands using PECS
- 0% tantrum behaviour per trial/opportunity

Revision Criteria and Criteria for Additional Training

Revise the protocol following 2 sessions in which:
- Child tantrum behaviour occurs on 40% of trials or higher
- Independent manding using PECS falls below 80% of opportunities

Provide additional parent training following 2 sessions in which:
- Parent performance on the Treatment Integrity checklist falls below 80%

Consequence for Tantrum Behaviour

If Olivia starts engaging in tantrum behaviour, please respond as you typically would. You will be trained on a new way to react to this behaviour in the Consequence Strategy portion of the treatment.

Data Collection

Data will be collected by the student investigator from video, and will include:

Parent Behaviour:
- Percentage of steps performed correctly on the Treatment Integrity checklist

Child Behaviour:
- Occurrence/non-occurrence of target behaviour per trial/opportunity
- Percentage of independent vs. prompted mands using PECS

I have read and understood the above protocol, and all of my questions have been adequately answered. I consent to the use of this intervention, and agree to participate as described.

Name: ____________________________

Date: ____________________________

Signature: ________________________
Appendix C

Treatment Step 3
Consequence Strategy
Extinction

Learner: Olivia
Date: March 14, 2018

Target Behaviour: Tantrum Behaviour is defined as any instance of guttural screams, yelling, swiping items off surfaces, throwing items, hitting, and/or scratching another person, as well as any attempts to hit and scratch, that are either dodged or blocked.

- Guttural scream = short vocalization at a volume above conversational level
  - EXCLUSION: guttural screams will not be counted if they are accompanied by a smile
- Yelling = sustained vocalizations at a volume above conversational level
- Hit = using a closed or open hand to make forceful contact with any part of another person’s body
  - Attempt to hit = open or closed hand forcefully projecting toward another person’s body. Exceptions: high 5, hand flapping, stretching, reaching for an item
- Scratching = fingernails making contact with another person, either stationary or with a dragging movement across the person’s skin
  - Attempt to scratch = fingernails reaching toward another person
- Swiping items = using hands to displace items from a surface onto the floor
  - EXCLUSION: swiping items will not be counted if it is accompanied by a smile
- Throwing items = picking up an item and throwing it forcefully
  - EXCLUSION: throwing items will not be counted if Olivia is throwing items around during play time and is accompanied by a smile

Rationale
Extinction is a behaviour analytic strategy that refers to discontinuing reinforcement for a problem behaviour. Typically, extinction is used in conjunction with a reinforcement strategy, such that the individual may still access the desired reinforcer by engaging in an appropriate behaviour, while no longer being able to access the reinforcer through the problem behaviour. In Olivia’s case, when told to wait for access to Mom putting on pajamas, or when access is denied, she may engage in tantrum behaviour. By implementing extinction, the items that Olivia is seeking (i.e., mom putting on pajamas) will no longer be made available to her in response to tantrum behaviour.

Materials
- Treatment protocol
- Timer
- Alternative activity for Olivia to engage with (e.g., puzzle, different book, blocks, trains, etc.)
Session Set-up
- Set up an area (e.g., the living room) with a few moderately preferred activities. Have the area ready for when Olivia comes home from school, so that she may start engaging with the items immediately.
- Turn the TV on prior to picking up Olivia from school.
- Place snacks on the counters, available within Olivia’s reach.

Procedure
Continue with Phase 1 and Phase 2 of the program as taught previously, while advancing through consecutive steps of the program as determined by the mastery criteria. If Olivia engages in tantrum behaviour at any time during a session, or during the day, in response to Mom delaying putting on her pajamas or denying Olivia’s request:
- Do NOT put on pajamas.
- If necessary, ask other individuals to leave the room.
- If necessary, bring SM to a contained environment (e.g., her bedroom) and allow her to finish the tantrum there.
- When the tantrum behaviour has ended (wait 10 seconds of absence of tantrum behaviour), re-start the wait/denial trial and once the pre-determined amount of time has passed (as per the wait protocol) prompt SM to mand appropriately using PECS. Following a successful trial, Mom may comply with SM’s request.

Mastery Criteria
Parent Behaviour:
- 85% correct steps on the Treatment Integrity checklist.

Child Behaviour:
- 80% independent mands using PECS.
- 0% tantrum behaviour per trial/opportunity.

Revision Criteria and Criteria for Additional Training
Revise the protocol following 2 sessions in which:
- Child tantrum behaviour occurs on 40% of trials or higher.
- Independent manding using PECS falls below 80% of opportunities.

Provide additional parent training following 2 sessions in which:
- Parent performance on the Treatment Integrity checklist falls below 85%.

Data Collection
Data will be collected by the student investigator from video, and will include:
- Parent Behaviour:
- Percentage of steps performed correctly on the Treatment Integrity checklist

  Child Behaviour:
  - Occurrence/non-occurrence of target behaviour per trial
  - Percentage of independent vs. prompted mands using PECS

I have read and understood the above protocol, and all of my questions have been adequately answered. I consent to the use of this intervention, and agree to participate as described.

Name: __________________________

Date: __________________________

Signature: ______________________
# Appendix D

## Treatment Integrity Checklist – MASTER LIST

**Date:**

**Observer:**

**Child:** Olivia

**Phase:**

**Wait Time:**

**Parent:** Karen

<table>
<thead>
<tr>
<th>Antecedent Strategy</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Before going to pick up the kids</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Lays out pajamas in the correct location as per protocol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Turns on TV</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Sets out toys and activities</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Places snacks on the counters</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Places diapers and two pairs of pajamas in the bathroom for Olivia to choose from</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>After arriving home</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Puts on pajamas immediately (Phase 1-2), OR in accordance with Replacement Skill protocol (Phase 3-4) (optional; makes a related statement)</td>
<td></td>
<td></td>
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<tr>
<td>7. Offers Olivia the option of putting her own pajamas by making a statement and/or gesturing towards the bathroom</td>
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</tbody>
</table>

## Replacement Skill

<table>
<thead>
<tr>
<th>Replacement Skill</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Ensures PECS binder is easily accessible to Olivia; removes pictures from sentence strip</td>
<td></td>
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</tr>
<tr>
<td>2. Prompts Olivia to pajama picture (if necessary) as per protocol (physical/gestural only) within 2 seconds</td>
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<tr>
<td>3. Prompts Olivia to build the sentence “I want pajamas” (if necessary; physical/gestural only) within 2 seconds</td>
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<tr>
<td>4. Prompts exchange/accepts independent exchange (physical/gestural only) within 2 seconds</td>
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<tr>
<td>5. Corrects errors using a higher prompt level as needed</td>
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<tr>
<td>6. For wait trials, states “Wait” or equivalent phrase</td>
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<tr>
<td>7. If applicable, starts timer for appropriate wait time</td>
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<tr>
<td>8. Compiles with mand to put on pajamas immediately (Phase 1), or after wait time has elapsed (Phase 3-4)</td>
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</tbody>
</table>

## Consequence Strategy

<table>
<thead>
<tr>
<th>Consequence Strategy</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do NOT put on pajamas</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>2. If needed, clear the immediate environment/bring Olivia to a safe environment</td>
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<tr>
<td>3. Wait for tantrum behaviour to stop for 10 seconds</td>
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<tr>
<td>4. Once behaviour has stopped, prompt Olivia to mand for pajamas</td>
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<tr>
<td>5. Restart the timer if during wait trial</td>
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<tr>
<td>6. Compiles with mand to put on pajamas immediately (Phase 1), or after wait time has elapsed (Phase 3-4)</td>
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</tbody>
</table>

## TOTAL

---

Session: ___
Appendix E

**Child Behaviour Data Sheet**

Date: ____________________  Observer: ____________________  Child: Olivia
Phase: ____________________  Wait Time: ____________________  Parent: Karen

<table>
<thead>
<tr>
<th>Antecedent</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>Total %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tantrum Behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Y = Yes</td>
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<td></td>
</tr>
<tr>
<td>N = No</td>
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</tbody>
</table>

Manding

- Approaches picture/book
- Builds sentence
- Exchanges strip
- Manding +/-

Waiting

- + = waited with no tantrum bx
- - = engaged in tantrum bx

<table>
<thead>
<tr>
<th>Trial</th>
<th>From:</th>
<th>To:</th>
<th>Duration of PB</th>
<th>Mean Duration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
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<tr>
<td>3</td>
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<td>4</td>
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<tr>
<td>5</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
### Quality of Life Impact

**Client:** ____________________  
**D.O.B.:** ____________________  
**Completed by:** ____________________  
**Date:** ____________________

**Target Behaviour:** ____________________

**Please rate the behaviour on the following:**

1. Does this behaviour interfere with opportunities for learning?  
   1 2 3 4 5 6 7  
   minimally  extremely

2. Does this behaviour interfere with opportunities for community integration or going out into the community?  
   1 2 3 4 5 6 7  
   minimally  extremely

3. Does this behaviour interfere with the individual's opportunities to develop friendships?  
   1 2 3 4 5 6 7  
   minimally  extremely

4. Does this behaviour interfere with this person's opportunities to become involved in daily activities and routines?  
   1 2 3 4 5 6 7  
   minimally  extremely

5. Does this behaviour interfere with opportunities of the family/group home to invite friends into the home?  
   1 2 3 4 5 6 7  
   minimally  extremely

6. Does this behaviour interfere with opportunities of the family/group home to attend social functions outside the home?  
   1 2 3 4 5 6 7  
   minimally  extremely

7. Does the behaviour cause the family/group home to feel stressful?  
   1 2 3 4 5 6 7  
   minimally  extremely

8. When you take him/her out, do other people respond positively to him/her?  
   1 2 3 4 5 6 7  
   minimally  extremely
Appendix G

Treatment Step 3
Consequence Strategy
Denied Access to PJs via Extinction

Learner: Olivia  Date: July 18, 2018

**Target Behaviour:** Tantrum Behaviour is defined as any instance of guttural screams, yelling, swiping items off surfaces, throwing items, hitting, and/or scratching another person, as well as any attempts to hit and scratch, that are either dodged or blocked.

- Guttural scream = short vocalization at a volume above conversational level
  - EXCLUSION: guttural screams will not be counted if they are accompanied by a smile
- Yelling = sustained vocalizations at a volume above conversational level
- Hitting = using a closed or open hand to make forceful contact with any part of another person’s body
  - Attempt to hit = open or closed hand forcefully projecting toward another person’s body. Exceptions: high 5, hand flapping, stretching, reaching for an item
- Scratching = fingernails making contact with another person, either stationary or with a dragging movement across the person’s skin
  - Attempt to scratch = fingernails reaching toward another person
- Swiping items = using hands to displace items from a surface onto the floor
  - EXCLUSION: swiping items will not be counted if it is accompanied by a smile
- Throwing items = picking up an item and throwing it forcefully
  - EXCLUSION: throwing items will not be counted if Olivia is throwing items around during play time and is accompanied by a smile

**Pajama-Related Tantrum Behaviour** is defined as tantrum behaviour that occurs under any of the following conditions:

- Within 10 seconds of a mand for pajamas
- Within 10 seconds of pulling at Mom’s clothes
- Within 10 seconds of picking up a pair of pajamas

**Rationale**

Extinction is a behaviour analytic strategy that refers to discontinuing reinforcement for a problem behaviour. In Olivia’s case, when access to pajamas during the day is denied, she may engage in tantrum behaviour. By implementing extinction, the items that Olivia is seeking (i.e., access to pajamas during the day) will no longer be made available to her in response to tantrum behaviour, or in response to appropriate requests for pajamas that occur at times when pajamas are not available.

**Materials**

- Treatment protocol
Timer
Alternative activity for Olivia to engage with (e.g., puzzle, different book, blocks, trains, etc.)

Session Set-up

- Contain Olivia’s pairs of pajamas to one location inside her bedroom (ex: her closet, or on her bed, or wherever they are usually kept)
- Remove pajamas from any other location in the house (ex: washroom)

Procedure

Any time that Olivia requests or somehow indicates that she would like pajamas (either her own, or Mom’s) before bedtime, Mom will state “Pajamas are not available. We can put them on at bedtime” (or something similar), and will NOT put on pajamas. Any additional requests will be ignored.

If Olivia requests for items/activities that have been traditionally paired with pajamas (ex: bathtub, pool, toilet, etc.) Mom will only honour these requests according to Olivia’s daily schedule, and will deny access at unscheduled times.

At bed time, Mom can state “Ok, it’s time for bed, now you can have pajamas”, and Mcm may assist Olivia with changing into pajamas at that time. If tantrum behaviour occurs, Mom will wait for 1 minute of calm behaviour before helping Olivia change into pajamas.

Safety Measures

It is possible that Olivia may engage in tantrum behaviour for an extended period of time at the beginning of the intervention. The staff will provide support with redirecting Olivia to a neutral or preferred activity. Attempt to sanitize the environment as much as possible, by removing items that can be easily broken if thrown. Instruct sibling to remain out of reach if tantrum escalates. Protective arm guards will be worn to safeguard against scratching.

Mastery Criteria

Parent Behaviour:
- 85% correct steps on the Treatment Integrity checklist

Child Behaviour:
- 5 consecutive days with less than 5% of intervals with pajama-related tantrum behaviour
- 5 consecutive days with less than 5% mands for pajamas before bed time

Other:
- 5 consecutive days with less than 5% of intervals with tantrum behaviour
Data Collection

Data will be collected by the student investigator and the treatment team in vivo and from video, and will include:

Parent Behaviour:
- Percentage of steps performed correctly on the Treatment Integrity checklist

Child Behaviour:
- Occurrence/non-occurrence of target behaviour per day
- Duration of target behaviour per day
- Percent of intervals with target behaviour per day

I have read and understood the above protocol, and all of my questions have been adequately answered. I consent to the use of this intervention, and agree to participate as described.

Name: __________________________

Date: __________________________

Signature: ______________________
Appendix H

Treatment Integrity Checklist – MASTER LIST

<table>
<thead>
<tr>
<th>Extinction of PIs</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Do NOT put on pajamas</td>
</tr>
<tr>
<td>2. Upon the first request for pajamas, state “Pajamas are only available at bed time”</td>
</tr>
<tr>
<td>3. If necessary, clear the environment or bring Olivia to a safe location</td>
</tr>
<tr>
<td>4. Ignore all additional requests for pajamas</td>
</tr>
<tr>
<td>5. Acknowledge and fulfill all appropriate requests for activities/items that coincide with the daily schedule</td>
</tr>
<tr>
<td>6. Upon the first request for items/activities that occur at any time outside of their scheduled time on the daily routine, state “It is not time for x.”</td>
</tr>
<tr>
<td>7. Ignore all additional requests for unscheduled items/activities</td>
</tr>
<tr>
<td>8. At bed time, state “It’s bed time. Now you can put on pajamas”</td>
</tr>
<tr>
<td>9. Assist Olivia to change into her pajamas</td>
</tr>
<tr>
<td>10. If tantrum behaviour occurs, wait for 1 minute of calm behaviour before helping Olivia to put on her pajamas</td>
</tr>
</tbody>
</table>

TOTAL

Date: ___________________________  Observer: ___________________________  Child: Olivia
Phase: ___________________________  Wait Time: ___________________________  Parent: Karen