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Evaluation of a Modified Incidental Teaching Procedure to Increase Child Compliance

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EVALUATION OF A MODIFIED INCIDENTAL TEACHING PROCEDURE TO INCREASE CHILD COMPLIANCE

by

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Teaching noncompliant children to engage in compliant behavior has long been a goal for many parents, teachers, and therapists (Patterson, Shaw, & Ebner, 1969). This goal has driven the development of behavioral technology, including entire manualized treatment programs, specifically intended for the treatment of noncompliance (Forehand & McMahon, 1981; Hembree-Kigin & McNeil, 1995). These programs have typically included time-out based interventions that are associated with resistance to instruction (Roberts, 1982; Roberts, 1984). Given children's frequent resistance to traditional approaches (e.g., timeout; Ducharme & Popynick, 1993), alternative interventions for the treatment of noncompliance are warranted.

A modified version of incidental teaching (Hart & Risley, 1974) termed naturalistic compliance training (NCT) may have particular value during compliance training with children because it has the potential to reduce resistance to instruction. The present study evaluated the effectiveness of NCT to increase the compliance of clinically referred children. A combined multiple baseline across participants and reversal design was used to evaluate the effects of caregiver implemented NCT on child compliance. Robust and immediate increases in compliance were observed across all five participants. The benefits of NCT and future applications are discussed.

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Noncompliance

Behavioral noncompliance is defined as instances when a child fails to perform a behavior requested by a parent or other adult authority figure (e.g., teacher; Forehand & McMahon, 1981; Forehand, Gardner, & Roberts, 1978). Noncompliance may be an active (e.g., saying "no") or passive (e.g., ignoring a request) act (Kalb & Loeber, 2003). Child noncompliance rates range from approximately 8% to 57% among non-clinically referred samples (Crowther, Bond, & Rolf, 1981; Shechtman, 1970). Among neuro-typical preschoolers, noncompliance occurs with approximately 25% to 50% of parent directives (Schroeder & Gordon, 2002).

Although noncompliance is often a transient and typical part of child development (Schroeder & Gordon, 2002), in many cases it persists over time (Kalb & Loeber, 2003). As a result, noncompliance is among the most common child behavior problems for which caregivers seek mental health treatment (Bernal, Klinnert, & Schultz, 1980). In the absence of treatment, childhood noncompliance tends to persist throughout childhood, adolescence and, in many cases, adulthood (Hoffman, 1977; Kochanska, Kuczynski, & Maguire, 1989; Kuczynski & Kochanska, 1990).

There are several adverse long-term outcomes associated with persistent childhood noncompliance that present a socially significant issue for children, their families, and society as a whole (Dishion & Patterson, 1992; Kazdin, 1987). Children engaging in high levels of noncompliance at early ages are at a substantially higher risk of social impairment (Kalb & Loeber, 2003; Taplin & Reid, 1977). Consequently, children may experience increased stress resulting from interactions with parents, teachers, or compliant peers as well as an increase in social isolation due to difficulty following directions or class rules (Kalb & Loeber, 2003). Longitudinal studies have also concluded that high rates of early noncompliance are a reliable predictor of psychiatric disorders (Keenan, Shaw, Delliquadri, Giovannelli, & Walsh, 1998),

adolescent delinquency (Hämäläinen & Pulkkinen, 1996; White, Moffitt, Earls, & Robins, 1990) and adult criminal behavior (Loeber & Dishion, 1983).

Behavioral parent training

Given the immediate and long-range consequences associated with noncompliance, researchers have developed a number of behavioral parent training programs specifically for its treatment (McMahon & Wells, 1998; Webster-Stratton, 2000; Patterson & Gullion, 1968). Perhaps the most widely disseminated empirically supported behavioral parent training programs are *Helping the Noncompliant Child* (HNC) developed by Forehand and McMahon (1981) and *Parent Child Interaction Therapy* (PCIT) developed by Hembree-Kigin and McNeil (1995). These programs share a common format for conducting child compliance training, characterized by the delivery of social reinforcement for compliance and time-out for noncompliance (Shriver & Allen, 2008). Over the last 50 years, this approach to teaching child compliance has yielded tremendous success and empirical support for the treatment of noncompliance (Maliken & Katz, 2013). Although, the PCIT and HNC programs have been effective, there are potential adverse side effects associated with reliance upon time-out as a key component of compliance training (Ducharme & Popynick, 1993).

Time-out

Time-out is a period in which there is a loss of reinforcement contingent upon a specified behavior (Brantner & Doherty, 1983). Time-out is considered a negative punishment procedure because it involves the removal of the subject from (or restricting access to) a reinforcing environment for a specified period of time contingent upon a response (e.g., noncompliance; Baer, 1962; Turner & Watson, 1999; Lerman & Vorndran, 2002). However, as there are different methods of implementing time-out (e.g., exclusionary, non-exclusionary), it often presents features of both punishment and extinction (Vieth & Rilling, 1972). For example, early research conducted with nonhuman subjects (i.e., rats, pigeons, primates) in laboratory settings (e.g., Azrin, 1961), facilitated time-out by turning off all available light sources, thus disrupting

opportunities for responses to contact reinforcement (Leitenberg, 1965), which is characteristic of extinction.

Although time-out in and of itself is often an effective procedure for suppressing behavior (Holz, Azrin, & Ayllon, 1963), its utility often hinges on its ability to condition an escape or avoidance response that occurs to terminate or postpone the aversive situation (Dinsmoor, 1954; Keller & Schoenfeld, 1950; Skinner, 1953; Holland & Skinner, 1961). Early basic laboratory experiments demonstrated that time-out from positive reinforcement was effective in generating and maintaining avoidance behavior (Leitenberg, 1965). For example, chimpanzees given the opportunity to engage in a response (i.e., key-press) that postponed interruptions in food delivery quickly learn to avoid occurrences of time-out (Ferster, 1958). Still other studies demonstrated that when a conditioned stimulus such as a tone precedes the onset of an aversive stimulus (e.g., time-out), the mere presentation of the tone and its termination could function as a negative reinforcer (Hoffman, 1966). Thus, the tone onset functions as a conditioned motivating operation, which both alters the value of escape and evokes the instrumental response (Carbone, Morgenstern, Zecchin-Tirri, & Kolberg, 2007). This established pattern of responding has been demonstrated to persist even when the aversive stimulus is reduced to a mild intensity that would otherwise not effectively suppress behavior (Azrin, Hake, Holz, & Hutchinson, 1965).

The principles derived from early research served as the basis for the use of time-out in applied settings (cf. Wolf, Risley, & Mees, 1964). Analogous to the tone used in basic research, stimuli that precede time-out (i.e., vocal warning) can function as an establishing operation for responses that terminate the stimulus or avoid time-out. In the case of compliance training, children learn to engage in a compliant response. However, children who are clinically referred for the treatment of noncompliance often present with an extensive repertoire of competing escape or avoidance behavior. In such cases, warning stimuli may function as establishing operations, which increase the value of escape, and evoke other maladaptive behaviors that have

previously terminated the command or avoided punishment. For example, children may attempt to leave the time-out area (Roberts, 1982; Roberts, 1988), prolong the administration of time-out (e.g., sometimes to over an hour), or engage in self-injurious or aggressive behavior (McNeil & Hembree-Kigin, 2010). These responses raise practical concerns as they increase the likelihood of caregiver frustration and anger as well as an increased potential for child harm (Barkley, 2000). As a result, empirically supported behavioral parent training programs (i.e., PCIT, HNC) have typically included adjunctive interventions (e.g., guided compliance) and adaptations (e.g., use of a seclusion room) intended to minimize the side effects associated with resistance to time-out (McMahon & Forehand, 2003; McNeil & Hembree-Kigin, 2011).

Although time-out has historically been deemed a socially acceptable intervention (Frentz & Kelley, 1986; Hobbs, Walle, & Caldwell, 1984), its use has recently come under increased scrutiny due to allegedly harmful side effects (Siegel & Bryson, 2014). For example, some professionals allege that neuroimaging studies provide evidence that the experiences of children during periods of isolation or time-out are similar to experiences of physical pain. Criticisms include concerns that time-out and similar discipline procedures fail to provide an opportunity for children to learn critical skills such as problem-solving. In response to these types of concerns, there have been recent calls for the development of alternatives that can increase child compliance while reducing the side effects associated with time-out (Ducharme & Popynick, 1993, Horner et al., 2005; Warzak & Floress, 2009).

Researchers have also long identified a need for supplemental strategies to compensate for non-responders to treatment (Kazdin, 1985; Webster-Stratton, 1985a). Some studies have found that up to 45% of children are non-responders to time-out based treatments (Webster-Stratton, 1985). That is, time-out fails to yield significant reductions in children's noncompliance, or caregivers are unable to effectively implement the procedures. There are multiple reasons that time-out may fail to reduce children's noncompliance. For some children, time-out may not be an aversive situation, especially if there is insufficient contrast with the time-

in environment or minimal reinforcement is provided contingent upon compliance. Also, time-out implementation may be associated with various forms of verbal or physical attention that is positively reinforcing. Lastly, if noncompliance is maintained by escape or avoidance of non-preferred task demands and caregivers fail to implement escape extinction as a component of time-out, then noncompliance may persist.

Timeout can also fail because of poor implementation. If caregivers fail to observe meaningful changes in children's noncompliance, their implementation of time-out may be extinguished. If caregiver attempts to follow-through with time-out evoke increasing levels of resistant behaviors by the child, their implementation may be punished (Allen & Warzak, 2000). Following repeated occurrences of either cycle, caregiver's adherence to time-out procedures may deteriorate.

Incidental teaching

One potential alternative, or adjunct, to the use of time-out when conducting child compliance training would be to use a modified incidental teaching method (Charlop-Christy, 2008). First developed in the early 1970s (Hart & Risley, 1974), incidental teaching is a naturalistic teaching procedure that seeks to minimize the aversive aspects of instruction by placing an emphasis on child-directed interactions and increasing the children's motivation to respond (LeBlanc et al., 2006). Incidental teaching can be found in numerous modified versions (Charlop-Christy & Berquist, 2007; Charlop, Schreibman, & Thibodeau, 1985; Charlop-Christy & Carpenter, 2000; Halle, Baer & Spradlin, 1981; Rogers-Warren & Warren, 1980; Warren, McQuarter, & Rogers-Warren, 1984).

Incidental teaching procedures operate on the basis of the Premack Principle (Premack, 1959) to leverage conditioned motivating operations and increase the probability of responding without the use of punishment. The Premack Principle, or differential-probability hypothesis, states that "any response A will reinforce any response B, if and only if, the independent rate of A is greater than that of B" (Premack, 1959). In his initial study, Premack demonstrated that the

opportunity for rats to drink water would function to reinforce the instrumental response of wheel running, so long as rats engaged in higher rates of water consumption than wheel running during baseline. In this arrangement, response deprivation functions as an establishing operation that alters the value of water and evokes the behavior of wheel running. Subsequent studies have also demonstrated that the standard Premack Principle arrangement may be modified to include response chains, in which the organism is responsible for satisfying multiple contingencies to obtain a terminal reinforcer (Schaeffer, 1967). Various applied uses of the Premack Principle have previously involved addressing a variety of behaviors, such as non-preferred food consumption, prevocational tasks, and sight word recognition, among others (Browder, Hines, McCarthy, & Fees, 1984; Fisher et al., 1992; Mithaug & Mar, 1980)

In practice, incidental teaching procedures incorporate the Premack Principle by initiating instructional trials only when a child has clearly indicated their interest in engaging in a high-probability behavior (e.g., toy-play). Access to the activity is then made contingent on the child exhibiting a targeted response (e.g., vocal mand). Contingent upon an incorrect response, the child is typically prompted to engage in the correct response. Although this basic instructional format has been used to teach a broad range of behaviors including self-help, play, and vocational skills, its effectiveness in increasing child compliance has yet to be evaluated.

Naturalistic compliance training. Consistent with established incidental teaching methods, what we are calling "Naturalistic Compliance Training" (NCT) involves creating teaching opportunities by restricting access to preferred items. Analogous to the basic research by Premack, deprivation of access to preferred items (e.g., a toy) is intended to function as conditioned motivating operation for engaging in an instrumental response that produces access. In this arrangement, the instrumental response is a chained response that involves a vocal request followed by compliance with a caregiver command. Therefore, trials are initiated when a child demonstrates interest in accessing a restricted item by pointing or gesturing toward it, or by vocally requesting it. Once interest is indicated by the child, the caregiver presents a compliance

trial, and contingent upon compliance with the command, the child is provided with verbal praise and brief access to the requested item. Contingent upon an incorrect response, there is no programed consequence although the child does not access the requested item. Although prompting has historically played an important role in the use of incidental teaching to target language skills in particular, the use of prompts within NCT is noncompulsory.

There are practical advantages associated with the use of NCT that suggest it may provide a viable alternative, or adjunct, to more traditional approaches to compliance training that rely on punishment (i.e., time-out). First, an emphasis is placed on child-directed interactions (LeBlanc, Esch, Firth, & Sidener, 2006), with teaching trials initiated by the child. In contrast to time-out, which is caregiver-directed and requires the presence of a designated time-out area (i.e., chair, room), NCT is child-directed and does not require a programmed response be provided following noncompliance. Rather, NCT procedures aim to increase the probability of compliance by capitalizing on children's naturally occurring motivation, allowing trials to be child-initiated, and thus only conducting teaching when children are highly motivated. This flexibility permits NCT to be conducted in the child's home, school, playground, or other naturally occurring environment.

Second, it is imperative for ethical purposes that positive and least restrictive procedures be used whenever possible (Alberto & Troutman, 2006; Sidman, 1993). Many ethical and professional guidelines for responsible conduct recommend an emphasis on least restrictive procedures (BACB, 2012), and some federal guidelines require it (IDEA, 1997). NCT provides a least restrictive, positive reinforcement-based alternative to typical compliance training procedures.

Third, there is an increase in the likelihood that a positive reinforcement-based approaches to compliance training will result in lasting behavior change. Previous research has indicated that behavior change achieved through punishment procedures is less likely to generalize to settings in which the threat of punishment is not present (Lerman & Vorndran,

2002; Sidman, 1989). NCT circumvents this issue and improves the probability of achieving generalization and maintenance.

The purpose of this study was to evaluate the effectiveness of caregiver-implemented NCT to increase the compliance of young children. We predicted that NCT would function to increase the rate of child compliance over the course of multiple teaching sessions and result in the maintenance of compliant behavior in a non-teaching setting. An analogue study was used to illuminate the therapeutic processes and efficacy of NCT in a well-controlled environment. Analogue research has proven valuable in situations which evaluation of clinical research questions is prohibitive or impractical in their clinical situation (Kazdin, 1978). For this study, clinically relevant subjects and target behavior were used; thus only the research setting was analogue. The use of an analogue setting allowed for more precise measurement and evaluation of the functional relation between NCT and child compliance than could have been yielded in an applied setting.

Method

Procedure

Participants. Five children were recruited for study participation (four male, one female; age range, 3 to 7 years). Joshua was a 5-year-old African-American male diagnosed with conduct disorder. Michael was a 3-year-old Caucasian male diagnosed with conduct disorder. Eve was a 5-year-old African-American female diagnosed with oppositional defiant disorder and attention deficit hyperactivity disorder. Lucas was a 7-year-old Caucasian male diagnosed with oppositional defiant disorder and attention deficit hyperactivity disorder. Peter was a 4-year-old Caucasian male diagnosed with autism spectrum disorder. All of the participants were able to follow simple one-step instructions. A records review was conducted and only Peter was diagnosed with a developmental disability.

Two of the participants (Joshua and Michael) were recruited from an outpatient psychology clinic operated by the University Of Nebraska Medical Center, Munroe-Meyer

Institute. Two of the participants (Eve and Lucas) were referred by an outpatient diagnostic clinic, operated by MMI. Lastly, Peter was referred by an outpatient autism treatment clinic, also operated by MMI.

Pre-assessment. Upon obtaining consent, a primary caregiver for each participant was asked to complete the Eyberg Child Behavior Inventory (see Appendix A) (ECBI; Eyberg & Pincus, 1999). The ECBI is a widely used, 36-question, standardized rating scale that is used to assess children's disruptive behavior. The intensity scale assesses the frequency of children's disruptive behaviors and the problem scale assess the degree to which caregivers consider disruptive behavior to be a problem. This assessment was used to obtain a standardized measure related to each participant's compliance prior to being exposed to the study intervention and for post-treatment comparisons.

Preference assessment. A multiple stimulus without replacement (MSWO) preference assessment (DeLeon & Iwata, 1996) was conducted to identify high- and low-preference play materials (e.g., iPad, cars, Legos) from an array of stimuli found in each child's home. Consumable items (i.e., food, drink) or any objects that would be potentially unsafe to withhold were not included. During this assessment, up to six stimuli were simultaneously presented at a distance of approximately 2 ft. from the child in a quasi-randomly sequenced straight line on the table, each approximately 2 inches apart. The child was allowed to select one stimulus and access it for approximately 30 s. Once the child made a selection, access to all additional stimuli was blocked. Following 30 s of access, the chosen stimulus was removed and the trial was complete. The remaining stimuli were re-presented in a straight line on the table in a different sequence. Subsequent trials were conducted in the same manner until all stimuli were selected or the child made no selection within 30 s from the beginning of a trial. The preference assessment procedures were conducted at least 3 times, and a preference hierarchy was then generated by determining the percentage of trials in which each stimulus was selected. The top ranked stimuli (i.e., those selected over 60% of trials) were identified as high-preference, middle ranked stimuli

(i.e., those selected less than 30-60% of trials) were identified as medium-preference, and low ranked stimuli (i.e., those selected less than 30% of trials) were identified as low-preference.

Results of the MSWO preference assessment for all five participants are presented in Figure 1. Joshua selected coloring as a high-preference activity, a puzzle and toy truck as middle-preference items, and the remaining items were identified as low preference. Michael selected the iPad as a high-preference item and refused to select other items during subsequent trials. Eve also selected an iPad as a high-preference item, two toy trucks as medium preference, and a minion figure as low preference. Lucas selected an iPad as a high-preference item, a car and truck as medium preference, and a zebra figure as low preference. Peter selected a ball as a high-preference item, an iPad as a medium-preference item, and all remaining items were identified as low preference.

During the baseline phase, caregivers were asked to record their child's total time (i.e., minutes) spent interacting with their highly preferred item(s) (see Appendix B); however, access was not restricted. During the intervention phases, in addition to recording this information, caregivers also were asked to restrict their child's daily home access to their highly preferred item(s) to at least 25% less than the average number of minutes recorded during baseline. Accordingly, approximately 1-2 of each child's highly preferred items were made primarily available during NCT teaching sessions. Restricting home access to these items was intended to increase children's motivation and minimize the probability of a child failing to initiate instructional trials during NCT teaching sessions.

The number of daily minutes that each child spent engaging with high-preference items during baseline and their maximum daily limit during NCT phases, for all five participants, are presented in Table 1. Additional items were restricted for use during NCT training based on children's request. Joshua did not engage in coloring when it was made freely available during baseline or on the days leading up to his first NCT session. Joshua requested access to the iPad during sessions five through eight, which he did not have access to at home. Joshua requested

access to a child size basketball hoop and ball at the beginning of his ninth session, which he did not have access to at home. Therefore, Joshua's access to an iPad and basketball were under 100% deprivation during NCT sessions. Michael was limited to 150 min per day of iPad access prior to study participation. During baseline, he was reported to use all of his available time each day to stream a specific animated show, Shaun the Sheep. Michael requested access to the iPad during all NCT sessions. Michael's iPad access was initially restricted to a maximum of 90 min per day and decreased to 60 min per day immediately following session 16. Eve was limited to 120 min per day of iPad access prior to study participation. During baseline, she was reported to use all of her available time each day to play games. Eve requested access to the iPad during all NCT sessions. Eve's iPad access was restricted to a maximum of 90 min per day over the course of all NCT sessions. Lucas was not permitted home iPad access prior to study participation. Lucas requested access to the iPad during all NCT sessions. Lucas's mother reported an inability to monitor his iPad access at home; therefore, Lucas's access to an iPad were maintained under 100% deprivation during NCT sessions. During baseline, Peter was reported average 150 min per day of iPad use. Peter requested access to the iPad during his initial NCT sessions. During this time, Peter's iPad access was restricted to a maximum of 60 min per day. Peter requested to bring play-dough with him to play with during session 10, which was not previously under deprivation. Peter requested iPad access during NCT sessions 11-17 and 22-24, which remained restricted to 60 min per day. During the last two sessions, Peter requested access to a balloon pump and balloon, which he did not have home access to and was under 100% deprivation.

Setting and materials. Study procedures were implemented within an outpatient or day treatment room of an outpatient treatment facility on a medical center campus. Prior to each baseline session, the training room was pre-arranged with instruction-related materials (e.g., a peg board with pegs, a box of moist towelettes, wooden blocks). Access to all items was made freely available throughout the session (i.e., within the child's reach).

Response measurement and interobserver agreement. The primary dependent variable was compliance with caregiver commands, as measured by the percentage of compliance across 10 consecutive instructional trials (see Appendix E). *Compliance* was defined as the child independently completing the action described in the command within 6 s (Wruble, Sheeber, Sorensen, Boggs, & Eyberg, 1991). Secondary dependent variables included the percentage of *noncompliance* and *problem behavior* across 10 consecutive trials and *session duration*. Noncompliance was defined as the failure of the child to independently complete the action described in a command within 6 s. Problem behavior was defined as the participant engaging in aggression (e.g., hitting, kicking, or biting others), self-injury (e.g., head-banging, biting self), property disruption (e.g., throwing toys), whining, crying, or saying "no" within 6 s of the delivery of the command. Session duration was recorded using a digital timer that was set at the beginning of each session and was terminated following completion of the last trial. Session duration was included to provide an indirect measure of children's resistance to NCT.

The principal investigator served as the primary observer during all experimental sessions. A second independent observer also scored target behaviors during 44% of sessions. Interobserver agreement was determined by comparing observers' records on a trial-by-trial basis. An agreement was defined as both observers scoring the occurrence and nonoccurrence of a target behavior on a given trial. Agreement ranged from 90% to 100% for all participants. Mean agreement was calculated by dividing the number of agreements by the number of agreements plus disagreements and converting the ratio to a percentage. Interobserver agreement for both compliance and problem behavior averaged 99% across all conditions. Interobserver agreement averages for compliance, for each participant were as follows: 100% for Joshua, 98% (range, 90% to 100%) for Michael, 98% for Eve (range, 90% to 100%), 98% for Lucas (range, 90% to 100%), and 99% for Peter (range, 90% to 100%).

Experimental design. A single-case experimental design was used as part of this investigation. Single-case experimental designs are widely recognized as valid means of

establishing evidence-based, empirically supported practices (Connell & Thompson, 1986; Towne & Shavelson, 2002; Tripodi, 1994). This approach yields a high degree of internal validity necessary to isolate the effect of the independent variable and highlight any existing functional relations between NCT and compliance (Barlow & Hersen, 1973). For purposes of this study, the use of a single-case design helped to facilitate efficient judgments of when a participant had met mastery criteria and inform condition changes. It also permitted visual analysis of individual participant data and the identification of clinically relevant behavior changes that may be statistically insignificant. Lastly, this methodology was chosen due to the experimental rigor involved in single-case experimental designs and their previous use in both the development and evaluation of educational (Dunlap & Kern, 1997) and clinical interventions (Barlow & Hersen, 1973).

A combined reversal (Kazdin, 2016) and nonconcurrent multiple-baseline-across-participants design (Watson & Workman, 1981) was used to evaluate the effects of NCT on the rate of child compliance. The reversal design has historically been regarded as the most powerful single subject research design (Gast & Ledford, 2014). The nonconcurrent multiple baseline design has also been used to effectively control for the possible effects of maturation and exposure and has generally demonstrated sufficient experimental control for evaluative purposes (Carr, 2005). The use of a combined design provided two sources of experimental control in the event that the results of teaching were found to be irreversible (i.e., compliance maintains during a return to baseline condition).

Baseline and experimental conditions were applied in an A-B-A-B sequence, and introduction of the independent variable was staggered (i.e., varied baseline lengths) across each participant. Data were graphically depicted and visually inspected for changes in level, trend, and variability during baseline and training conditions to determine when to implement and reverse the independent variable with each child. The initial transition for each child from baseline to teaching conditions followed low (i.e., 60% or below), stable levels of child compliance for a

minimum of 3-7 sessions. Subsequent condition changes were initiated for each participant contingent upon meeting a pre-determined mastery criteria. Specific mastery criteria requirements included compliance during at least 80% of trials, across three consecutive training sessions conducted on at least two calendar

Experimental conditions.

Caregiver training. Caregivers were trained to implement NCT procedures in advance of conducting NCT sessions. Caregiver training consisted of didactic information and role-play sessions with immediate feedback. Written information described NCT (see Appendix C), trial initiation and reinforcer delivery, and definitions of compliance and noncompliance. This information was reviewed, and following the didactic training, skill rehearsal (i.e., role-play) was conducted. Immediate feedback was provided during role-play contingent upon errors. Caregivers were required to demonstrate mastery with at least 90% of the steps involved in NCT implementation across 10 role-play trials, prior to implementation with their child.

Baseline. During baseline, the child was allowed to interact with any instruction-related materials for 1 min prior to the start of a session. The caregiver was then instructed to deliver the first command following the 60-s play period. Subsequent trials were initiated on a 30-s fixed-time schedule by delivery of a new command. A trial was defined as the delivery of a command and the following 6-s. A session was defined as 10 consecutive trials. In the case that a session was not completed in a single day due to a lasting more than 60 min or other caregiver time constraints, then it was resumed during the next visit. During each session, a timer was used to track 30-s intervals. The caregiver was provided with a list of the 10 commands to be used during each session (see Appendix D) in order to ensure that the same command was not repeated twice in a session. Specific commands (Stephenson & Hanley, 2010) used included variations of the instructional frames and related materials listed in Table 2 (e.g., “give me a block”). The complete list of commands are presented in Appendix D. Parents were asked to review the list of commands and confirm their child’s ability to receptively comprehend and physically complete

each task prior to study participation. Each session consisted of 10 trials, included two randomly selected commands from each of the instructional categories, and lasted approximately 5 min. Contingent upon compliance, the caregiver was instructed to state "good job." There was no programmed consequence for noncompliance. Caregivers were instructed in advance of each session to engage in planned ignoring (e.g., pretend to engage in another activity, look away) contingent upon any occurrence of child problem behavior (e.g., crying, whining, disruptive behavior). Once the session was complete, the child and caregiver were provided with a brief break.

Naturalistic compliance training (NCT). NCT sessions began the same as baseline, and included all of the same stimulus materials, except one of the child's highly preferred items was also present. An instructional trial began when the child engaged in an appropriate request for access to a highly preferred activity. An appropriate request was defined as a vocal mand, that is a statement or question that is under functional control of the relevant conditions of deprivation (e.g., "can I have the _____?"; "I would like to play with the _____.") and that specified the reinforcer (i.e., desired item; Skinner, 2014). In order to be considered appropriate, a request was also required to occur in the absence of problem behavior (e.g., throwing items, using inappropriate words). However, the tone or inflection of a child's request was not considered a relevant feature of an appropriate initiation. Pre-teaching was conducted prior to start of each training session, in which the caregiver provided the child with a simple verbal rule describing an appropriate initiation. Pre-teaching involved the caregiver stating:

"If you would like to play with the (preferred item), you have to ask nicely. This includes no hitting or throwing. To get the (preferred item), you will need to follow the direction(s) that I give you, and you will need to do it as quickly as you can. If you follow the instruction, then you can play with the (preferred item) for a little bit. If you do not follow the direction(s), you will not get the (preferred item). If you do not follow the direction(s) quickly

enough, but you want to try again, all you have to do is tell me when you're ready, and ask for the (preferred item) again."

Once an instructional trial was initiated, the caregiver responded to the child's request with the following statement: "Yes, you can have the (preferred item), but first I need you to (task)." A timer was then set for 6 s. Each session consisted of 10 trials and included two randomly selected commands from each of the instructional categories.

Contingent upon compliance, the caregiver stated "good job" and the child was provided with immediate access to the item. A timer was then be set for 60 s. Caregiver attention was also available during this time. Following a 60-s access period, the caregiver retrieved the item or otherwise reinstated restricted access (e.g., physically blocked access). A new trial could be initiated immediately following a 60-s period of access once the child made a new appropriate request for an item.

Contingent upon noncompliance, the caregiver stated at the end of the 6-s interval: "Time is up" and continued restricting access to the requested item. Contingent upon an appropriate child initiation, a new trial began, and the caregiver issued the last command with which the child was noncompliant.

In the case that a child failed to engage in 10 appropriate requests within 60 min, the session was terminated. Preference was re-assessed prior to the start of the next session, and the restricted item was substituted to reflect changes in the child's preference. If outcomes of the second preference assessment did not indicate a change in preference, access was restricted to one or two additional preferred items, which were also made available contingent upon an appropriate request.

Because previous research has demonstrated that the use of lean schedules of reinforcement promotes maintenance and generalization of acquired behaviors (Kazdin & Polster, 1973; Koegel & Rincover, 1977), the number of commands issued prior to reinforcer delivery

was increased over the course of NCT sessions. The format of training sessions during each condition remained consistent.

Initially, children were required to demonstrate compliance with a single command per instruction trial prior to the delivery of a reinforcer, reflecting an FR-1 schedule of reinforcement.

Upon meeting a mastery, the number of commands delivered per instructional trial was increased to reflect a variable-ratio-3 schedule of reinforcement. According to this schedule, the child was required to demonstrate compliance with an average of three commands per instructional trial. The exact reinforcement schedule during VR-3 sessions was calculated and randomized, and a sheet listing the number of commands per instructional trial was generated prior to each session. NCT sessions varied in duration based on the rate at which trials were initiated during each session. The maximum duration of a session, however, was limited to 60 min.

The child was informed at the start of each trial, how many commands would be given, and the timer was reset to 6-s following the delivery of each sequential command. Each command was delivered and compliance assessed individually (e.g., "I need you to do three things. The first thing is to_____"). If the child was noncompliant with any command during the sequence, the trial was scored as noncompliance, and the caregiver stated, "Time is up. If you would like the item, you will have to ask again." Contingent upon an appropriate child initiation, a new trial began and the caregiver began with the last command with which the child was noncompliant. Upon meeting mastery criteria of compliance during at least 80% of trials, across three consecutive training sessions, a reversal to baseline condition was initiated.

During the reversal phase, baseline conditions were implemented as the previously described baseline condition. Once a stable level of compliance was observed (i.e., a minimum of three sessions), the VR-3 schedule of reinforcement was reintroduced.

The VR-3 phase remained in place until the mastery criteria of compliance during at least 80% of trials was met during three final consecutive training sessions.

The complete sequence of steps implemented by the caregiver during a naturalistic compliance training session are illustrated in Figure 2. The key in the upper left-hand side of the flow chart describes the function of each geometric figure. Rounded rectangles indicate the beginning or end of a trial. Squared rectangles describe an adult response. Diamonds describe a yes/no option. Two lines emerge from each diamond subsequent to the first. ”Yes” indicates that the condition in the diamond was met, and "no" indicates that the condition described was not met. The trial was complete following either noncompliance or a 60-s reinforcement interval.

***Social acceptability questionnaire*.** After completion of the final session, each child’s caregiver was asked to complete a modified version of the Treatment Acceptability Rating Form Revised (TARF-R; Reimers & Wacker, 1988) (see Appendix G). This form contains nine items, each of which are rated using a Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Post-assessment. Following study completion, the same parent of each participant was asked to complete a copy of the Eyberg Child Behavior Inventory (ECBI) a second time. This reassessment was used to supplement experimental data and help to highlight any changes in each participant’s compliance related behavior as a result of participating in the study intervention.

***Integrity of implementation*.** Data were collected on integrity of implementation in order to ensure consistent implementation of NCT procedures within and across sessions (see Appendix F). A second observer maintained a pencil and paper data sheet in order to monitor trial-by-trial integrity implementation during 31% of sessions. Data were collected during baseline and NCT sessions using the task analysis of the steps involved in consistent procedural implementation in addition to the number of task command delivered. Integrity for each session was determined by dividing the number of procedural steps implemented correctly during each trial by the total number of possible steps, and converting this ratio into a percentage and equaled 98%.

Results

The results of NCT on levels of compliance are displayed in Figure 3. The percentage of intervals with compliance for all five participants are plotted on the y-axis. During the baseline

phase, all five participants were observed to engage in low percentages of compliance with stable or decreasing trends. Joshua engaged in low, stable levels of compliance during baseline (*M* = 3%). However, upon introduction of NCT, his compliance demonstrated an immediate increase in trend that remained at high, stable levels throughout both of the NCT phases (*M* = 94%). Joshua's compliance demonstrated an immediate return to low levels in the second baseline phase (*M* = 3%). During the final NCT (VR 3) phase, his compliance immediately returned to high, stable levels (*M* = 100%).

Michael's compliance was initially high during baseline, followed by a steep decreasing trend (*M* = 30%). Upon introduction of NCT, his compliance immediately increased and remained at high, relatively stable levels throughout both of the NCT phases (*M* = 90%). Michael's compliance demonstrated an immediate decreasing trend toward low, stable levels in the second baseline phase (*M* = 28%). During the final NCT phase, his compliance immediately returned to high, stable levels, with the exception of one variable session (*M* = 72%).

Eve's compliance demonstrated a similar decreasing trend to Michael (*M* = 36%). Upon introduction of NCT, her compliance immediately increased and remained at high, relatively stable levels throughout both of the NCT phases (*M* = 92%). In contrast to Joshua and Michael, Eve's compliance maintained at high, stable levels in the second baseline phase (*M* = 88%). During the final NCT phase, her compliance demonstrated a slight increase (*M* = 100%).

Lucas engaged in low, stable levels of compliance (*M* = 37%). Upon introduction of NCT, his compliance immediately increased and remained at high, stable levels throughout both of the NCT phases (*M* = 93%). Lucas's compliance demonstrated a decreasing trend characteristic of an extinction curve in the second baseline phase (*M* = 53%). During the final NCT phase, his compliance immediately returned to high, stable levels (*M* = 100%).

Peter engaged in low, stable levels of compliance (*M* = 6%). Upon introduction of NCT, his compliance demonstrated a stable increasing trend. Peter's demonstrated a decrease in compliance during one session, but overall his compliance remained at high levels throughout

both of the NCT phases (*M* = 77%). Peter's compliance demonstrated a less immediate decreasing trend similar to Lucas, returning to low levels in the second baseline phase (*M* = 28%). During the final NCT phase, his compliance immediately returned to high levels (*M* = 87%).

The occurrence of problem behavior during all study phases is displayed in Figure 4. The percentage of intervals with problem behavior for all five participants are plotted on the y-axis. Joshua demonstrated a steep increasing trend in problem behavior during baseline (*M* = 57%), which immediately decreased upon introduction of NCT. His problem behavior remained at low, stable levels throughout the NCT phases (*M* = 9%). Joshua was not observed to engage in problem behavior during the second baseline or final NCT condition (*M* = 0%).

Michael demonstrated low, stable levels of problem behavior during baseline (*M* = 3%) and both of the NCT conditions (*M* = 2%). His problem behavior demonstrated a slight increasing trend during the second baseline (*M* = 15%) and a higher degree of variability during the final NCT condition (*M* = 10%).

Eve demonstrated a steep increasing trend of problem behavior during baseline (*M* = 24%). Her problem behavior was immediately reduced upon the implementation of NCT conditions and remained low throughout with one elevated session (*M* = 7%). Eve was not observed to engage in problem behavior during the second baseline or final NCT condition (*M* = 0%).

Lucas demonstrated low, stable levels of problem behavior during baseline (*M* = 2%). He did not engage in problem behavior during the NCT conditions (*M* = 0%), second baseline (*M* = 0%), or the final NCT condition (*M* = 0%).

Peter demonstrated low, stable levels of problem behavior during baseline (*M* = 0%). He demonstrated a slight increasing trend in problem behavior during his initial NCT sessions, with some degree of variability across sessions (*M* = 6%). Peters' problem behavior demonstrated an

increasing trend increased during the second baseline (*M* = 45%). However, it immediately returned to low levels during the final NCT condition (*M* = 3%).

The session duration across all study phases is displayed in Figure 5. The number of minutes for all five participants is plotted on the y-axis. All baseline sessions were 5 min. NCT session duration data provide indirect evidence that children responded to intervention procedures with minimal resistance. Joshua demonstrated an increasing trend in session duration following the first baseline phase (*M* = 31 min), which steeply decreased following the third NCT session and returned to low, stable levels following the second baseline (*M* = 22 min).

Michael demonstrated low, stable session durations following the first baseline phase (*M* = 15 min), which immediately increased following the second baseline phase before returning to low levels that were maintained within a stable range (*M* = 19 min).

Eve demonstrated a steep increasing trend in session duration following the first baseline phase (*M* = 28 min), which decreased following the second NCT session and maintained at low, stable levels following the second baseline (*M* = 14 min).

Lucas demonstrated low, stable session durations following the first baseline phase (*M* = 19 min), which maintained within a stable range following the second baseline phase (*M* = 16 min).

Similar to Lucas, Peter demonstrated stable session durations following the first baseline phase (*M* = 21 min), which maintained within a relatively stable range following the second baseline phase (*M* = 20 min).

The pre- and post-ECBI scores for all five participants are displayed in Figure 6. The dashed horizontal line indicates the clinical significance cut-off (i.e., T-scores above 60). T-scores are plotted on the y-axis. Joshua's ECBI T-scores for both intensity and problem reduced from clinically significant, pre-assessment levels (71 and 49 respectively), to average, post-assessment levels (67 and 41 respectively).

Michael's ECBI T-scores for both intensity and problem demonstrated minimal change, with no reduction in intensity (60) and a slight reduction in problem, from a pre-assessment level of problem (66), to post-assessment levels (64).

Eve's ECBI T-scores for both intensity and problem demonstrated a slight change, from pre-assessment levels (78 and 76 respectively), to post-assessment levels (75).

Lucas's ECBI T-scores for both intensity and problem demonstrated a slight change, from pre-assessment levels (79 and 76 respectively), to post-assessment levels (73 and 72 respectively).

Peter's ECBI T-scores for intensity and problem demonstrated a slight increase, from pre-assessment levels (70 and 68 respectively), to post-assessment levels (71 and 76 respectively).

Social acceptability

Overall mean social acceptability was determined for all participants by summing all items and converting entries into a percentage by dividing the total score by the total possible score and equaled 79%. The mean and range of responses made by participants for each item in the modified TARF-R are presented in Table 3. In response to eight of the twelve survey items (1, 2, and 7-12) caregivers rated four or above. The three of the survey items (3-6) that were primarily related to the effectiveness of NCT and long-term benefits received the lowest scores. These responses suggest that although the procedural components of NCT may have been easy for caregivers to implement, caregivers had less confidence that increases in compliance observed during training would be associated with lasting behavior change.

Discussion

Overall, the results of this study support the use of NCT to increase child compliance. When participants were presented with simple commands by a caregiver, their compliance was initially poor. However, when opportunities to engage in a preferred activity were made contingent upon compliance with the same commands, marked improvements were noted. Also

worth noting, is that each of the five children who participated were clinically referred for the treatment of noncompliance and disruptive behavior. These effects were maintained through schedule thinning and persisted during the intervention withdrawal for one participant.

The results of this study extend the literature in four important ways. First, NCT was demonstrated to be an efficient intervention for increasing compliance for each participant. The average increase in compliance, from the final baseline session to the first intervention, session was 72%. Session duration data support this notion, as the average time for the first intervention session was 26 minutes. Thus, initial compliance gains of 50%-100% were attained in an average of less than 30 minutes for all five participants. It is interesting to note that children maintained or in some cases even decreased their session duration during the VR 3 phase of NCT. Despite increases in the number of commands delivered per instructional trial, children generally maintained or improved their efficiency of compliance with commands. Furthermore, within-session data analysis indicated that increases in children's compliance occurred during early trials of the initial NCT sessions. Although we did not directly compare NCT to other interventions, these results support the immediate effectiveness of NCT, with minimal resulting problem behavior (M = 6%). This finding has particular clinical importance because the use of time-out based interventions are often associated with child resistance (Ducharme & Popynick, 1993) and potentially poor parental adherence (Allen & Warzak, 2000). In contrast, NCT procedures are only implemented when the child is highly motivated, thus minimizing the likelihood of resistance. Furthermore, social validity ratings indicated that NCT procedures were highly acceptable and easy for parents to implement.

Second, the current study provides a contemporary demonstration of the underappreciated Premack Principle to address a common and socially significant clinical problem. Iwata and Michael (1993) noted that despite over 15 years of research indicating the potential utility of response deprivation that there had been very few extensions to the applied area. Over 20 years later, applied research using the Premack Principle, or other variations of

response deprivation, remains scarce. This lack of research using the Premack Principle in applied settings is unfortunate. Translational research in other areas of behavior theory (e.g., behavioral momentum theory; Nevin, Mandell, & Atak, 1983) has proved highly successful in developing interventions with broad applications (Mace & Critchfield, 2010). The current study provides yet another example how research on novel applications of behavioral theories or principles can help to expand treatment options for applied researchers and practitioners.

Third, in addition to providing a positive intervention to address noncompliance, the outcomes of this study suggest that NCT might be valuable to parents as a means of reducing the frequency of time-outs. Specifically, NCT could be used to reliably evoke compliance with minimal occurrences of problem behavior and thereby reduce caregiver need for time-outs contingent upon noncompliance. Problem behavior data support this notion, as children largely engaged in low, stable levels of problem behavior during NCT sessions. Visual inspection of problem behavior and compliance data during corresponding sessions also reveals no consistent pattern that would indicate problem behavior occurred as a function of children being denied access to their preferred item. That children may not immediately engage in problem behavior when access to a reinforcer is denied due to noncompliance is not entirely surprising since NCT procedures allow children to immediately make subsequent requests.

Fourth, NCT procedures introduce a method of compliance training that directly promotes positive caregiver-child interactions. In fact, many of the activities (e.g., basketball, play-dough) selected by children for use in study intervention sessions were associated with various forms of positive social attention (e.g., reciprocal or parallel play, descriptive statements), despite the absence of instructions related to engaging in play. Of course, most empirically supported behavioral parent training programs also incorporate social reinforcement through child-directed interaction or “time-in,” during which parents are trained to deliver various forms of attention. However, NCT procedures have the potential to generate these opportunities without overt instruction. Although the frequency of child initiated bids for caregiver attention

was not measured, this would be an interesting dependent variable to include in future investigations.

The fact immediate reductions in compliance were demonstrated by the return to baseline for four of the five participants presents a clinical concern associated with the use of NCT. From a conceptual perspective there are a few possible explanations why compliance returned to baseline levels for these children. The most compelling explanation centers on the reversal of the contingencies arranged during the NCT condition. Previous research using the Premack principle has demonstrated that the low-probability behavior returns to baseline levels when it is no longer made contingent upon the high-probability behavior (Hanley, Iwata, Thompson, & Lindberg, 2000).

An alternative, or complementary explanation for the return to baseline involves stimulus control. Certain features of baseline and NCT sessions may have been highly discriminative and influenced children's compliance. Since children were provided with different verbal rules before baseline and NCT sessions and requests to access their preferred items were extinguished, compliance may have been extinguished during the return to baseline sessions.

There were several limitations of this study that warrant mention. First, the lack of a functional analysis impedes the ability to determine the function of each child's noncompliance. Also, it leaves conclusions regarding variables responsible for maintaining Eve's compliance during the second reversal speculative. However, despite the lack of a functional analysis, a fairly clear demonstration of experimental control was still achieved for all five participants. These findings are consistent with previous research that supports the effectiveness of positive reinforcers to increase compliance without consideration of the function of noncompliance (Fischer, Iwata, & Mazaleski, 1997; Lalli et al., 1999).

Second, the definitions of compliance and problem behavior (i.e., occurring within 6 seconds of trial initiation) failed to capture delayed responses. Therefore, improvements in compliance within a longer latency (i.e., between 6 and 30 seconds) were undetected. However,

given the use of instructions that have been standardized for use with preschoolers, any increases in compliance after a 6 s latency could be deemed less socially acceptable. Problem behavior that occurred between trials was also undetected. Also, any prolonged occurrences of problem behavior following the trial termination, or between trials, would in most cases be reflected by a longer session duration.

Third, the parameters of reinforcer deprivation and intervention effectiveness were not explored. That is, the number and quality of reinforcers (i.e., high versus medium preference) restricted and their level of deprivation below baseline levels were not manipulated. This limitation prevents conclusions regarding how the rate of compliance and problem behavior would vary based on the preference of reinforcers restricted, the level of deprivation implemented, or the minimum level of deprivation necessary to ensure the effectiveness of NCT. Although the quality and quantity of reinforcer deprivation was not manipulated, NCT was demonstrated effective for all five participants with minimal restriction of as few as one to four reinforcers.

Fourth, the effectiveness of NCT appears to be limited by its evocative properties as an establishing operation (Klatt & Morris, 2001) similar to other contingency-based interventions (Wilder et al., 2008). That is, NCT may only be effective as long as 1) the high probability behavior is restricted below baseline level, 2) the high probability behavior is made contingent upon the low probability behavior, and 3) the high probability behavior does not become satiated. Accordingly, the effectiveness of current NCT procedures may be limited to situations in which caregiver time is flexible and children request a preferred item or activity. This premise is also supported by the observed decreases in compliance during reversal phase, for four of the five participants. However, although use of NCT may be limited to some situations, the procedures can be very effectively used when children are motivated.

Although achieving response persistence during withdrawal of NCT was not a goal of the current study, it is interesting to speculate which variables may have been primarily responsible

for disrupting compliance in the return to baseline conditions. As previously mentioned, the verbal rules provided to children before each session may have functioned as discriminative stimuli, indicating whether reinforcement was available. Verbal rules associated with the baseline condition may have served to abolish compliance. Also, the variable ratio schedule component of NCT was distinct from traditional arrangements. In a typical arrangement, the subject is unaware of the terminal number of responses necessary to satisfy the schedule and obtain the reinforcer (Ono, 1987). However, in this study children were informed of the number of responses required at the beginning of each trial. Hence, children were not required to engage in compliance under any conditions that more closely resemble extinction. As a result, while the VR3 phase of NCT increased the response effort required relative to the FR1 phase, it may not have contributed any additional response-strengthening effect.

A systematic replication of this study, using a variable interval schedule of reinforcement and programmed noncontingent reinforcement, rather than a terminal variable ratio schedule, may yield a higher probability of response persistence (Nevin, Grace, Holland, & McLean, 2001). For example, children could be instructed to follow various caregiver commands and compliance could be reinforced contingent upon compliance with the last command once a variable interval schedule elapses. Noncontingent reinforcement, in the form of access to the requested item or activity, could be provided periodically throughout the interval. Through gradual thinning of both the VI and NCR schedules, children's compliance could eventually be reinforced only under conditions that reflect baseline conditions (i.e., absent of reinforcement for up to 5 min).

The use of a tandem schedule, as opposed to a chained schedule, may also serve to reduce the discriminability between intervention and baseline conditions and promote response persistence. One way to achieve such a tandem schedule would be to eliminate the use of distinct verbal rules across conditions. Moreover, in the current study, children's requests for their preferred item or activity at the beginning of second baseline sessions were extinguished, which may have also increased the saliency of condition changes.

One practical reason to pursue systematic replications, with modifications aimed at generating response persistence, may be to increase the social acceptability of NCT to caregivers. Although, many aspects of NCT were rated as acceptable, caregivers provided the least endorsement for questions related to its effectiveness and their satisfaction with improvements in their child's behavior. One possible reason for low satisfaction ratings, may have been a lack of generalized (i.e., to home) or maintained compliance. The highly controlled environment in which the study was implemented may have contributed to both issues related to generalization and maintenance. However, a possible alternative explanation may be that children exhibited other topographies of disruptive behavior, which NCT was not intended to treat. Pre- and post-ECBI scores support this explanation due to the minimal improvements in disruptive behavior, for four of the five children.

In the future, investigators should consider evaluating the use of NCT in home and classroom environments. Although the current study demonstrated the effectiveness of NCT in a relatively analogue setting, it remains imperative to test the procedures in less controlled environments. Investigators should also explore the extent to which reinforcer access must be restricted to yield socially acceptable increases in compliance. Studies that seek to increase the persistence of compliance outside of the context of NCT and probe for generalization with additional caregivers would also be valuable. Lastly, a component analysis should be conducted to determine the elements of NCT responsible for its effectiveness. For example, an alternating treatments design could be used to compare children's resistance to caregiver-initiated and child-initiated trials. To control for the density of command delivery the schedule of caregiver-initiated trial initiation could be yoked to match the schedule observed during child-initiated sessions.

In sum, the results of the current support the use of NCT as a practical adjunct intervention for increasing child compliance. Although, NCT may not provide a substitute for time-out in all situations, it adds a supplemental strategy to the tool box of behavior analysts. Lastly, the ability of NCT to increase compliance without physical manipulation of the child and

its acknowledgement of important motivating operations offer both practical and conceptual benefits.

References

Alberto, P. A., & Troutman, A. C. (2006). *Applied behavior analysis for teachers* (7th ed.). Upper Saddle River, NJ: Merrill/Prentice Hall.

Allen, K. D., & Warzak, W. J. (2000). The problem of parental nonadherence in clinical behavior analysis: Effective treatment is not enough. *Journal of Applied Behavior Analysis*, *33*(3), 373-391.

Azrin, N. H. (1961). Time-out from positive reinforcement. *Science*, *133*(3450), 382-383.

Azrin, N. H., Hake, D. F., Holz, W. C., & Hutchinson, R. R. (1965). Motivational aspects of escape from punishment. *Journal of the Experimental Analysis of Behavior*, *8*(1), 31-44.

Baer, D. M. (1962). Laboratory control of thumbsucking by withdrawal and re-presentation of reinforcement. *Journal Of The Experimental Analysis Of Behavior*, *5*(4), 525-528. doi:10.1901/jeab.1962.5-525

Barkley, R. A. (2000). Commentary: Issues in training parents to manage children with behavior problems. *Journal Of The American Academy Of Child & Adolescent Psychiatry*, *39*(8), 1004-1007. doi:10.1097/00004583-200008000-00015

Barlow, D. H., & Hersen, M. (1973). Single-case experimental designs: Uses in applied clinical research. *Archives Of General Psychiatry*, *29*(3), 319-325. doi:10.1001/archpsyc.1973.04200030017003

Behavior Analyst Certification Board (2012). *Fourth edition task list*. Retrieved from http://www.bacb.com/Downloadfiles/TaskList/BACB_Fourth_Edition_Task_List.pdf

Bernal, M. E., Klinnert, M. D., & Schultz, L. A. (1980). Outcome evaluation of behavioral parent training and client-centered parent counseling for children with conduct problems. *Journal Of Applied Behavior Analysis*, *13*(4), 677-691. doi:10.1901/jaba.1980.13-677

Brantner, J. P., & Doherty, M. A. (1983). A review of timeout: A conceptual and methodological analysis. The effects of punishment on human behavior, 87-132. Academic Press.

Browder, D. M., Hines, C., McCarthy, L. J., & Fees, J. (1984). A treatment package for increasing sight word recognition for use in daily living skills. *Education & Training Of The Mentally Retarded*, *19*(3), 191-200.

Carbone, V. J., Morgenstern, B., Zecchin-Tirri, G., & Kolberg, L. (2007). The role of the reflexive conditioned motivating operation (CMO-R) during discrete trial instruction of children with autism. *Journal of Early and Intensive Behavior Intervention*, *4*(4), 658.

Carr, J. E. (2005). Recommendations for Reporting Multiple-Baseline Designs across Participants. *Behavioral Interventions*, *20*(3), 219-224. doi:10.1002/bin.191

Charlop-Christy, M. H. (2008). *How to Use Incidental Teaching with Children with ASD*. Pro-Ed. Publishing.

Charlop-Christy, M. H., & Berquist, K. L. (2007). *Increasing social initiations in nonverbal children with autism: A comparison of modified incidental teaching sessions (MITS) and discrete trial training (DTT)*. Unpublished manuscript, Claremont Graduate University, Claremont, CA.

Charlop, M. H., Schreibman, L., & Thibodeau, M. G. (1985). Increasing spontaneous verbal responding in autistic children using a time delay procedure. *Journal Of Applied Behavior Analysis*, *18*(2), 155-166. doi:10.1901/jaba.1985.18-155

Charlop-Christy, M. H., & Carpenter, M. H. (2000). Modified incidental teaching sessions: A procedure for parents to increase spontaneous speech in their children with autism. *Journal Of Positive Behavior Interventions*, *2*(2), 98-112. doi:10.1177/109830070000200203

Connell, P. J., & Thompson, C. K. (1986). Flexibility of single-subject experimental designs: III. Using flexibility to design or modify experiments. *Journal Of Speech & Hearing Disorders*, *51*(3), 214-225.

Crowther, J. H., Bond, L. A., & Rolf, J. E. (1981). The incidence, prevalence, and severity of behavior disorders among preschool-aged children in day care. *Journal Of Abnormal Child Psychology*, *9*(1), 23-42. doi:10.1007/BF00917855

DeLeon, I. G., & Iwata, B. A. (1996). Evaluation of a multiple-stimulus presentation format for assessing reinforcer preferences. *Journal Of Applied Behavior Analysis*, *29*(4), 519-533. doi:10.1901/jaba.1996.29-519

Dinsmoor, J. A. (1954). Punishment: I. The avoidance hypothesis. *Psychological review*, *61*(1), 34.

Dishion, T. J., & Patterson, G. R. (1992). Age effects in parent training outcome. *Behavior Therapy*, *23*(4), 719-729. doi:10.1016/S0005-7894(05)80231-X

Ducharme, J. M., & Popynick, M. (1993). Errorless compliance to parental requests: Treatment effects and generalization. *Behavior Therapy*, *24*(2), 209-226. doi:10.1016/S0005-7894(05)80264-3

Dunlap, G., & Kern, L. (1997). *Behavior analysis and its relevance to special education*. In J. L. Paul, M. Churton, H. Roselli-Kostoryz, W. Morse, K. Marfo, C. Lavely, & D. Thomas (Eds.), Foundations of special education: Basic knowledge informing research and practice in special education (279-290). Pacific Grove, CA: Brooks/Cole.

Eyberg, S., & Pincus, D. (1999). *Eyberg Child Behavior Inventory & Sutter-Eyberg Student Behavior Inventory-Revised: Professional Manual*. Odessa, FL: Psychological Assessment Resources.

Ferster, C. B. (1958). Control of behavior in chimpanzees and pigeons by time out from positive reinforcement. *Psychological Monographs: General and Applied*, *72*(8), 1.

Fischer, S. M., Iwata, B. A., & Mazaleski, J. L. (1997). Noncontingent delivery of arbitrary reinforcers as treatment for self-injurious behavior. *Journal of Applied Behavior Analysis*, *30*(2), 239-249.

Fisher, W., Piazza, C. C., Bowman, L. G., Hagopian, L. P., Owens, J. C., & Slevin, I. (1992). A comparison of two approaches for identifying reinforcers for persons with severe and profound disabilities. *Journal Of Applied Behavior Analysis*, *25*(2), 491-498. doi:10.1901/jaba.1992.25-491

Forehand, R., Gardner, H., & Roberts, M. (1978). Maternal response to child compliance and noncompliance: Some normative data. *Journal of Clinical Child & Adolescent Psychology*, *7*(2), 121-124.

Forehand, R. L., & McMahon, R. J. (1981). *Helping the noncompliant child: A clinician's guide to parent training*. New York: Guilford press.

Frentz, C., & Kelley, M. L. (1986). Parents' acceptance of reductive treatment methods: The influence of problem severity and perception of child behavior. *Behavior Therapy*, *17*(1), 75-81. doi:10.1016/S0005-7894(86)80116-2

Gast, D. L., & Ledford, J. R. (2014). *Single case research methodology: Applications in special education and behavioral sciences (2nd ed.)*. New York, NY, US: Routledge/Taylor & Francis Group.

Hanley, G. P., Iwata, B. A., Thompson, R. H., & Lindberg, J. S. (2000). A component analysis of "stereotypy as reinforcement" for alternative behavior. *Journal of Applied Behavior Analysis*, *33*(3), 285-297.

Hoffman, H. S. (1966). The analysis of discriminated avoidance. *Operant behavior: areas of research and application*. New York: Appleton-Century-Crofts, 499-530.

Holland, J. G., & Skinner, B. F. (1961). *The analysis of behavior: A program for self-instruction*. New York: McGraw-Hill.

Holz, W. C., Azrin, N. H., & Ayllon, T. (1963). Elimination of behavior of mental patients by response-produced extinction. *Journal of the Experimental Analysis of Behavior*, *6*(3), 407-412.

Halle, J. W., Baer, D. M., & Spradlin, J. E. (1981). Teachers' generalized use of delay as a stimulus control procedure to increase language use in handicapped children. *Journal Of Applied Behavior Analysis*, *14*(4), 389-409. doi:10.1901/jaba.1981.14-389

Hämäläinen, M., & Pulkkinen, L. (1996). Problem behavior as a precursor of male criminality. *Development And Psychopathology*, *8*(2), 443-455. doi:10.1017/S0954579400007185

Hart, B., & Risley, T. R. (1974). Using preschool materials to modify the language of disadvantaged children. *Journal Of Applied Behavior Analysis*, *7*(2), 243-256. doi:10.1901/jaba.1974.7-243

Hembree-Kigin, T. L., & McNeil, C. B. (1995). *Parent-Child Interaction Therapy*. New York: Plenum Press.

Hobbs, S. A., Walle, D. L., & Caldwell, H. S. (1984). Maternal evaluation of social reinforcement and time-out: Effects of brief parent training. *Journal Of Consulting And Clinical Psychology*, *52*(1), 135-136. doi:10.1037/0022-006X.52.1.135

Hoffman, M. L. (1977). Moral internalization: Current theory and research. *Advances in experimental social psychology*, *10*, 85-133.

Horner, R. H., Dunlap, G., Koegel, R. L., Carr, E. G., Sailor, W., Anderson, J., & ... O'Neill, R. E. (2005). Toward a Technology of 'Nonaversive' Behavioral Support. *Research And Practice For Persons With Severe Disabilities*, *30*(1), 3-10. doi:10.2511/rpsd.30.1.3

Individuals with Disability Education Act Amendments of 1997 [IDEA]. (1997). Retrieved from http://thomas.loc.gov/home/thomas.php

Iwata, B. A., & Michael, J. L. (1994). Applied implications of theory and research on the nature of reinforcement. *Journal of applied behavior analysis*, *27*(1), 183-193.

Kalb, L. M., & Loeber, R. (2003). Child disobedience and noncompliance: A review. *Pediatrics*, *111*(3), 641-652.

Kazdin, A. E. (1978). Evaluating the generality of findings in analogue therapy research. *Journal of Consulting and Clinical Psychology*, *46*(4), 673-686.

Kazdin, A. E. (1985). *Treatment of antisocial behavior in children and adolescents*. Dorsey Pr.

Kazdin, A. E. (1987). *Conduct disorders in childhood and adolescence*. Thousand Oaks, CA, US: Sage Publications, Inc.

Kazdin, A. E. (1987). Treatment of antisocial behavior in children: Current status and future directions. *Psychological Bulletin*, *102*(2), 187-203. doi:10.1037/0033-2909.102.2.187

Kazdin, A. E. (2016). Single-case experimental research designs. In A. E. Kazdin, A. E. Kazdin (Eds.) , *Methodological issues and strategies in clinical research (4th ed.)* (pp. 459-483). Washington, DC, US: American Psychological Association. doi:10.1037/14805-029

Kazdin, A. E., & Polster, R. (1973). Intermittent token reinforcement and response maintenance in extinction. *Behavior Therapy*, *4*(3), 386-391. doi:10.1016/S0005-7894(73)80118-2

Keenan, K., Shaw, D., Delliquadri, E., Giovannelli, J., & Walsh, B. (1998). Evidence for the continuity of early problem behaviors: Application of a developmental model. *Journal Of Abnormal Child Psychology*, *26*(6), 441-452. doi:10.1023/A:1022647717926

Keller, F. S., & Schoenfeld, W. N. (2014). *Principles of psychology: A systematic text in the science of behavior* (Vol. 2). BF Skinner Foundation.

Klatt, K. P., & Morris, E. K. (2001). The Premack principle, response deprivation, and establishing operations. *The Behavior Analyst*, *24*(2), 173.

Kochanska, G., Kuczynski, L., & Maguire, M. (1989). Impact of diagnosed depression and self-reported mood on mothers' control strategies: A longitudinal study. *Journal Of Abnormal Child Psychology*, *17*(5), 493-511. doi:10.1007/BF00916509

Koegel, R. L., & Rincover, A. (1977). Research on the difference between generalization and maintenance in extra-therapy responding. *Journal Of Applied Behavior Analysis*, *10*(1), 1-12. doi:10.1901/jaba.1977.10-1

Kuczynski, L., & Kochanska, G. (1990). Development of children's noncompliance strategies from toddlerhood to age 5. *Developmental Psychology*, *26*(3), 398-408. doi:10.1037/0012-1649.26.3.398

Lalli, J. S., Vollmer, T. R., Progar, P. R., Wright, C., Borrero, J., Daniel, D., Barthold, C.H., Tocco, K., & May, W. (1999). Competition between positive and negative reinforcement in the treatment of escape behavior. Journal of Applied Behavior Analysis, 32(3), 285-296.

LeBlanc, L. A., Esch, J., Sidener, T. M., & Firth, A. M. (2006). Behavioral Language Interventions for Children with Autism: Comparing Applied Verbal Behavior and Naturalistic Teaching Approaches. *Analysis Of Verbal Behavior*, *22*49-60.

Leitenberg, H. (1965). Is time-out from positive reinforcement an aversive event? A review of the experimental evidence. *Psychological Bulletin*, *64*(6), 428.

Lerman, D. C., & Vorndran, C. M. (2002). On the status of knowledge for using punishment: Implications for treating behavior disorders. *Journal Of Applied Behavior Analysis*, *35*(4), 431-464. doi:10.1901/jaba.2002.35-431

Loeber, R., & Dishion, T. (1983). Early predictors of male delinquency: A review. *Psychological Bulletin*, *94*(1), 68-99. doi:10.1037/0033-2909.94.1.68

Mace, F. C., & Critchfield, T. S. (2010). Translational research in behavior analysis: Historical traditions and imperative for the future. *Journal of the Experimental Analysis of Behavior*, *93*(3), 293-312.

Maliken, A. C., & Katz, L. F. (2013). Exploring the impact of parental psychopathology and emotion regulation on evidence-based parenting interventions: A transdiagnostic approach to improving treatment effectiveness. *Clinical Child And Family Psychology Review*, *16*(2), 173-186. doi:10.1007/s10567-013-0132-4

McMahon, R. J., & Forehand, R. (2003). Helping the noncompliant child: A clinician's guide to effective parent training. *New York: Guilford*.

McMahon, R. J., Wells, K. C., & Kotler, J. S. (1998). Conduct problems. *Treatment of childhood disorders*, *3*, 137-268.

McNeil, C., & Hembree-Kigin, T. L. (2010). *Parent-child interaction therapy*. Springer Science & Business Media.

Mithaug, D. E., & Mar, D. K. (1980). The relation between choosing and working prevocational tasks in two severely retarded young adults. *Journal Of Applied Behavior Analysis, 13*(1), 177-182. doi:10.1901/jaba.1980.13-177

Nevin, J. A., Grace, R. C., Holland, S., & McLean, A. P. (2001). Variable-ratio versus variable-interval schedules: Response rate, resistance to change, and preference. *Journal of the Experimental Analysis of Behavior, 76*(1), 43-74.

Nevin, J. A., Mandell, C., & Atak, J. R. (1983). The analysis of behavioral momentum. *Journal Of The Experimental Analysis Of Behavior, 39*(1), 49-59. doi:10.1901/jeab.1983.39-49

Ono, K. (1987). Superstitious behavior in humans. *Journal of the experimental analysis of behavior*, *47*(3), 261-271.

Patterson, G. R., & Gullion, M. E. (1968). Living with children: New methods for parents and teachers. Champaign, IL: Research Press.

Patterson, G. R., Shaw, D. A., & Ebner, M. J. (1969). Teachers, peers, and parents as agents of change in the classroom. *Modifying deviant social behaviors in various classroom settings*. *Monograph*, (1), 13-48.

Premack, D. (1959). Toward empirical behavior laws: I. Positive reinforcement. *Psychological Review*, *66*(4), 219-233. doi:10.1037/h0040891

Reimers, T. M., & Wacker, D. P. (1988). Parents' ratings of the acceptability of behavioral treatment recommendations made in an outpatient clinic: A preliminary analysis of the influence of treatment effectiveness. *Behavioral Disorders, 14*(1), 7-15.

Roberts, M. W. (1982). Resistance to timeout: Some normative data. *Behavioral Assessment*, *4*(2), 237-246.

Roberts, M. W. (1988). Enforcing chair timeouts with room timeouts. *Behavior Modification*, *12*(3), 353-370. doi:10.1177/01454455880123003

Rogers-Warren, A., & Warren, S. F. (1980). Mands for verbalization: Facilitating the display of newly trained language in children. *Behavior Modification*, *4*(3), 361-382. doi:10.1177/014544558043006

Schaeffer, R. W. (1967). Positive reinforcement: An extension of the Premack Principle to response chains. *Psychonomic Science*, *8*(1), 31-32.

Shechtman, A. (1970). Psychiatric symptoms observed in normal and disturbed children. *Journal Of Clinical Psychology*, *26*(1), 38-41. doi:10.1002/1097-4679(197001)26:1<38::AID-JCLP2270260108>3.0.CO;2-R

Schroeder, C. S., & Gordon, B. N. (2002). *Assessment and treatment of childhood problems: A clinician's guide*. Guilford Press.

Shriver, M. D., & Allen, K. D. (2008). *Working with parents of noncompliant children: A guide to evidence-based parent training for practitioners and students* (pp. 13-27). Washington, DC, US: American Psychological Association.

Sidman, M. (1989). *Coercion and its fallout*. Boston, MA, US: Authors Cooperative.

Sidman, M. (1993). Reflections on behavior analysis and coercion. *Behavior And Social Issues*, *3*(1-2), 75-85.

Siegel, D. J., & Bryson, T. P. (2014). 'Time-Outs' Are Hurting Your Child. Retrieved from http://time.com/3404701/discipline-time-out-is-not-good/#3404701/discipline-time-out-is-not-good/

Skinner, B. F. (1953). *Science and human behavior*. Simon and Schuster.

Skinner, B. F. (2014). *Verbal behavior*. BF Skinner Foundation.

Stephenson, K. M., & Hanley, G. P. (2010). Preschoolers' compliance with simple instructions: A descriptive and experimental evaluation. *Journal Of Applied Behavior Analysis*, *43*(2), 229-247. doi:10.1901/jaba.2010.43-229

Taplin, P. S., & Reid, J. B. (1977). Changes in parent consequences as a function of family intervention. *Journal Of Consulting And Clinical Psychology*, *45*(6), 973-981. doi:10.1037/0022-006X.45.6.973

Towne, L., & Shavelson, R. J. (Eds.). (2002). *Scientific research in education*. National Academies Press.

Tripodi, T. (1994). *A primer on single-subject design for clinical social workers*. NASW Press.

Turner, H. S., & Watson, T. S. (1999). Consultant's guide for the use of time-out in the preschool and elementary classroom. *Psychology In The Schools*, *36*(2), 135-148. doi:10.1002/(SICI)1520-6807(199903)36:2<135::AID-PITS6>3.0.CO;2-3

Vieth, A., & Rilling, M. (1972). Comparison of time-out and extinction as determinants of behavioral contrast: An analysis of sequential effects. *Psychonomic Science*, *27*(5), 281-282.

Warren, S. F., McQuarter, R. J., & Rogers-Warren, A. K. (1984). The effects of mands and models on the speech of unresponsive language-delayed preschool children. *Journal of Speech and Hearing Disorders*, *49*(1), 43-52.

Warzak, W. J., & Floress, M. T. (2009). Time-out training without put-backs, spanks, or restraint: A brief report of deferred time-out. *Child & Family Behavior Therapy*, *31*(2), 134-143. doi:10.1080/07317100902910570

Watson, P. J., & Workman, E. A. (1981). The non-concurrent multiple baseline across-individuals design: An extension of the traditional multiple baseline design. *Journal Of Behavior Therapy And Experimental Psychiatry*, *12*(3), 257-259. doi:10.1016/0005-7916(81)90055-0

Webster-Stratton, C. (1985). Predictors of treatment outcome in parent training for conduct disordered children. *Behavior Therapy*, *16*(2), 223-243.

Webster-Stratton, C. (1985). The effects of father involvement in parent training for conduct problem children. *Journal of Child Psychology and Psychiatry*, *26*(5), 801-810.

Webster-Stratton, C. (2000). *The incredible years training series*. Washington, DC: US Department of Justice, Office of Justice Programs, Office of Juvenile Justice and Delinquency Prevention.

White, J. L., Moffitt, T. E., Earls, F., & Robins, L. (1990). How early can we tell: Predictors of childhood conduct disorder and adolescent dekazdinquency. *Criminology, 28*, 507.

Wilder, D. A., Saulnier, R., Beavers, G., & Zonneveld, K. (2008). Contingent access to preferred items versus a guided compliance procedure to increase compliance among preschoolers. *Education & Treatment Of Children*, *31*(3), 297-305. doi:10.1353/etc.0.0008

Wolf, M., Risley, T., Johnston, M., Harris, F., & Allen, E. (1967). Application of operant conditioning procedures to the behavior problems of an autistic child: A follow-up and extension. *Behaviour Research and Therapy*, *5*(2), 103-111.

Wruble, M. K., Sheeber, L. B., Sorensen, E. K., Boggs, S. R., & Eyberg, S. (1991). Empirical derivation of child compliance time. *Child & Family Behavior Therapy, 13*(1), 57-68. doi:10.1300/J019v13n01_04

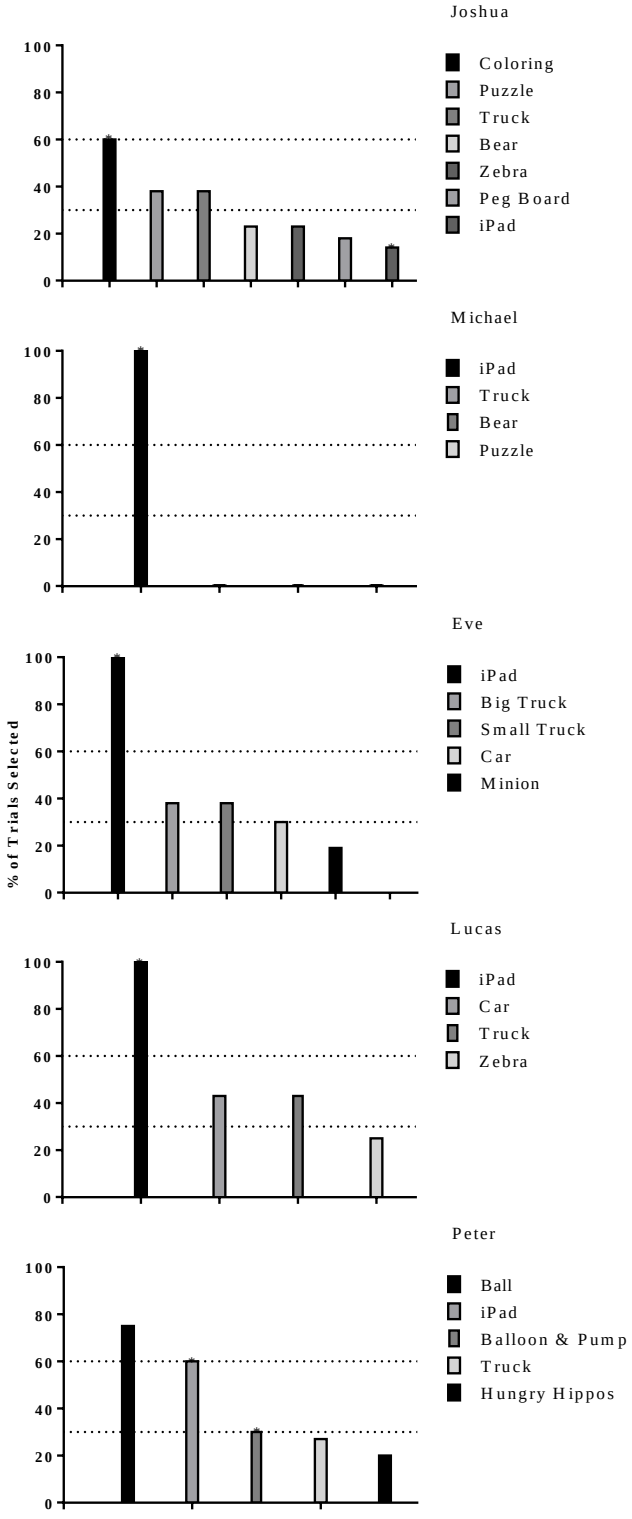

Figure 1. Percentage of trials on which stimuli were selected for each participant. Asterisks indicate stimuli used during Naturalistic Compliance Training (NCT) sessions.

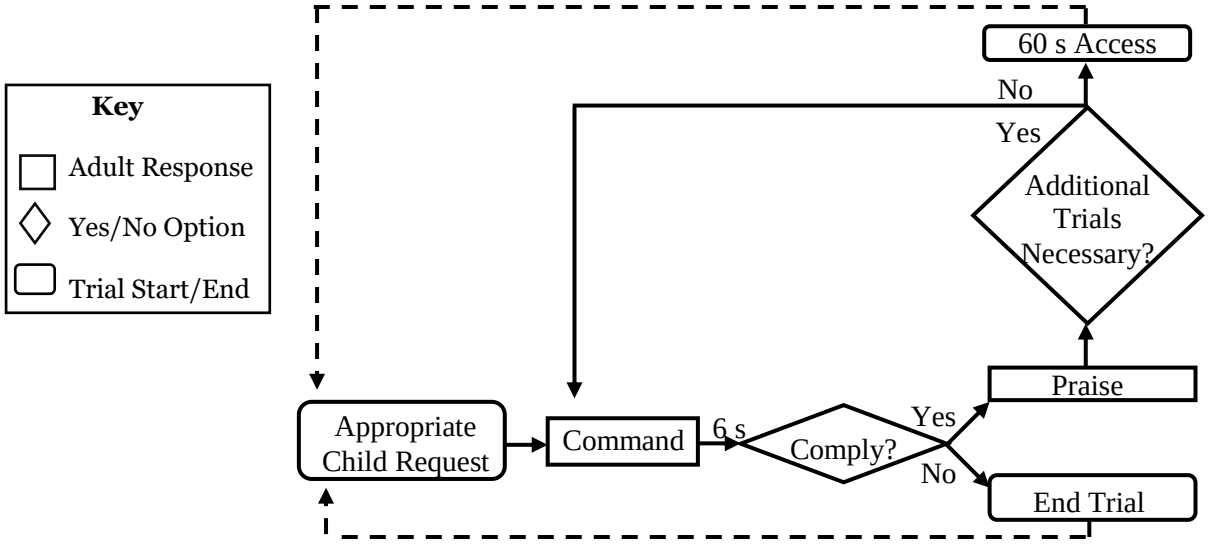

Figure 2. The naturalistic compliance training flow chart.

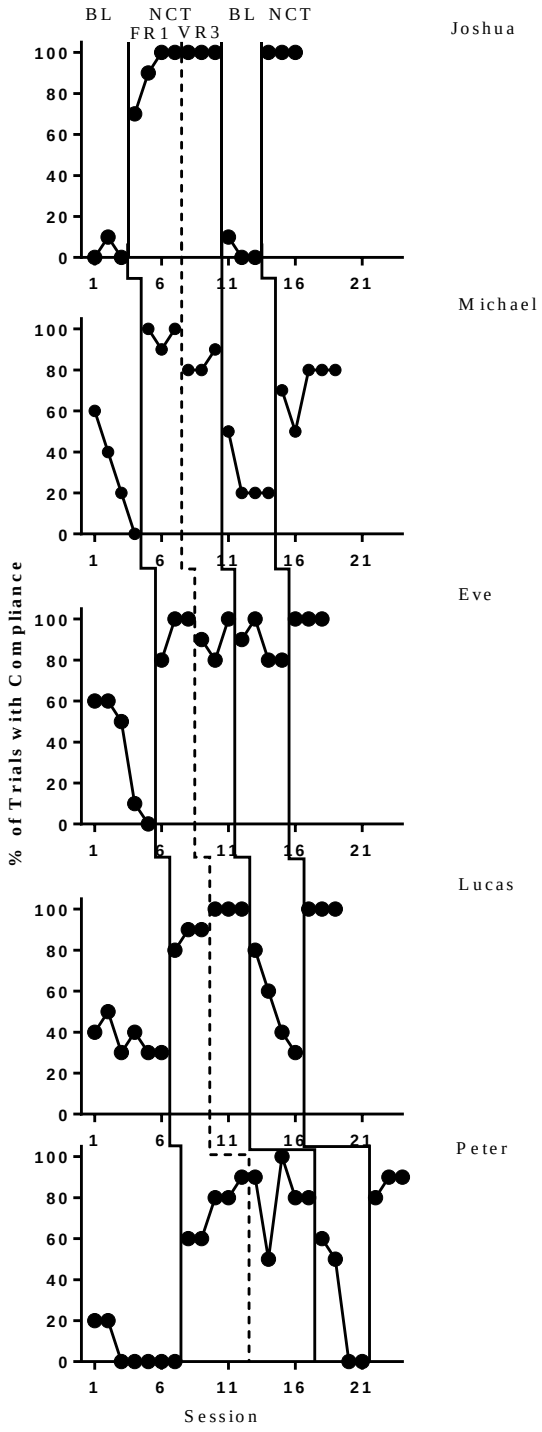

Figure 3. Percentage of trials with compliance during each session across baseline and Naturalistic Compliance Training (NCT) phases of the treatment evaluation for all five participants.

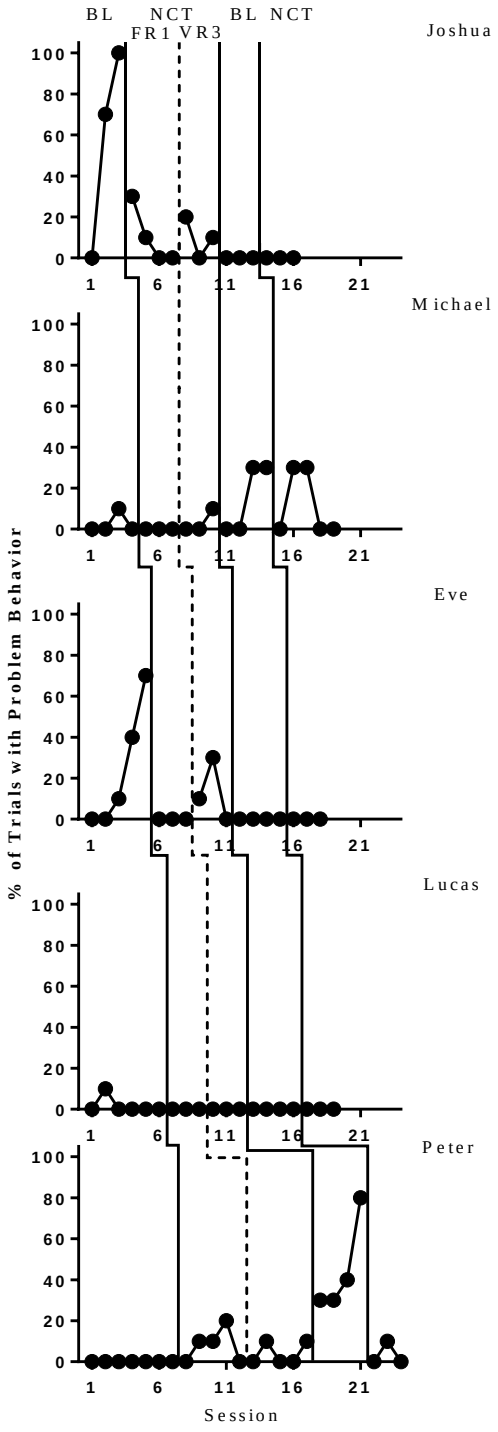

Figure 4. Percentage of trials with problem behavior during each session across baseline and Naturalistic Compliance Training (NCT) phases of the treatment evaluation for all five participants.

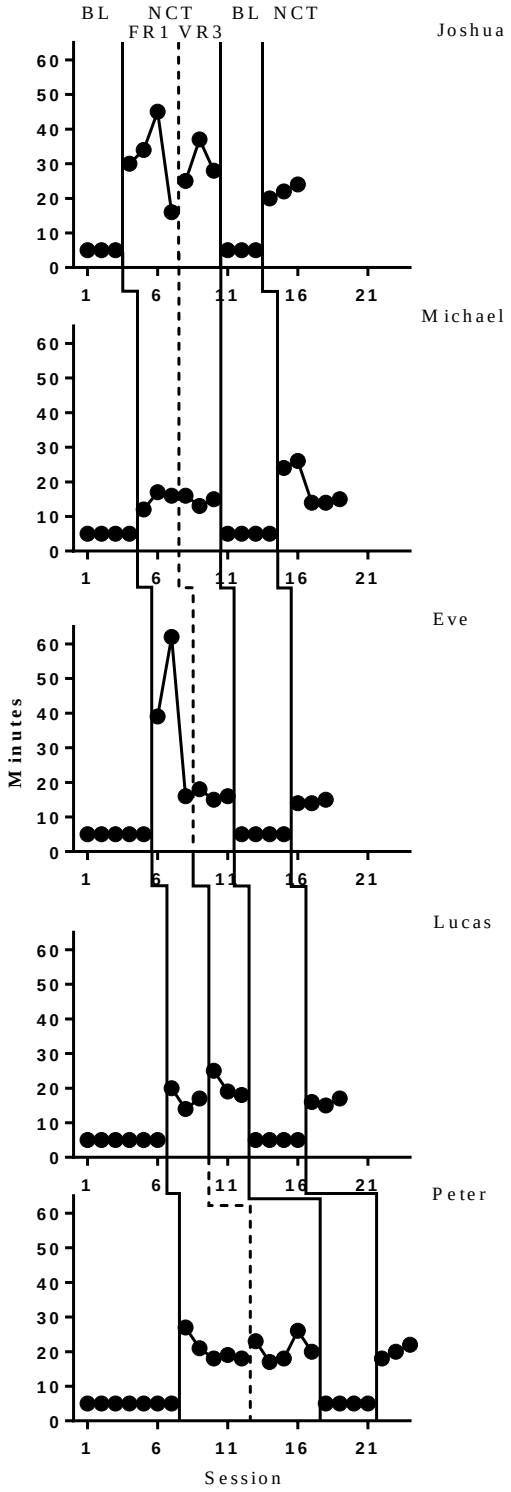

Figure 5. Duration of each session across baseline and Naturalistic Compliance Training (NCT) phases of the treatment evaluation for all five participants.

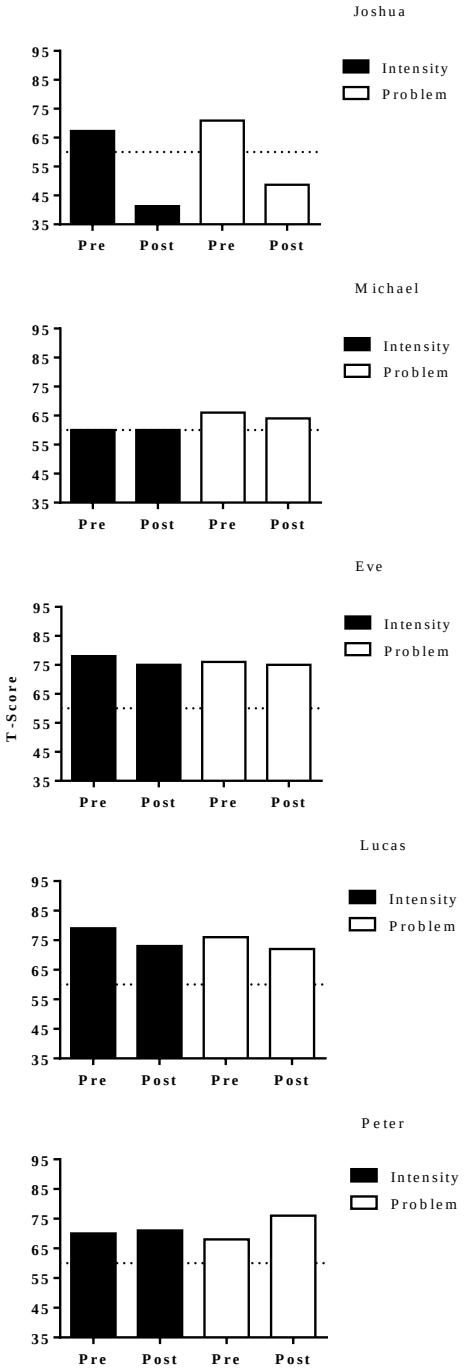

Figure 6. Pre- and Post-ECBI scores for all five participants. Clinical significance cut-off is indicated by the dashed horizontal line.

Child	Session(s) Selected	Restricted Item(s)	Baseline	NCT
Joshua	4	Coloring	0 min/day	0 min/day
	5-8	iPad	N/A	N/A
	9-11, 15-17	Basketball	N/A	N/A
Michael	5-10, 15-16	iPad (Shaun the Sheep)	150 min /day	90 min/day
	17-19	iPad (Shaun the Sheep)		60 min/day
Eve	6-11, 16-18	iPad	120 min/day	90 min/day
Lucas	7-12, 13-19	iPad	N/A	N/A
Peter	8-9	iPad	150 min/day	60 min/day
	10	Play-Dough	N/A	N/A
	11-17, 22-24	iPad		60 min/day
	22-24	Balloon Pump	N/A	N/A

Table 1. List of restricted items for each child, the average daily duration of access during baseline, and maximum daily duration permitted during NCT phases.

Category	Frame	Items
Gross motor	Roll the ____ to me.	Ball, car, truck.
	Put the ____ in the box.	Ball, horse, and so on.
	Clap your hands; wave your hands, touch your toes; stand up.	
Fine motor	Put a ____ in the ____.	Shape and shape sorter; peg and peg board; piece and puzzle.
Self-help	Wipe your hands with the towelette	Moist towelette.
	Zip the zipper up to the top of the vest.	Vest with zipper.
Concept formation	Give me a [color] ____.	Plastic bear, wooden block.
	Put a ____ in my hand.	Animal figure, block, etc.
Physical transition	Put the ____ on [in] the ____.	Any item, shelf, box.
	Give me the ____.	Any item.

Table 2. List of instructional categories, frames, and items used.

Item	Question	*M*	Range
1	I would recommend NCT to other parents.	*4*	3 to 5
2	I would use NCT with my other or future children.	*4.2*	3 to 5
3	The program was effective in improving my child's behavior.	*3*	2 to 5
4	I am happy with the compliance changes that NCT produced.	*3.2*	2 to 5
5	I am happy with the overall behavioral changes that NCT produced.	*3.4*	2 to 5
6	My child will probably take away permanent benefits from NCT.	*3.6*	2 to 5
7	I liked the procedural components of NCT.	*4.2*	4 to 5
8	I found NCT to be reasonable based on the characteristics of my child.	*4.2*	4 to 5
9	NCT would not interfere with my other parenting activities/responsibilities.	*4.4*	4 to 5
10	NCT would be easy to use in my home.	*4.4*	4 to 5
11	NCT would not take up too much of my time each day.	*4.2*	4 to 5
12	NCT would be cost effective to implement in my home.	*4.4*	4 to 5

Table 3. Social acceptability of NCT.

APPENDIX A

Items: Below are a series of phrases that describe children's behavior. Please (1) circle the number describing how often the behavior currently occurs with your child, and (2) circle either "yes" or "no" to indicate whether the behavior is currently a problem.
How often does this occur with your child?

	Never	**Seldom**		**Sometimes**	**Often**		**Always**	**Is this a problem for you?**	
1. Dawdles in getting dressed	1	2	3	4	5	6	7	Yes	No
2. Dawdles or lingers at mealtime	1	2	3	4	5	6	7	Yes	No
3. Has poor table manners	1	2	3	4	5	6	7	Yes	No
4. Refuses to eat food presented	1	2	3	4	5	6	7	Yes	No
5. Refuses to do chores when asked	1	2	3	4	5	6	7	Yes	No
6. Slow in getting ready for bed	1	2	3	4	5	6	7	Yes	No
7. Refuses to go to bed on time	1	2	3	4	5	6	7	Yes	No
8. Does not obey house rules on own	1	2	3	4	5	6	7	Yes	No
9. Refuses to obey until threatened with punishment	1	2	3	4	5	6	7	Yes	No
10. Acts defiant when told to do something	1	2	3	4	5	6	7	Yes	No
11. Argues with parents about rules	1	2	3	4	5	6	7	Yes	No
12. Gets angry when doesn't get own way	1	2	3	4	5	6	7	Yes	No
13. Has temper tantrums	1	2	3	4	5	6	7	Yes	No
14. Sasses adults	1	2	3	4	5	6	7	Yes	No
15. Whines	1	2	3	4	5	6	7	Yes	No
16. Cries easily	1	2	3	4	5	6	7	Yes	No
17. Yells or screams	1	2	3	4	5	6	7	Yes	No

18. Hits parents	1	2	3	4	5	6	7	Yes	No
19. Destroys toys and other projects	1	2	3	4	5	6	7	Yes	No
20. Is careless with toys and other objects	1	2	3	4	5	6	7	Yes	No
21. Steals	1	2	3	4	5	6	7	Yes	No
22. Teases or provokes other children	1	2	3	4	5	6	7	Yes	No
23. Teases or provokes other children	1	2	3	4	5	6	7	Yes	No
24. Verbally fights with friends own age	1	2	3	4	5	6	7	Yes	No
25. Verbally fights with sisters and brothers	1	2	3	4	5	6	7	Yes	No
26. Physically fights with friends own age	1	2	3	4	5	6	7	Yes	No
27. Physically fights with sisters and brothers	1	2	3	4	5	6	7	Yes	No
28. Constantly seeks attention	1	2	3	4	5	6	7	Yes	No
29. Interrupts	1	2	3	4	5	6	7	Yes	No
30. Is easily distracted	1	2	3	4	5	6	7	Yes	No
31. Has short attention span	1	2	3	4	5	6	7	Yes	No
32. Fails to finish tasks or projects	1	2	3	4	5	6	7	Yes	No
33. Has difficulty entertaining self alone	1	2	3	4	5	6	7	Yes	No
34. Has difficulty concentrating on one thing	1	2	3	4	5	6	7	Yes	No
35. Is overactive or restless	1	2	3	4	5	6	7	Yes	No
36. Wets the bed	1	2	3	4	5	6	7	Yes	No

APPENDIX B

Child: _____

Date Range: ____ ____/____ ____/____ ____- ____ ____/____ ____/____ ____

	Example			
Monday	12:00 PM – 2:00 PM 3:00 PM – 3:30 PM			
Total Time				
Tuesday	3:00 PM – 3:30 PM			
Total Time				
Wednesday	1:30 PM – 3:00 PM			
Total Time				
Thursday				
Total Time				
Friday				
Total Time				
Saturday	8:00 AM – 10:00 AM			
Total Time				
Sunday	9:00 AM – 11:30 AM			
Total Time				
Average				
Median				

APPENDIX C

Baseline:

1. Your child will be allowed to be play with any toys and materials for 1 min prior to the start of a session.
2. You will be provided with a list of the 10 commands to be used prior to the start of each session.
3. You will deliver the first command following the 60 s play period.
4. The remainder of the commands on the list provided will be delivered every 30-seconds, one at a time (a timer will be used to track 30-s intervals).
5. Contingent upon compliance (i.e., child independently completes the action described in the command within 6-seconds), you will state "good job."
6. Contingent upon noncompliance (i.e., child fails to independently complete the action described in the command within 6 seconds) or problem behavior (e.g., crying, whining, disruptive behavior), you will engage in planned ignoring (e.g., pretend to engage in another activity, look away).
7. Once all 10 commands have been delivered, you and your child will be provided with a brief break.

NCT (FR):

1. At the start of each session, you will state the following to your child:

   > "If you would like to play with the (preferred item), you have to ask nicely. This includes no hitting or throwing. To get the (preferred item), you will need to follow the direction(s) that I give you, and you will need to do it as quickly as you can. If you follow the instruction, then you can play with the (item) for a little bit. If you do not follow the direction(s), you will not get the (preferred item). If you do not follow the direction(s) quickly enough, but you want to try again, all you have to do is tell me when you're ready, and ask for the (preferred item) again."

2. Once your child appropriately asks for an item, you will respond to your child's request with the following statement: "Yes, you can have the (preferred item), but first I need you to (insert task)."
3. A timer will be set for six s.
4. Contingent upon <u>compliance</u>, you will state "good job" and provide your child with immediate access to the item.
5. A timer will then be set for 60 s.
6. Following a 60 s access period, you will retrieve the item or otherwise reinstate restricted access (e.g., physically block access).
7. Contingent upon <u>noncompliance</u>, you will state at the end of the 6 s interval: "Time is up" and continue restricting access to the requested item.
8. Contingent upon <u>problem behavior</u> at any point during an instructional trial, you will engage in planned ignoring.

NCT (VR)

1. Once your child appropriately asks for an item, you will respond to your child's request with the following statement: "Yes, you can have the (preferred item), but first I need you to do _____ things. The first thing is to_____").
2. A timer will be reset to 6 s following the delivery of each sequential command.

APPENDIX D

Command #	**Instructional Frame/Item**
Gross Motor	
1	Roll me the *ball.*
2	Roll me the *car*.
3	Roll me the *truck.*
4	Put the *ball* in the box.
5	Put the *horse* in the box.
6	Put the *truck in the box*.
7	Clap your hands.
8	Wave your hands.
9	Touch your toes.
10	Stand up.
Fine Motor	
11	Put a shape in the shape sorter.
12	Put a peg in the peg board.
13	Put a piece in the puzzle.
Self-Help	
14	Wipe your hands with the towelette.
15	Zip the zipper up to the top of the vest.
Concept Formation	
16	Give me the [color] animal figure.
17	Give me the [color] wooden block.
18	Put an animal figure in my hand.
19	Put a block in my hand.
20	Put the ball in my hand.
21	Put the car in my hand.
22	Put the truck in my hand.
23	Put the horse in my hand.
Physical Transition	
24	Put the [any item] on the shelf.
25	Give me the [any item].

APPENDIX E

Date: ____ ____/____ ____/____ ____ Child #: _____

Time: _____ Session #:_____

Trial:	**Command Delivered (#):**	**Compliance**	**Noncompliance**	**Problem Behavior**
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
% of Trials:				

Definitions:

Compliance: Child independently completes the action described in the command within 6-seconds.

Noncompliance: Child fails to independently complete the action described in the command within 6-seconds.

Problem Behavior: Child engages in aggression (e.g., hitting, kicking, or biting others), self-injury (e.g., head-banging, biting self), property disruption (e.g., throwing toys), whining crying, or saying "no" following the delivery the command.

APPENDIX F

Date: ____ ____/____ ____/____ ____ Child #: _____ Session #: _____

1. The child was allowed to play with materials for 1 min prior to the start of the session.

Yes	
No	

2. The child was provided with the verbal rule prior to the start of the NCT session.

Yes	
No	

3. The parent delivered the command from a standing or seated position, at a distance of at least 1 m from the child.

Trial	1	2	3	4	5	6	7	8	9	10
Yes										
No										

4. The parent delivered the correct number of commands.

Trial	1	2	3	4	5	6	7	8	9	10
Yes										
No										

5. The parent stated the command only once.

Trial	1	2	3	4	5	6	7	8	9	10
Yes										
No										

6. The parent withheld vocal attention in between trials.

Trial	1	2	3	4	5	6	7	8	9	10
Yes										
No										

7. The parent said “time is up” or “thank you” at the end of the trial.

Trial	1	2	3	4	5	6	7	8	9	10
Yes										
No										

8. Access to the preferred item was withheld or re-restricted after 1 min of access.

Trial	1	2	3	4	5	6	7	8	9	10
Yes										
No										

APPENDIX H

Child/Parent: _____ Date: ____ ____/____ ____/____ ____

Circle the number reflecting your level of agreement for each statement.

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. I would recommend NCT to other parents.	1	2	3	4	5
2. I would use NCT with my other or future children.	1	2	3	4	5
3. The program was effective in improving my child's behavior.	1	2	3	4	5
4. I am happy with the compliance changes that NCT produced.	1	2	3	4	5
5. I am happy with the overall behavioral changes that NCT produced.	1	2	3	4	5
6. My child will probably take away permanent benefits from NCT.	1	2	3	4	5
7. I liked the procedural components of NCT.	1	2	3	4	5
8. I found NCT to be reasonable based on the characteristics of my child.	1	2	3	4	5
9. NCT would not interfere with my other parenting activities/responsibilities.	1	2	3	4	5
10. NCT would be easy to use in my home.	1	2	3	4	5
11. NCT would not take up too much of my time each day.	1	2	3	4	5
12. NCT would be cost effective to implement in my home.	1	2	3	4	5

Comments: