

EFFECTIVENESS OF AN ENHANCED CHOICE MODEL (ECM) WITHIN A DIFFERENTIAL
REINFORCEMENT OF ALTERNATIVE (DRA) BEHAVIOR TREATMENT

by

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(Under the Direction of Joel Ringdahl)

ABSTRACT

The enhanced-choice model (ECM; Rajaraman et al., 2021) has been hypothesized as one way to promote assent in behavior analytic practices. Previous studies have used ECM within skills-based treatment packages (Metras et al., 2023; Rajaraman et al., 2021; Staubitz et al., 2022) and replicated effectiveness in reducing target behavior and increasing task completion amongst participants. This study evaluates the effectiveness of ECM within a differential reinforcement of alternative (DRA) behavior treatment package to reduce target behavior and increase task completion. One participant was included with autism spectrum disorder, minimal vocal-verbal abilities, and engaged in aggression and disruption. Results demonstrate that ECM was effective at reducing target behavior but ineffective at increasing task completion and allocating to majority of time spent in treatment. Study outcomes are indicative of requiring further research in evaluating ECM in other treatment packages, such as DRA. Limitations of this study and future research opportunities are discussed.

INDEX WORDS: Assent, applied behavior analysis, differential reinforcement of alternative behavior, enhanced choice model

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CHAPTER 1

INTRODUCTION

Social validity in Applied Behavior Analysis (ABA) entails programming for the needs and goals of our clients and their stakeholders within clinical services, which directly coincides with the Ethics Code for Behavior Analysts (Code 2.01 Providing Effective Treatment; BACB, 2020). Social validity refers to the extent to which targeted behaviors are appropriate, intervention procedures are acceptable and important, and socially significant changes in target and collateral behaviors are produced (Huntington et al., 2022; Wolf, 1978). Oftentimes, measures of social validity are based on the perspective of stakeholders such as caregivers, teachers, and immediate members of the community, but not directly the recipient of services (Huntington et al., 2022.) By incorporating the perspectives of clients and stakeholders, behavior analysts may avoid historical criticisms which surround programming that does not promote decision-making or applicability to the real world (Leaf et al., 2021). It should also be noted that the BACB Ethics Code begins by describing four foundational principles, two of which are Benefit Others and Treat Others with Compassion, Dignity, and Respect. In combination, these two principles describe protecting the welfare and rights of clients, respecting and actively promoting clients' self-determination to the best of their abilities, and acknowledging that personal choice in service delivery is important. All of which, are described to emphasize the importance of assent in practice (BACB, 2020).

Consent and assent are important to the social validity of clinical practice. Consent is permission given by an individual with the legal right to consent before participating in services or research (BACB, 2020). Factors such as mental capacity (i.e., sound mind and legal age), voluntariness to give consent freely and without coercion, and the knowledge to understand what they are consenting to, allow participants the legal right to consent (Graber & Maguire, 2023). Assent, on the other hand, is an agreement to participate in treatment intervention or research by a person who is not legally able to provide informed consent (Morris et al., 2021). According to the BACB Ethics Code (2020), assent is

vocal or nonvocal behavior that can be taken to indicate willingness to participate in research or behavioral services by individuals who cannot provide informed consent. Smiling, active engagement or participation in the current activity, shaking their head yes, and statements such as, “yes” or “I’m ready” are all examples of assent that have been observed in practice (Breaux & Smith, 2023). In some cases, it is not possible to obtain consent from an individual and assent may be waived in circumstances wherein the individual’s capacity to understand is deemed too limited for the provision of assent. Assent is most relevant to individuals under the age of 18. However, when individuals, regardless of age, have an intellectual impairment that prevents their understanding of abstract notions, assent may not be obtained. When consent and assent are waived, an individual’s caregiver provides consent on their behalf (Flowers & Dawes, 2023), ultimately eliminating the client’s personal choice.

Assent is particularly relevant to ABA in that behavior analysts primarily serve autistic individuals. More specifically, 74.74% of BACB certificants report working with this population (Behavior Analyst Certification Board, 2024). Autistic individuals receiving ABA services often present with co-occurring intellectual disabilities and/or language impairments, which inhibit their ability to provide consent (Etyemez et al., 2022), meaning it is obtained via a parent or legal representative. Thus, there is need for procedures to obtain assent with the population behavior analysts interface with each day. Given the relevance of assent to our clinical practice, it is a stated priority within our Code of Conduct as behavior analysts. Namely, obtaining assent is an ethical duty of behavior analysts and is encouraged, when conditions are applicable and relevant, more specifically, required by funders or agencies (BACB, 2020). Beyond an ethical imperative, assent may afford clinical benefits such as building rapport with clients (Flowers & Dawes, 2023) and lowering the risk of exploitation (Snyder & Barnett, 2006). Despite its relevance, assent can be difficult to translate into clinical practice. Factors such as limited strategies and research (Morris et al., 2021) or lack of considerations surrounding ethical guidelines, culture, and context make it difficult to do so (Beaulieu & Jimenez-Gomez, 2022). Translating assent into clinical practice with autistic individuals may be especially difficult in light of co-occurring language impairments that impede clear vocal and nonvocal communication as indicators of assent.

Further, assent can be difficult to program for in cases of addressing externalizing behavior, such as aggression and self-injury. These behaviors may pose safety concerns that limit when or how providing choice to participate in treatment is appropriate and safe to do so. It is possible that indicators of assent withdrawal or dissent may be related to presenting concerns; therefore, may be clinically contraindicated to withdrawing treatment contingent on escape-maintained behavior. Flowers et al. (2006) concluded that research emphasizing the unique needs of learners who exhibit escape-maintained behaviors should be a goal in creating comprehensive assent practices in behavior analytic therapy.

Despite these complexities, minimal guidance exists for behavior analysts on how to effectively plan for assent across clients with varying skill and behavior repertoires. Morris et al. (2021) conducted a literature review to identify the strategies used to obtain assent in behavior analytic research. Ultimately, they found that there is little evidence *if* assent is being obtained and, when it is, *how* assent is being obtained. Morris and colleagues (2021) included 16 different journals that met inclusion criteria of: containing the word “assent” and being accessible via Google Scholar. From there, each article was coded for variables that included the author’s description of the procedures used to obtain assent. Four categories were created and are described as follows: “waived” meant articles stated that assent was not required for some of the participants, “no detail” meant that assent was obtained but no further detail was provided, “minimal detail” meant that assent was obtained written or verbally but no further detail was provided, and “detailed” meant specific information was provided that described how assent was obtained. Results showed that of the 16 journals, there were 187 articles coded, and 7 (4%) were coded “waived,” 124 (66%) were coded “no detail,” 33 (18%) were coded “minimal detail,” and 28 (15%) were coded “detailed” (Morris et al., 2021). In a follow up to this review, Jasperse and colleagues (2023) surveyed 123 researchers in the field regarding consent and assent processes used in behavior analytic research. Like Morris and colleagues (2021), they found that most researchers report they do not describe assent procedures in their scholarly products. There is critical need for descriptions of how assent may be effectively obtained for individuals with limited language abilities and co-occurring externalizing behavior.

One promising approach to intervention design is the “Enhanced-Choice Model” (ECM; Rajaraman et al., 2021). ECM uses concurrent reinforcement schedules to program continuous opportunities that a recipient of services may opt in and out of treatment contingencies as a proxy for assent. The main procedural components of ECM are not novel to research but rather expand the already vast literature of concurrent schedules of reinforcement and differential reinforcement of alternative (DRA) behavior, which include several studies that show such an arrangement can be successful in reducing target behavior and increasing task completion (Hoch et al., 2002; Lalli et al., 1999; Piazza et al., 1997; Slocum et al., 2015). ECM expands these lines of research by offering a behavioral application of concurrent reinforcement to permit evaluation of assent. Specifically, ECM uses behavioral indicators of opting in/out of treatment, thereby potentially addressing concerns when a service recipient has language impairments. It has also shown promise for use with individuals with externalizing behavior (Metras et al., 2023; Rajaraman et al., 2021; Staubitz et al., 2022).

Rajaraman and colleagues (2021) designed ECM to offer choice-making opportunities within skills-based treatment (SBT; a specific arrangement of differential reinforcement) to minimize escalation of dangerous behavior. During ECM, therapists present concurrent, continuously available options to (a) enter practice (or treatment) context, (b) enter “hang-out” space, or (c) leave the clinic altogether. Each context held a different set of contingencies but allowed the individual to freely choose between contexts. In the treatment context, therapists presented skills-based treatment (SBT) to the participant. The hangout context was a room in which participants could enter and exit freely, non-contingent on targeted behavior. Individuals could take their preferred items into the space, while receiving therapist attention and avoid receiving materials or instructions related to the treatment context. The last context included the ability to leave the clinic altogether, which was previously agreed upon with parents and determined that no negotiations to stay would ensue.

In the first evaluation of ECM, researchers conducted two studies, in Study 1 participants included three individuals (ages 4-9) diagnosed with attention deficit/hyperactivity disorder (ADHD), generalized anxiety disorder, and ASD. Each of the participants were referred to a clinic for behavior

reduction. Behavior function for each participant was determined via the Interview-Informed Synthesized Contingency Analysis (IISCA), showing each to have a combined escape, tangible, and attention function. During the treatment evaluation, researchers measured levels of targeted behavior as well as time spent in the treatment context relative to other contexts (i.e., hangout, home). Study results showed that participant 1 elected to participate in treatment for 88% of the time, participant 2 elected to treatment for 99% of the time, and participant 3 elected to treatment for 92% of the time, averaging 93% for all participants. Additionally, target behaviors were divided into dangerous and nondangerous behaviors, throughout all phases of treatment (i.e., functional communication training (FCT), tolerance response training and contextually appropriate behavior (CAB) chaining). All participants displayed near zero levels of dangerous behaviors and low rates of nondangerous behaviors (less than 0.5 behaviors per minute). In Study 2, participants included two individuals (ages 8-9) diagnosed with ASD, ADHD, and emotional disturbance (ED). Both participants attended a specialized public school serving children with special needs and sought out services to provide assessment and treatment for reduction in dangerous behavior. Behavior function was determined via the IISCA, showing combined escape, tangible, and attention functions. Study 2 was identical to Study 1, except that there was no other room designated as the hangout context, rather a taped off portion of the floor indicating a “hangout” space. Results showed that Participant 1 elected to participate in treatment 99% of the time when ECM was implemented, though asked to terminate the visit from researchers and return to his regularly scheduled classroom activities five times. Participant 2 never used the hangout space and never asked to leave, thus electing to participate in treatment 100% of the time. Target behaviors were recorded the same, and results indicated that Participant 1 engaged in dangerous behavior a total of three times during treatment and Participant 2 never engaged in dangerous behavior. Additionally, both participants engaged in nondangerous behaviors toward the end of complex FCR and during CAB chaining but noted that all behavior was eliminated by the conclusion of treatment. These data suggest ECM was effective at reducing targeted externalizing behavior while also permitting the opportunity to opt in and out of treatment. Further, despite having the continuously available options to consume reinforcers noncontingently or to leave the clinic, all

individuals chose to experience differential reinforcement in the practice context for most of the time (Rajaraman et al., 2021). Therefore, this may be a promising treatment arrangement even when an individual presents with escape-maintained behavior.

In a follow-up study, Staubitz et al. (2022), published a systematic replication in a public-school setting rather than a clinical setting. Participants in this study included three vocal-verbal male students (ages 7-9 years old), diagnosed with ED, ADHD, language impairment, and speech impairment. The participants engaged in target behaviors such as property destruction, physical aggression, elopement, self-injurious behavior, and verbal aggression. Again, ECM demonstrated effectiveness in reducing target behavior and increasing task completion. Results showed targeted behavior for all participants remained low relative to baseline levels, and participants largely selected the treatment context (participant 1 elected to practice for 78.6% of the time; Participant two elected to practice for 88% of the time; participant 3 elected to practice for 94.8% of the time). Many findings were consistent with Rajaraman et al. (2021), though researchers found that as response requirements increased, allocation to alternative contexts (i.e., enter hang out or leave) ensued.

Most recently, a third study was published by Metras et al. (2023) in which one of three participants experienced ECM as an extension to their study on distance-based collaborative consulting for assessing and treating challenging behavior. This participant was a 7-year-old male, with an ASD diagnosis, who spoke in full, complete sentences. The participant engaged in self-injurious behavior, aggression, and disruption. Upon observing an increase in target behavior during probe sessions, ECM was implemented. Results showed that the participant utilized the hangout context during 14 out of 19 visits and the average time spent in the hangout context was 6 minutes, which equated to approximately 10% of each visit. Ultimately, findings were again consistent with previous studies in that target behavior decreased and task completion increased relative to baseline levels.

While ECM seems promising, there are several limitations that warrant continued research on this topic. First, there are only three published studies using this model, meaning that there is little evidence of replication, internal and external validity. Second, participant characteristics within existing studies

included participants with vocal-verbal language repertoires. Rajaraman and colleagues (2021) included three participants with developmentally appropriate language levels, Staubitz et al. (2022) included three vocal-verbal male students, and Metras et al. (2023) included a participant that spoke in full, complete sentences. Verbal statements of contingencies were used in all studies, meaning it is unclear whether the different contingencies of each context would be discriminable across all language profiles. This is an important limitation to address, because as earlier stated, behavior analysts serve a vast population with intellectual disabilities and/or language impairments (Etyemez et al., 2022). Third, ECM has only been used with practical functional assessment (PFA) and SBT procedures. PFA is an iteration of a functional analysis, wherein researchers take hypothesized reinforcers and test them against a control condition (Hanley, 2014). The interview-informed, synthesized contingency analysis (IISCA) is the term given to the PFA model based on defining procedural features (Jessel et al., 2016). By combining hypothesized reinforcers within the assessment, the role of escape – independent from other functions – is unclear. Replication is needed among participants with a clearly confirmed escape function, especially considering findings that participants primarily opt into treatment despite the presence of potentially aversive stimuli that should establish escape as a reinforcer. SBT teaches various communication targets and is based on intermittent and unpredictable reinforcement. SBT in published studies included functional communication training (FCT), tolerance responses, and CABs. Therefore, it is also of question as to whether this model will work with other treatment packages, such as traditional DRA. That is, DRA with an extinction component and a fixed ratio schedule of reinforcement. Whereas SBT teaches a mand through which one could obtain multiple reinforcers, DRA on the other hand, individualizes mands for one reinforcer at a given time and often uses more predictable schedules of reinforcement early in treatment.

It is important to evaluate ECM with other treatment arrangements to consider if this concurrent, continuous option to opt out of treatment can translate to other treatment packages in the field. In doing so, researchers may better serve their clients by promoting assent and consider clients' perspectives during interventions. The purpose of this study was to compare DRA to DRA+ECM for an individual

with escape-maintained behavior and minimal vocal-verbal communication. More specifically, this study evaluated if, relative to baseline and DRA without ECM, whether ECM (1) decreased targeted externalizing behavior and (2) increased task completion. Researchers hypothesized that ECM would be effective in decreasing targeted behavior as a concurrently and continuously option was readily available to avoid aversive tasks. More specifically, researchers hypothesized that the ECM context would have similar rates of targeted behaviors as the DRA context when compared to baseline levels. Researchers also hypothesized that task completion may not increase during treatment with DRA+ECM, contrary to previous studies, due to the contrast in population and targeted aims of tasks. Irrespective of hypotheses, findings of this study will aid in addressing whether the enhanced choice model is a broadly useful schedule arrangement to translate assent and social validity into clinical practice. Moreover, findings will provide suggestions for future research opportunities.

CHAPTER 2

METHODS

Settings and Materials

This study took place at a large academic-medical center for the assessment and treatment of behavior disorders among individuals with developmental disabilities. Sessions were conducted in various 3x4 m rooms. Room 1 was designated as the “DRA+ECM” space and was indicated with a blue stimulus card on the door. Within this room, there was a table, two chairs and a “hang-out space,” indicated in the right corner of the room by blue tape. In the hang-out space, there was a bean bag provided for comfortable seating and a laminated sign taped on the wall that read “Hangout Space.” This room also included instructional materials based on the type of tasks to be presented (i.e., academic materials or daily living activity materials) and the preferred item (i.e., tablet) to the participant. Room 2 was designated as the “DRA” space and was indicated with a green stimulus card on the door. This room was set up similar to the first room, but without the hang-out space (i.e., blue tape, bean bag, and sign). Additionally, the observation rooms, adjacent to the session rooms, were housed with an intercom system that allowed the team to speak with one another regarding session start and end, and a secure laptop that was used to record sessions using a secure recording system.

It is important to note that the current study did not include a third context, such as leaving the clinic or returning to the classroom (Rajaraman et al., 2021; Staubitz et al., 2022). In the context in which this study was conducted, researchers believe this option to be clinically contraindicated; moreover, exclusion of this option from ECM has proven to sustain effectiveness in decreasing target behavior and increasing task completion (Metras et al., 2023; Rajaraman et al., 2021).

Participant

A total of three participants were recruited through the academic-medical center’s complex behavior support program. Initially, two participants were consented to the study. Shortly after, the

researcher began conducting a multi-element functional analysis, one participant at a time. The assessment process was extended due to the inability to clearly hypothesize an escape function. Ultimately, their caregiver reported that they could not maintain the time commitment and dropped out of the study.

A third participant, Zane, was thereafter recruited. This participant was receiving services for the behavioral concerns of aggression and disruption. Services included a caregiver training format, once a week for 10-12 weeks, wherein caregiver was taught to conduct a latency-based functional analysis, functional communication training, and multiple schedule sessions. Intervention focused primarily on reducing target behavior during tangible restriction and denied mands for highly preferred locations. By the end of the admission, clinicians were incorporating minimal demands during extinction intervals of multiple schedule sessions. Upon completing their admission within the program, caregiver agreed to consent to their child to the present study. This individual met the following criteria to be included in the study: an escape function, as determined by a functional analysis (See Pre-Study Procedures below). Zane (12-year-old Asian male) had a diagnosis of autism spectrum disorder and had minimal vocal-verbal abilities, speaking in 1- to 2-word phrases. Zane engaged in aggression and disruption, both of which are operationally defined in Table 1. Primary caregiver reported that Zane's target behavior caused physical injury to others such as redness and bruising, limited the opportunities to participate in events or visit places outside of the home, and impacted his ability to be independent in various tasks. Therefore, participation in this study helped to address such concerns by providing an opportunity to opt out of aversive tasks in the absence of targeted externalizing behavior.

Dependent Measures

Researchers collected data for the following dependent measures: rate of targeted behavior, duration of time participant spent in treatment context, duration of time participant spent in hang out context, rate of instructional tasks completed, and participant affect (via indices of happiness and unhappiness), across phases of the study as relevant (see Table 1 for operational definitions). Rate was calculated for targeted behavior by dividing the total count of target behavior (aggression and disruption)

by session duration. Rate for tasks completed was calculated by dividing the number of tasks completed by the session duration. Participant affect was calculated by dividing the number of each rating individually (happy, neutral, and sad) by the total number of ratings scored. Data was collected utilizing clickers and a timer, recorded on paper data sheets (Appendix B) and all sessions were video recorded using a secure online platform.

Experimental Design

The study design included an alternating treatments design embedded within a reversal design. Specifically, the alternating treatment design allowed for a comparison of DRA and DRA+ECM. The effectiveness of each intervention relative to baseline was evaluated within the reversal design component. Overall, the design allowed for an evaluation of the efficacy of ECM and relative to the reduction of target behavior and increase in task completion.

Pre-Study Procedures

Indices of Happiness and Unhappiness Questionnaire

Zane's caregiver, who was most familiar with the participant, completed the Indices of Happiness and Unhappiness Questionnaire (Ramey et al., 2022) after the consent process was complete. The questionnaire contains four, open-ended questions about responses observed when the participant is happy and unhappy, as well as what types of settings or situations the participant feels most happy or unhappy (Appendix A). This measure was used to operationally define idiosyncratic mood indicators of the participant (Ramey et al., 2022), which allowed the researcher to measure happiness and unhappiness throughout the study and compare affect across and between phases.

Functional Analysis

Therapist conducted a multi-element functional analysis, following procedures described by Iwata et al. (1982/1994), with the inclusion of a tangible condition. Therefore, conditions consisted of control, attention, escape, and tangible. All sessions were 10 minutes in length, conducted by a certified registered behavior technician (RBT), and therapist remained in the room with Zane during all conditions. During the control condition, Zane was allowed access to highly preferred (i.e., iPad) and moderately

preferred items (i.e., plastic fruits and vegetables), therapist's attention every 10 seconds, all in the absence of demands. All target behavior and other inappropriate behavior (e.g., screaming) was ignored. Prior to the attention condition, therapist provided Zane high-quality attention for 2 minutes. The attention condition began, after therapist verbally stated, "I've got work to do now but you can hang out by yourself" and withdrew her attention (i.e., walked across the room and pretended to engage in reading a book). Contingent on target behavior, therapist provided a reprimand such as "don't do that" before withdrawing their attention again. During the escape condition, therapist placed instructional tasks consistently and used verbal paced prompting (i.e., nag prompting) every 5-10 seconds until Zane cooperated with the task. Contingent on target behavior, Zane received a break from instruction with his iPad for 30 seconds. After the break, therapist stated, "my turn with your items" and again, placed instructional tasks. Completion of task did not result in reinforcement. Tasks completed during escape sessions were selected based on caregiver and clinician report of specifics that evoked target behavior at home and during previous appointments. Academic and daily living tasks such as counting, single digit addition without carrying, tracing various lines and shapes, wiping/cleaning surfaces, picking up toys, picking up laundry, and picking up trash were instructionally placed. Prior to the tangible condition, Zane was given access to his iPad for two minutes. The tangible condition began, after therapist stated, "my turn with your items" and removed access to the iPad. Contingent on target behavior, Zane was given access to his iPad for 30 seconds and procedures repeated once the 30 seconds ended.

Study Procedures

Baseline

Baseline sessions were conducted in both contexts (i.e., Rooms 1 and 2), randomized across sessions and were 10 min in length. The first session of the day began with 2 min of pre-exposure with Zane's highly preferred items, along with therapist attention provided on a fixed interval (10 seconds) schedule of reinforcement. When 2 min elapsed, therapist restricted all items and attention and stated, "my turn with your items, it's time to do work." Therapist then placed instructional tasks until the participant engaged in any instance of target behavior (i.e., aggression or disruption). Upon the first

instance of target behavior, the therapist stated, “you can have a break,” and immediately stopped presenting instructional tasks and materials. The participant then received a 30-s break with their highly preferred item and attention from the therapist continued every 10 s. If other behaviors occurred during the session (e.g., yelling, cursing) those were ignored by therapist and procedures continued as planned. Contingent on cooperating with a task, the therapist provided praise and then immediately provided the next instruction. If multiple sessions were conducted in a day, the participant was given 5 min of access to reinforcement between sessions.

Differential reinforcement of alternative behavior

Room 2 (“DRA”) was utilized for these sessions, and all sessions were 10 min in length. At the beginning of the session, the therapist oriented Zane to the colored stimulus card on the door by pointing and stated the following contingency, “We are going to do work in here, and hang-out is no longer an option.” After the contingency was given, 2 min of pre-exposure with Zane’s highly preferred item, along with therapist attention began. When 2 min elapsed, therapist restricted all items and attention and stated, “my turn with your items, it’s time to do work.” Therapist then placed an instructional task and upon completion of the task, Zane received a 30-s break and attention from therapist every 10 s. If Zane were to engage in any instance of target behavior or non-targeted behavior, protective strategies were utilized to keep all parties safe and verbal paced prompting was implemented until the task was completed. Once the task was completed, Zane then received a 30-s break with highly preferred items and attention from the therapist. These procedures continued for the entire 10-min session. If multiple sessions were conducted in a day, Zane was given 5 min of access to reinforcement between sessions.

Enhanced choice model + Differential reinforcement of alternative behavior

Room one (“DRA+ECM”) was utilized for these sessions and all sessions were 10 minutes in duration. At the beginning of the session, the therapist oriented Zane to the colored stimulus card on the door by pointing and stating the following contingencies, “You can choose to do work, or you can choose to enter the hang-out space. You are allowed to go in and out of the hang-out space whenever you want,

and I will not ask you to do anything while you are there.” Procedures were implemented the same way as described above if Zane was in the treatment context.

If at any point, Zane walked to the hang-out space or indicated that they wanted to hang-out (e.g., stated “break,” pointed to the hang out area), the therapist immediately stopped presenting instructions. While in the hang-out space, the therapist did not present instructional tasks, speak about work materials or speak about possible reinforcers earned from treatment. Therapist provided attention every 10 s as to maintain consistency across contexts, as well as provided a reminder every 5 min of the contingencies, such as “you can continue to be in the hangout space, or you can come out and do work.” Similar to entering the hang-out space, if Zane walked back to the treatment area or asked to go back to work, therapist would oblige, and DRA procedures described above would continue. Both spaces were continuously and concurrently available for the session duration. If multiple sessions were conducted in a day, Zane was given 5 minutes of access to reinforcement between sessions.

Data Integrity

An independent observer watched 89.7% of sessions retrospectively via the secure recording platform and collected data on dependent variables, to collect interobserver agreement (IOA) data. IOA for target behavior, task completion, and time in treatment was calculated by dividing the smaller count by the larger count and multiplying by 100 to create a percentage. Mean IOA for targeted behavior was 91.1% (range = 50% - 100%). Mean IOA for task completion was 92.3% (range= 68% - 100%). Mean IOA for time in treatment was 98.6% (range = 80% - 100%).

Participant’s affect IOA was calculated by dividing number of agreements by total number of scored sessions. Agreement for baseline procedures was (85.7%), DRA procedures was (62.5%), DRA + ECM procedures was (62.5%).

Procedural Fidelity

An independent observer scored procedural fidelity for 89.7% of sessions retrospectively using a checklist researchers developed (Appendix C). The checklist outlined specific components for each

context (i.e., DRA and DRA+ECM) related to the procedural protocol. During all sessions scored, implementer(s) maintained 100% procedural fidelity.

CHAPTER 3

RESULTS

Figure 1 displays results of Zane's multi-element functional analysis (Iwata 1982/1994). All test conditions (attention, tangible, and escape) were elevated when compared to the control condition (toy play). The escape condition displays an increasing trend, whereas the tangible and attention conditions display a decreasing trend overall. Additionally, the highest rate of target behavior was observed in the escape condition (10.2 responses per minute). The results of the functional analysis indicated attention, tangible, and escape functions. The escape function was relevant to the current investigation.

Figure 2 includes a three-panel graph that displays rate of target behavior (Panel 1), rate of tasks completed (Panel 2), and percentage of time spent in treatment (Panel 3), across conditions. During the initial baseline phase, Zane engaged in elevated rates of target behavior (range = 0.5-1.2 responses per minute; average = 0.96), moderately completed tasks (range = 1.5-4.1 responses per minute; average = 2.6), and spent 100% of time in treatment. It should be noted that percentage of time in treatment is 100% due to the inability to opt out (i.e., the hang out space was not honored outside of DRA+ECM sessions).

During the initial intervention phase there was an immediate decrease in rate and variability of targeted behavior during DRA+ECM but not DRA. While in the DRA context Zane engaged in the following rates of targeted behavior (range = 0.2-1.0 responses per minute; average = 0.6) and while in the ECM context (range = 0.0-0.2 responses per minute; average = 0.08). Although both treatments produced lower rates and variability of task completion, Zane completed slightly more tasks during DRA than DRA+ECM. Zane completed tasks at the following rates while in the DRA context (range = 0.9-1.3 responses per minute; average = 1.04) and while in the ECM context (range = 0.1-1.0 responses per minute; average = 0.38). During sessions wherein ECM was an option, Zane's time in treatment decreased relative to baseline and DRA (range = 1.6%-100%; average of 26.2%).

When intervention was withdrawn and baseline contingencies were implemented again, there was an increasing trend in targeted behavior and decreasing trend in task completion. Zane engaged in rates of targeted behavior relative to that of the initial baseline phase (range = 0.2-1.9 responses per minute; average = 0.8) and maintained similar task completion (range = 0-6.2 responses per minute; average = 3.2).

Experimental control was demonstrated by replicating an immediate decrease in targeted behavior during DRA+ECM relative to baseline. Both DRA and DRA+ECM were on a downward trend, but DRA+ECM produced relatively lower to zero rates of targeted behavior with clearer differentiation from baseline. During the final intervention phase, while in the DRA context Zane engaged in the following rates of targeted behavior (range = 0.0-1.4 responses per minute; average of 0.6) and while in the ECM context (range = 0.0-0.5 responses per minute; average = 0.1). Again, although both treatments produced lower rates and variability of task completion, Zane completed more tasks during DRA than DRA+ECM. Zane completed tasks at the following rates while in the DRA context (range = 1.2-1.6 responses per minute; average = 1.4) and while in the ECM context (range = 0.0-0.9 responses per minute; average = 0.24). During sessions wherein ECM was an option, Zane's time in treatment again decreased, to notably lower percentages during this intervention phase (range = 0.5%-53.8%; average = 13.7%).

In all, visual analysis shows that DRA+ECM resulted in reliable decreases in targeted behavior compared to baseline, whereas DRA did not. That said, DRA+ECM had lower (near zero) rates of tasks completed during treatment, which directly correlates to the reduced amount of time he spent in the treatment context. Visual analysis suggests that Zane spent majority of time in the hangout space during the aforementioned sessions, thus the inability to engage in task completion. It is also of note the prevalent decrease and stability across all panels at the end second intervention phase when DRA+ECM was in place.

A novel aspect of this study's procedures included a social validity perspective via participant's affect rating, which were created via caregiver reported information from the indices of happiness and

unhappiness questionnaire (Ramey et al., 2022) throughout the study. Overall, Zane appeared to have a neutral affect, though it is worth highlighting that Zane was most happy when ECM procedures were present. Results showed during functional analysis procedures (happy = 16.6%, neutral = 80%, sad = 16.6%), baseline procedures (happy = 12.5%, neutral = 62.5%, sad = 12.5%), DRA procedures (happy = 40%, neutral = 60%, sad = 0%), DRA + ECM procedures (happy = 44.4%, neutral = 55.55%, sad = 0%). More specifically, results determine that procedures were equally social valid across phases.

CHAPTER 4

DISCUSSION

The purpose of this study was to extend previous research related to ECM procedures (Metras et al., 2023; Rajaraman et al., 2021; Staubitz et al., 2022) and evaluate the effectiveness of ECM within a DRA treatment package at reducing targeted externalizing behaviors and increasing task completion for one participant. Results of this study determined that implementation of DRA+ECM was effective in reducing target behavior but not increasing task completion for this participant. Zane's rates of targeted behavior when ECM was in place were near-zero and at zero levels in both phases of intervention. Interestingly, although DRA+ECM reduced targeted behavior relative to baseline, which replicated findings of previous research (Metras et al., 2023; Rajaraman et al., 2021; Staubitz et al., 2022), DRA did not.

This finding was unexpected given the wealth of research supporting the use of DRA alone to decrease targeted behavior (Lennox et al., 1988; Matson et al., 2005; Vollmer & Iwata, 1992; Vollmer et al., 1999). One reason may be that Zane had multiply maintained behavior per the functional analysis. Specifically, Zane's targeted behavior was found to be maintained by escape, tangible, and attention. Therefore, restriction of items in the DRA context may have evoked targeted behavior – unrelated to the escape function being addressed within that arrangement (Vollmer et al., 1999). DRA targeting Zane's tangible function first, before adding contingencies for escape that included restriction of the tablet, may have produced more reliable decreases in targeted behavior (Saini et al., 2016; Tiger et al., 2008). Such results could also be accounted for when considering multiple-treatment interference effects of implementing an alternating treatments design (Barlow & Hayes, 1979; Hains & Baer, 1989), in this case, DRA versus DRA+ECM. The rapid iteration of alternating treatments allows researchers to compare the effects of two interventions and determine which is superior (Byiers et al., 2012), but in this case, receiving longer breaks of reinforcement in ECM and placing the hangout area on extinction every other

session may have produced the elevation in DRA. Elevation effects can be visually analyzed as an extinction burst, or a transitory increase in target responding (Lerman & Iwata, 1995/1996; Lerman et al., 1999).

Regarding task completion, results showed that implementation of ECM did not increase task completion, as rates of task completion in that context were near-zero levels. Likewise, task completion in DRA context was proportionally low compared to baseline levels, though slightly higher than ECM. Ultimately, Zane completed more tasks in DRA than he did in ECM. There are a couple of plausible explanations for such results, one correlates to the programmed reinforcement time while in treatment and the other correlates to the law of effect, or the matching law (Herstein, 1970). First, it is not uncommon to garner similar results in the DRA context due to the dense reinforcement schedule (FR1) utilized. Thus, the importance of incorporating schedule thinning into intervention, which was beyond the scope of this study, but could have aided in increasing task completion (Betz et al., 2013; Greer et al., 2016; Vollmer et al., 1999). Second, observing such decreases in task completion within the ECM context provides further justification of the matching law (Hernstein, 1970), which can be paraphrased to describe that an organism, or in this case the participant, allocates responding to the environment in which reinforcement is richer. Thus, when in the ECM context, Zane allocated to the hang-out space where reinforcement of escape from demands and access to preferred tangible items was given non-contingently rather than participating in treatment, wherein escape from demands was on extinction and minimal access to his preferred item was only received upon completion of a specified task.

It is also of note that task completion was lower during DRA+ECM relative to DRA, likely due to Zane opting out from treatment for the majority of sessions. When ECM was in place, Zane's time spent in the treatment context was relatively low (average across all sessions = 22.2%), barring one session in the first intervention phase. Zane's results contradict previous studies, as seen in Rajaraman and colleagues (2021), wherein all five participants elected to enter the practice context for an average of 96% of the time (range 92%-100%); Staubitz et al. (2022) reports participant 1 elected to practice for 78.6% of the time, participant 2 elected to practice for 88% of the time, participant 3 elected to practice for 94.8%

of the time; and lastly, Metras and colleagues (2023) report that when ECM was implemented and the participant utilized it (14 out of 19 visits), they elected into treatment about 90% of each visit. As for the remaining 5 visits, the hang out space was not used, thus elected into treatment 100% of those visits. Such results suggest that ECM may have simply functioned as an alternative response to escape, meaning that instead of completing the desired task to earn a break from demands, he simply entered the hangout area to achieve the same consequence (i.e., escape from tasks). Moreover, Zane's tangible function per the functional analysis conducted is again, important to note, as he had continuous access to the tablet while in the hangout space and was not asked to relinquish it. Differences in results could also be attributed to contrast in participant characteristics, such that previous studies were conducted with participants that had vocal-verbal abilities and developmentally appropriate language skills (Metras et al., 2023; Rajaraman et al., 2021; Staubitz et al., 2022), whereas this participant had a minimally vocal-verbal repertoire. Thus rule-governed contingencies via the verbal reminders given may not have been clear to this particular participant. There are also procedural differences between SBT and DRA, such that, SBT initially reinforces appropriate responses with reinforcers identified in the IISCA (i.e., synthesized) while placing target behavior on extinction, though eventually begins to reinforce appropriate behavior intermittently and unpredictably (Hanley et al., 2014). Traditionally, DRA involves reinforcing alternative behaviors on a fixed schedule of reinforcement while also placing target behaviors on extinction (Vollmer & Iwata, 1992). Thus, time in treatment could be contradictory to previous studies as the DRA context is not as enriching as SBT context in terms of reinforcement provided (Hanley et al., 2014).

Limitations

One limitation surrounds only conducting this study with one participant as this does not allow for across participant replication. Therefore, some suggestions for future research include addressing the very limitations of this study, such as, extending procedures to multiple participants, including participants with varying diagnoses, externalizing behavior, skills set, and behavioral functions.

Another limitation coincides with the chosen experimental design, noted as the alternating treatments design. As stated above, this could have attributed to multi-treatment interference. In lieu of

such a design, researchers may conduct further research utilizing a reversal design. The reversal design would allow for researchers to avoid potential variables and gain confidence that the design does not affect participant results.

Lastly, percentages of IOA for participant affect rating were below acceptable (80%). It is hypothesized that this was due to collecting data on the overall session. In attempting to obtain a socially validating measure and make it objective by completing a questionnaire, researchers did not think of the subjectiveness that may ensue throughout an entire 10-minute session. Thus, when including such measures in the future, one might suggest collecting data in smaller intervals, such as every 10 seconds across the entire session, for increased accuracy.

Implications

Although ECM has proven to be effective in reducing targeted behavior, there may not utility in increasing task completion and time in treatment within other treatments. Thus, leading to considerations for further evaluating ECM in different treatment packages, one could begin with further evaluating the effectiveness of ECM within a DRA treatment package with more participants that have similar characteristics. Future research opportunities could explore extensions of this study wherein modifications to reinforcement contingencies of the hang-out space are manipulated. For example, if participants were to allocate more time spent in the hang-out area, one could assess the effectiveness of changing contingencies from allowing highly preferred items to the space to only allowing moderately- to low-preferred items or even no items at all. Essentially, exploring ways to yolk the environments of reinforcement to increase effective productivity but also maintain the participant's ability to choose.

As noted, several times throughout the discussion of this study, there is importance in understanding how multiply maintained target behaviors play a role in such a model. More specifically, researchers could focus on utilizing assessments such as the traditional functional analysis (Iwata et al., 1982/1994) rather than synthesized contingencies such as the IISCA (Hanley et al., 2014) to understand the potential effects of individual functions.

Lastly, researchers could consider including schedule thinning of similar treatment packages within ECM to evaluate sustained effectiveness of less dense reinforcement. As seen in previous studies wherein SBT was implemented, participants began to choose alternate contexts as thinning was implemented (Staubitz et al., 2022, Rajaraman et al., 2021). Therefore, it is of importance to evaluate in understanding the full utility of ECM.

The findings of this study provide further evaluation to the effectiveness of an enhanced-choice model (Metras et al., 2023; Rajaraman et al., 2020; Staubitz et al., 2022), though continued research prioritizing such procedures into behavioral treatments that intend to reduce target externalizing behaviors and promote assent within the population behavior analysts serve can continue to improve and increase social validity within ABA.

CHAPTER 5

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TABLE 1*Operational definitions of dependent measures*

Dependent Measure	Operational Definition
Aggression (frequency)	• Hitting: Zane's hand (open or closed fist) or object in Zane's hand meets another person from 6 inches or greater (each hand counts as a separate instance). • Kicking: Zane's foot meets another person from 6 inches or greater (each foot counts as a separate instance). • Grabbing: Zane's fingers enclose around another person's body or clothing (each hand counts as a separate instance). • Pushing/Pulling: Zane's hand(s) or body contact another person and applies force that alters the original standing position of that person. • Pinching: Two or more of Zane's fingers grasp a person's skin or clothing and squeezes in a forceps like motion.
Disruption (frequency)	• Hitting: Zane's hand(s) or feet (open or closed) or object in Zane's hand(s) contacts a surface from 6 inches or greater. • Swiping: Zane slides an object across a surface or off a surface from 6 inches or greater • Kicking/kneeing: Any instance in which Zane's foot or knee meets a surface or object(s) from a distance of 6 inches or greater. • Ripping/tearing: Zane splits or ruptures an object that results in an alternation of its original format.
Time in treatment (duration)	• Onset of timer when instruction is placed and offset upon participant choosing to enter hang-out or session end. If two thirds of Zane's body was outside of the blue tape, he was considered in treatment.
Time in hang-out (duration)	• Onset of timer when participant asks to enter or physically enters hang out and offset upon exiting designated hang-out space. If two thirds of Zane's body was inside of the blue tape, he was considered in hang-out.
Instructions placed (frequency)	• Vocalization emitted by therapist specifically stating task instruction. Ex: "Pick up the shirt and place it in the bin" "Count the pigs."

Instructions completed (frequency)	Participant met task objective placed. Ex: Zane picked up the shirt from the floor and placed it in the assigned laundry bin. Zane looked at the paper and counted each pig aloud.
Participant's affect	- Happy face: behaviors (smiles, laughs, jumps, some screaming); situations/settings (playing on tablet, when left alone) - Neutral face: when definitions of happy face or sad face were not met - Sad face: behaviors (poking others, crying), situations/settings (when asked to do work, when asked to do something he does not want to do, when verbal ordered or physically forced to complete a task)

Note. Participant's affect, more specifically happy and sad face, was based on caregiver's answers from Indices of Happiness and Unhappiness Questionnaire (Ramey et al., 2022).

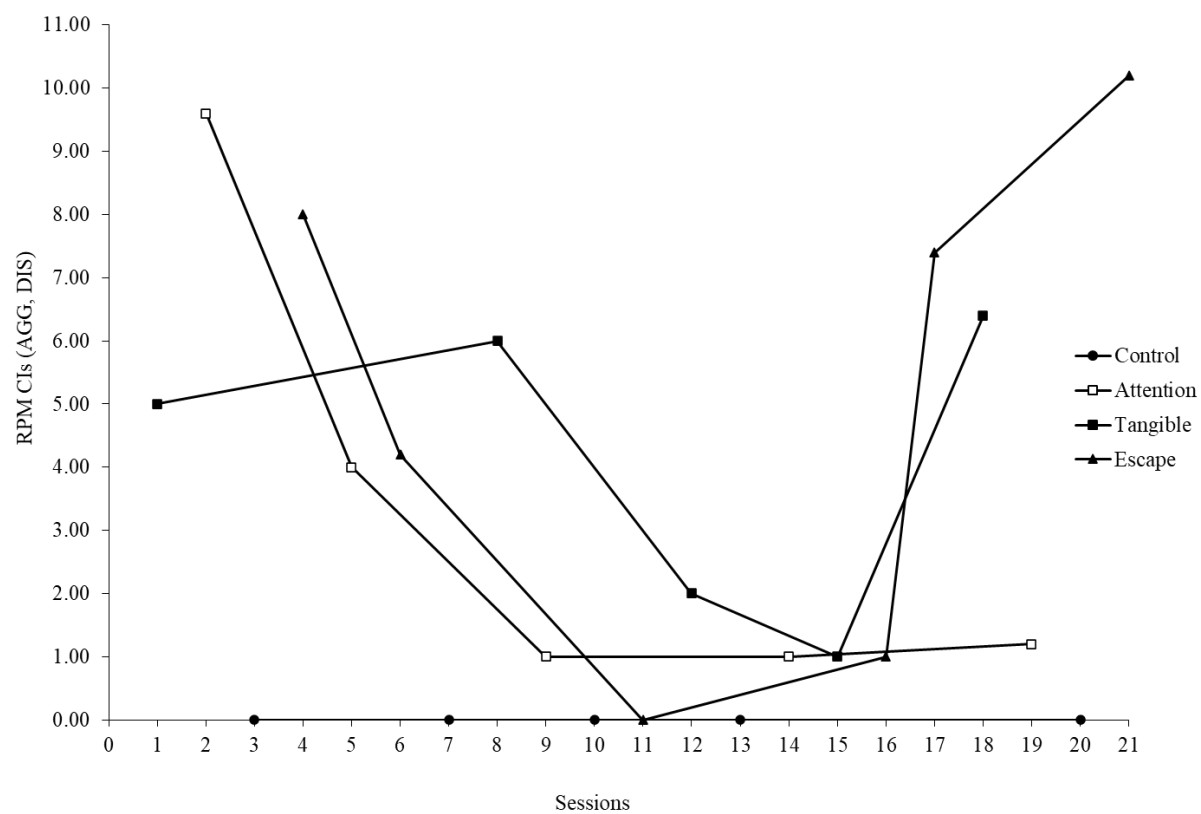
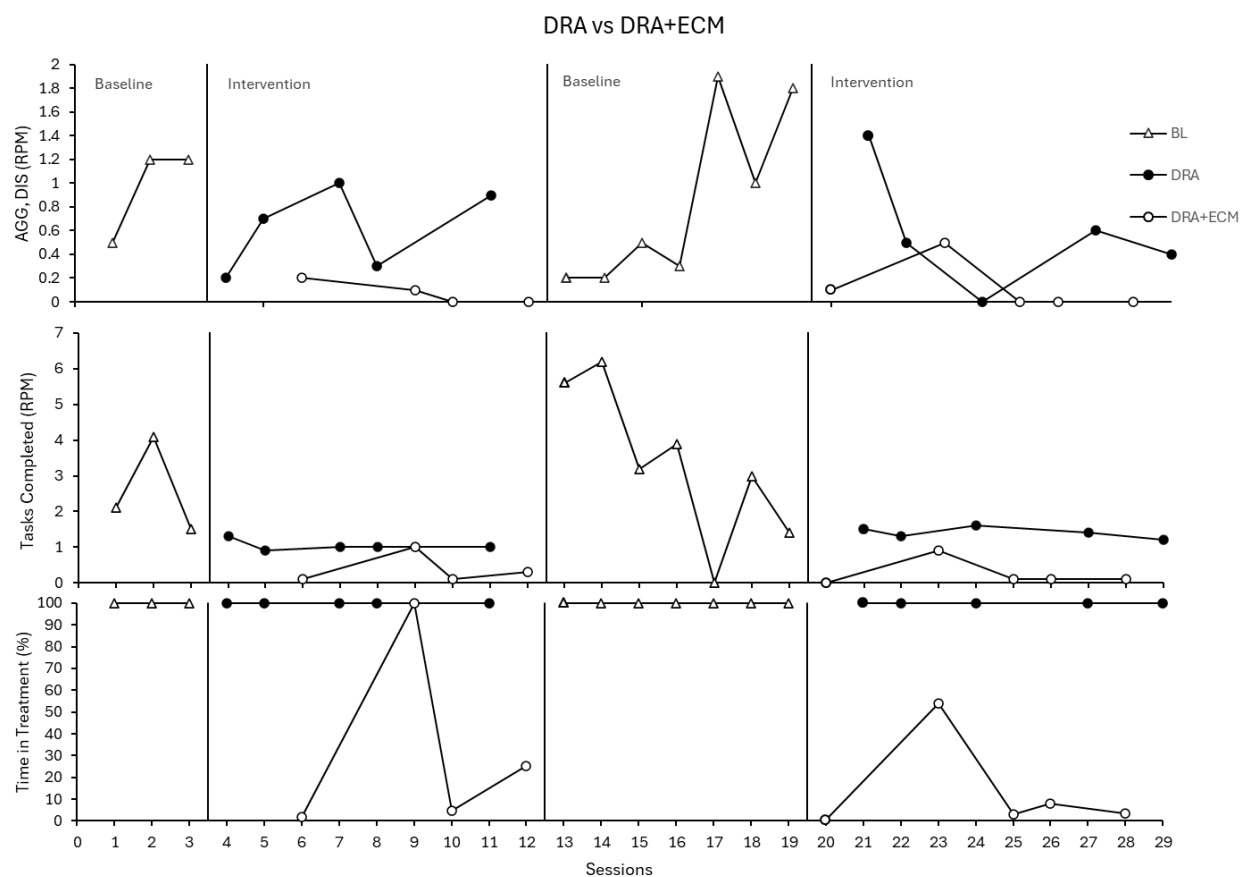
FIGURE 1*Multi-element functional analysis results*

FIGURE 2

Dependent measures outcomes throughout the study



Note. Panel 1 displays the rate of target behavior. Panel 2 displays the rate of tasks completed. Panel 3 displays the percentage of time spent in treatment.

Appendix A

Indices of Happiness and Unhappiness Questionnaire

Instructions: Please answer the following questions to the best of your knowledge. Provide as much detail regarding your child's behaviors as you can. If more space is needed, please continue on the back of this page.

1. What specific behaviors does your child engage in when he/she is feeling **happy**?

2. What specific behaviors does your child engage in when he/she is feeling **unhappy**?

3. In what situation(s)/setting(s) is your child most likely to feel **happy**?

4. In what situation(s)/setting(s) is your child most likely to feel **unhappy**?

Appendix B



Wooden Thesis Data Sheet



Client: _____

Date: _____

Primary/Reli _____

Session Number: _____ Duration (TX): _____ Duration (H-O): _____ THX: _____ DC: _____ Condition: _____

	AGG	DIS	Task (I/C*)	Mands for H/O (freq)	Attempts to leave work area (freq)	Child Affect Rating?
Treatment			/			😊 😐 😞
Hang-out			/			😊 😐 😞

*I = instruction; C = completion

*Use happiness/unhappiness indices in client's folder to circle the appropriate rating

Session Number: _____ Duration (TX): _____ Duration (H-O): _____ THX: _____ DC: _____ Condition: _____

	AGG	DIS	Task (I/C*)	Mands for H/O (freq)	Attempts to leave work area (freq)	Child Affect Rating?
Treatment			/			😊 😐 😞
Hang-out			/			😊 😐 😞

*I = instruction; C = completion

*Use happiness/unhappiness indices in client's folder to circle the appropriate rating

Appendix C



Wooden Thesis Data Sheet



Client:

Date:

Session Number: _____ THX: _____ DC: _____ Condition: _____

Steps	Circle One	Notes
Treatment contingencies		
1. Did therapist state the correct contingencies at the beginning of the session?	Y / N N/A	
2. Did therapist provide 2 minutes of pre-exposure? (only applicable during the first session of the day)	Y / N N/A	
3. Did therapist provide appropriate instructional task until end of session?	Y / N N/A	
4. Did therapist use verbal paced prompting until participant completed task?	Y / N N/A	
5. Did therapist provide a 30 second break with participant's items contingent on task completion until the end of session?	Y / N N/A	
6. Were attention/items withheld during instructional tasks?	Y / N N/A	
7. Did therapist provide attention every 10 seconds during reinforcement periods?	Y / N N/A	
Hang out contingencies		
1. Did therapist withhold presenting any instructional tasks or materials?	Y / N N/A	
2. Did therapist provide attention every 10 seconds?	Y / N N/A	
3. Was the participant allowed to take preferred items with them or honored with items after asking?	Y / N N/A	
4. Was the participant immediately allowed access to hang out upon mand and/or indicating response?	Y / N N/A	
5. Did therapist provide contingencies of hangout/treatment every 5 minutes?	Y / N N/A	