THE EFFECTS OF NONCONTINGENT REINFORCEMENT WITH SIGNALS ON PROBLEM BEHAVIOR IN THE CLASSROOM SETTING

by

Jannica Pozuelos

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Approved:

Thomas Higbee, Ph.D. Major Professor	Timothy Slocum, Ph.D. Committee Member
Tyra Sellers, Ph.D. Committee Member	Richard S. Inouye, Ph.D. School of Graduate Studies

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Logan, Utah

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ABSTRACT

The Effects of Noncontingent Reinforcement with Signals on Problem Behavior in the Classroom Setting

by

Jannica Pozuelos, Master of Science

Utah State University, 2018

Major Professor: Thomas S. Higbee, Ph.D.
Department: Special Education and Rehabilitation

Research has shown noncontingent reinforcement (NCR) to be an effective antecedent intervention in reducing problem behavior when implemented in clinical and applied settings. Some research suggests the reductive effects of NCR on the problem behavior of adults and teenagers with disabilities may be enhanced through signals (e.g., visual timers). Additional research is warranted to investigate if NCR with signals is an effective intervention in reducing problem behavior of young children with autism. This study evaluated the effects of NCR with and without signals on the problem behavior of three preschoolers with autism attending a special education day treatment program. All interventions were implemented by classroom staff during typical learning activities. Overall results were inconsistent regarding the reductive effects of NCR with signals on problem behavior of preschoolers with autism in a natural setting. However, results suggest NCR with signals may contribute to reducing escape-maintained problem

behavior for some preschoolers with autism. Additional research will be needed to verify these tentative conclusions.

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PUBLIC ABSTRACT

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Research has shown noncontingent reinforcement (NCR) to be an effective intervention in reducing inappropriate behavior (i.e., problem behavior) when implemented prior to its occurrence in both clinical and applied settings. Some research suggests problem behavior of teenagers and adults with disabilities may be reduced at greater rates when NCR is implemented in combination with signals (e.g., visual timers). Additional research is warranted to investigate if the positive effects of NCR can be enhanced using signals when working with young children with autism. This study evaluated the effects of NCR when implemented with and without a visual timer on the problem behavior of three preschoolers with autism attending a special education day treatment program. All interventions were implemented by classroom staff during typical learning activities. Overall results were inconsistent in determining if NCR with signals may be an effective intervention for reducing problem behavior of preschoolers with autism. However, results suggest NCR with signals may contribute to a reduction in problem behavior for some preschoolers with autism. Additional research will be needed to verify these tentative conclusions.

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CONTENTS

Page

ABSTRACT iii

PUBLIC ABSTRACT v

ACKNOWLEDGMENTS vi

LIST OF FIGURES ix

CHAPTER

I. INTRODUCTION 1

II. LITERATURE REVIEW 7

III. METHOD 16

Participants 16
Setting and Materials 18
Pre-Experimental Measures 19
Functional Analyses 22
Behavior Skills Training 28
NCR and NCR-S Treatments 30
Interobserver Agreement 35
Treatment Integrity 36
Social Validity Measure 38

IV. RESULTS 39

Functional Analyses 39
NCR and NCR-S Treatments 41
Social Validity Measure 46

V. DISCUSSION 48

REFERENCES 54

APPENDICES 57

Appendix A: Brief Caregiver Interview 58

Page

Appendix B: More and Less Skill Assessment Data Sheet 60
Appendix C: Caregiver/Informant Questionnaire 62
Appendix D: Initial Observations Data Sheet 65
Appendix E: Functional Analysis Data Sheet 67
Appendix F: Behavior Skills Training Data Sheet 69
Appendix G: Partial Interval Time Sampling Data Sheet 71
Appendix H: Treatment Integrity Data Sheet 73
Appendix I: Staff Member Questionnaire 75
Appendix J: Participant Questionnaire 79
Appendix K: MSWO Preference Assessment Data Sheet 81

LIST OF FIGURES

Figure Page

1. Percentages of intervals during which Andrew, Michael, and Henri engaged in disruptive behavior during functional analyses 40

2. Percentages of intervals during which Andrew, Michael, and Henri engaged in disruptive behavior during baseline, NCR, and NCR-S sessions 42

CHAPTER I

INTRODUCTION

Autism spectrum disorder (ASD) is a developmental disorder that affects social communication, social interaction, and repetitive patterns of behavior (American Psychiatric Association [APA], 2013). According to the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed., *DSM-5;* APA, 2013), ASD may be accompanied by an intellectual and/or language impairment. In conjunction with the social, intellectual, and language impairments associated with autism, research also indicates that children with ASD exhibit a higher incidence of clinically significant maladaptive behavior (i.e., problem behavior) than demonstrated by their typically developing peers (Hartley, Sikora, & McCoy, 2008). Problem behavior related to withdrawal, attention, and aggression are areas of particular concern that may result in learning obstacles, such as difficulty attending to educational activities and engaging in inappropriate classroom behavior.

Based on this information, children with ASD who demonstrate problem behavior require specialized interventions in order to overcome related learning challenges. Rogers (1996) discussed the importance of identifying effective interventions for children with ASD so that such interventions may be implemented as early as possible to decrease any debilitating symptoms of ASD and improve social outcomes. Furthermore, researchers are responsible for ensuring that any recommended behavior-change strategies are time-efficient and easy to implement (Codding, Feinburg, Done, & Pace, 2005).

The Centers for Disease Control and Prevention (CDC, 2014) estimates the

prevalence of children identified with ASD as 1 in 59. Given this statistic, one may reasonably assume children with ASD are commonly found in a significant number of classrooms. Therefore, classroom teachers represent a group of providers in need of interventions that are practical (i.e., feasible given the resources typically found in a classroom setting) and effective when dealing with the problem behavior of children with ASD. Parsimony and efficiency also appear to be important attributes of classroom setting interventions when considering teachers as behavior-change agents. In other words, the novice practitioner (e.g., a classroom teacher) is more likely to implement interventions that require minimal training, time, and effort. Researchers should actively accept the responsibility of determining which interventions meet these criteria.

Problem behavior reduction interventions include two categories: consequence-based and antecedent-based. Cooper, Heron, and Heward (2007) define a consequence as a stimulus change following a behavior of interest. Hence, consequence-based interventions refer to any change in the environment contingent on the occurrence of a behavior of interest. Antecedent-based interventions involve the manipulation of discriminative stimuli (S^Ds) and motivating operations before the behavior of interest is observed. This manipulation alters the effect of any consequences following the behavior of interest.

Differential reinforcement is a commonly used consequence-based intervention with multiple variations. Differential reinforcement consists of providing reinforcement for one response class while simultaneously withholding reinforcement for another response class. Although differential reinforcement has been proven effective in

decreasing problem behavior and increasing desired behavior, these procedures may be difficult to implement depending on previous training and available resources. One disadvantage of differential reinforcement is the high rates of reinforcement that are needed to increase an alternate response class and decrease severe problem behavior. Such rich schedules of reinforcement may not be feasible in all settings. For example, a classroom teacher engaged in whole class instruction may not be able to provide consistent and immediate reinforcement to one student each time an alternate behavior occurs. Another disadvantage is the constant supervision required to accurately implement differential reinforcement, which may render this intervention impractical given limited time and staff constraints in natural settings. Differential reinforcement may also necessitate the use of punishment interventions that could result in undesirable side effects. For example, extinction (EXT) procedures are commonly used in conjunction with differential reinforcement to decrease problem behavior but may result in extinction-induced aggression or lack of generalization (Cooper et al., 2007; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993).

Differential reinforcement of other behavior (DRO) is one of the variations of differential reinforcement (Cooper et al., 2007). DRO involves reinforcement delivered contingent on the absence of a behavior of interest. One advantage of DRO is ease of implementation since the observer is only required to track the absence of a response class. This procedure typically proves less cumbersome than recording the rate of a behavior of interest, monitoring the occurrences of incompatible behaviors, or teaching and tracking an alternative behavior. Unfortunately, DRO shares the disadvantages of

differential reinforcement, namely constant monitoring for accurate implementation and possible undesirable side effects from punishment interventions (e.g., EXT) that may be required as part of an effective DRO treatment plan. These disadvantages have encouraged researchers to identify alternative interventions that yield similar reductive problem behavior outcomes without the aforementioned disadvantages.

In contrast to differential reinforcement, noncontingent reinforcement (NCR) is an antecedent-based intervention that manipulates environmental conditions to reduce the occurrence of problem behavior. NCR involves the delivery of putative reinforcing stimuli on a fixed-time (FT) or variable-time (VT) schedule independent of behavioral contingencies (Cooper et al., 2007). Typically, a functional analysis (FA) is conducted prior to implementing NCR to identify the function (i.e., attention, access to tangibles, escape from or avoidance of a social demand, automatic reinforcement) of the target behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994). Practitioners are then able to develop an appropriate FT or VT schedule based on the frequency and intensity of the target behavior as observed during the FA. This schedule may be gradually thinned over time based on the effects of the NCR intervention (e.g., FT 10-s to FT 5-min). NCR may be delivered by providing positive reinforcement (i.e., attention, access to tangibles, or allowing an opportunity for automatic reinforcement) or negative reinforcement (i.e., removal of social demands). Research has identified the possible underlying mechanisms of NCR as (1) satiation from high rates of reinforcement that alters the establishing operation for problem behavior and (2) EXT due to the noncontingent delivery of reinforcement (Kahng, Iwata, Thompson, & Hanley, 2000; Lalli, Casey, & Kates, 1997;

Thompson, Iwata, Hanley, Dozier, & Samaha, 2003; Wallace, Iwata, Hanley, Thompson, & Roscoe, 2012).

In a landmark study, Vollmer et al. (1993) investigated NCR as` an alternative intervention to DRO by comparing the effects of a DRO procedure with the effects of NCR on self-injurious behavior (SIB). During this study, NCR was delivered on a fixed-time schedule regardless of participants' behavior. Results of the Vollmer et al. study indicated that NCR may be equally effective as DRO in reducing SIB without the disadvantages common to differential reinforcement procedures (e.g., time and staff required to monitor the target behavior, extinction-induced aggression).

In addition to decreasing SIB, researchers have investigated NCR as a viable reductive intervention across problem behaviors such as rumination (Wilder, Draper, Williams, & Higbee, 1997), noncompliance (Cataldo, Ward, Russo, Riordan, & Bennett, 1986), aggression (Ringdahl, Call, Christensen, & Boelter, 2010), interrupting others (Schadler, Wilder, & Blakely, 2009), and general disruptive classroom behavior (Waller & Higbee, 2010). Several studies have taken place in non-educational settings (e.g., residential homes, in-patient facilities, community-based settings). The majority of studies have recruited adult participants with developmental disabilities (Gouboth, Wilder, & Booher, 2007; Schadler et al., 2009). While few studies have been conducted in educational settings with individuals less than 18 years old, studies completed in junior high special education and elementary general education classrooms have yielded promising results (Austin & Soeda, 2008; Waller & Higbee, 2010).

Evidence also exists in support of enhanced NCR effects through the use of

signals. Researchers have incorporated visual and audible timers into NCR treatment protocols in such a way that they can be seen and heard by participants. This component allows participants to be aware of when the next noncontingent reinforcer will be made available. Results indicate that NCR may be more effective in reducing problem behavior when implemented in conjunction with signals (Gouboth et al., 2007; Ringdahl, et al., 2010; Schadler et al., 2009.) However, additional research is needed to determine if the effects of NCR can be enhanced through signals across additional populations and settings, such as young children with autism in public special education settings.

Current research indicates that NCR is an effective intervention across a variety of problem behaviors. Natural next steps would be to further extend this research by involving younger participants (e.g., preschool or kindergarten students), examining the efficacy of NCR on reducing problem behavior for individuals with ASD, recruiting classroom teachers and para-professionals as behavior-change agents, and conducting research in the classroom setting. If effective interventions should be implemented as early as possible, particularly when considering the effects of the symptoms and prevalence of problem behavior associated with ASD, it stands to reason that further research is needed regarding NCR as a reductive intervention for problem behavior of elementary school-aged individuals with ASD. Research should also address how NCR procedures might be enhanced in the classroom setting (e.g., by using signals) when implemented by readily available behavior-change agents (e.g., teachers, para-professionals) to ensure maximum effect.

CHAPTER II

LITERATURE REVIEW

I conducted a literature search via EbscoHost (specifically ERIC, Educational Source, and Psych Info) and Google Scholar using the term noncontingent reinforcement. This search yielded approximately 70 results. I narrowed these search results to approximately 30 journal articles by adding the terms extinction, signals, discriminative stimuli, and education setting. Based on the recommendation of Dr. Tyra Sellers Ph.D., BCBA-D, I investigated the 129 articles related to NCR from the Association of Professional Behavior Analysts selected references bibliography (Schondorf, Rios, & Keri, 2011). I further narrowed all search results by selecting the most current studies that (a) implemented NCR with EXT, (b) supplemented NCR procedures with signals (e.g., timers, vocal instructions, color-coded cards), and (c) took place in educational settings.

Prior research has evaluated the effects of NCR in multiple settings (e.g., clinical settings, school settings, residential settings). Research has also investigated ways in which NCR might be enhanced using S^Ds, such as verbal instructions, digital timers, and color-coded cards. Waller and Higbee (2010) evaluated the effects of NCR on escape-maintained behavior when students were presented with color-coded cards signaling (a) the expectation to engage in work activities or (b) the availability of a break. Two junior high students (Brent and David) previously identified as having either an emotional disturbance or a specific learning disability participated in this study. Both participants attended a self-contained public-school classroom. FAs were conducted prior to treatment and determined that both participants' problem behavior were maintained by escape.

Researchers used a reversal design (ABAB) and treatment sessions were implemented by a paraprofessional under the supervision of a graduate level student. Each treatment session began with a paraprofessional placing two color-coded cards (i.e., a yellow sticky note labeled “work” and an orange sticky note labeled “break”) on the participant’s desk and pointing to the “work” card. The paraprofessional then indicated the availability of a break by pointing to the “break” card at a predetermined FT interval. At the conclusion of the allotted break time, the paraprofessional pointed to the “work” card on the participant’s desk. Researchers established an initial FT schedule of either 23 s or 106 s based on the mean latency of the first problem behavior during baseline sessions and gradually thinned to 240 s or 300 s. Breaks initially lasted 60 s, but were later faded to 30 s.

Results demonstrated a significant decrease in disruptive behavior and increase in appropriate classroom behavior for both participants when compared to baseline data. Brent’s disruptive behavior was highly variable during the initial baseline phase; however, disruptive behavior occurred in less than 10% of intervals during the second treatment phase on an FT 300 s schedule. Brent’s mean percentage appropriate behavior was 67% during the first treatment phase as compared to 51% during the withdrawal phase and 89% during the second treatment phase. When compared to the initial baseline data, David’s disruptive behavior decreased from a mean percentage of 27% to 6% during the first treatment phase. When compared to the withdrawal phase, David’s disruptive behavior decreased from a mean percentage of 35% to 5% during the second treatment phase. David’s mean percentage of appropriate behavior increased from 66%

during the initial baseline phase to near 100% for all remaining phases (Waller, 2007).

The overall results indicate visual signals, such as color-coded cards, may enhance the impact of NCR on problem behavior reduction for teenagers with disabilities in the special education classroom setting. One limitation of the Waller and Higbee (2010) study is the few number of participants. However, one particularly promising feature of this study is its practical implications. All treatment sessions were conducted in the natural educational setting by a paraprofessional with limited to no expertise in applied behavior analysis (ABA). One limitation of this study included few participants from a restricted age range. Additional research should investigate how to further enhance the effects of NCR in the classroom setting for younger participants with typical staff acting as behavior-change agents.

Gouboth et al. (2007) compared the effects of NCR plus EXT with and without signals (i.e., verbal instructions and visual timers) on problem behavior of two teenagers (Sam and Tina) with multiple developmental disabilities in a community-based group home. Researchers targeted aggressive behavior maintained by access to tangibles for Sam and inappropriate interrupting maintained by attention for Tina as dependent variables. Functions of behavior were determined by conducting FAs prior to treatment sessions. Researchers implemented a baseline condition, an NCR plus EXT (NCR) condition, and NCR plus EXT with signals (NCR/S) condition using a reversal design for Sam and a multielement reversal design for Tina. Throughout treatment conditions, researchers used pre-determined FT schedules calculated from the mean latency of the first problem behavior during baseline sessions.

For Sam, the NCR condition consisted of providing Sam with a preferred item for 30 s on an FT 30 s interval schedule. The researcher did not say anything to Sam when giving or taking away the preferred item. The NCR/S condition was similar to the NCR condition with the exception of a digital timer set to 30 s placed within Sam's view and Sam being told the preferred item would be returned when the timer sounded. During the NCR condition for Tina, the researcher made conversation with a research partner, but delivered 5 to 8 s comments to Tina on an FT 10 s schedule. The NCR/S was similar to the NCR condition except following each comment directed to Tina, the researcher told her he needed to speak to the research partner and would speak to her again when the timer sounded. A timer set to 10 s was then placed within Tina's view. Neither access to the preferred item nor attention was delivered following problem behavior during any treatment condition.

Researchers presented results from this study as the mean rates of aggression per min for Sam and the mean percentage of intervals with interruptions for Tina. Data for Sam indicated .69 during the baseline condition, .45 during the NCR condition, and .12 during the NCR/S condition. Data for Tina showed 48% during the baseline condition, 30% during the NCR condition, and 4% during the NCR/S condition. Overall results of this study suggested including S^Ds in the form of verbal instructions, timers, and an auditory signal (i.e., the beeping sound from the timer) may enhance the effects of NCR. One significant limitation of this study is treatment was administered to participants in their private rooms by researchers who appeared to have at least some expertise in ABA (i.e., authors did not report additional information regarding who implemented the

procedures of this study). Typical classroom teachers and staff have limited to no formal ABA training and do not have the resources to implement interventions in a private room. The number and restricted age range of participants represented additional limitations of this study. Further research should investigate the effects of NCR with signals on the problem behavior of younger individuals.

Schadler et al. (2009) extended research by Gouboth et al. (2007) by comparing the effects of NCR plus EXT on problem behavior when delivered with either a vocal statement (NCR-vocal) or a visual digital timer (NCR-visual). Researchers recruited two adult participants (Susan and Jeff) with multiple developmental disabilities from a community-based group home. As in the Gouboth et al. study, researchers targeted aggression and inappropriate interrupting, and conducted FAs prior to treatment to determine the function(s) of problem behavior. FA results indicated Susan's aggression (i.e., hitting) was maintained by access to tangible items and Jeff's interrupting was maintained by attention. Researcher used reversal designs (i.e., ABACABAC for Susan and ACABACAB for Jeff) and implemented pre-determined FT schedules during treatment conditions. The FT schedules were based on the mean latency of the first problem behavior during baseline sessions.

During the NCR-vocal condition (C), researchers delivered the appropriate reinforcer for Susan on an FT 15 s schedule and for Jeff on an FT 10 s schedule. Following the delivery of the respective reinforcers (i.e., an edible item for Susan and a 2-s comment on a preferred topic for Jeff), the researcher made a brief statement indicating how long until the next reinforcer would be made available. The NCR-visual

condition (B) was similar to the NCR-vocal condition with one exception. Instead of making a brief statement, researchers placed a digital timer set to the appropriate FT schedule (i.e., 15 s or 10 s) within the participant's view. The timer sounded at the end of each pre-determined interval. Neither access to the preferred item nor attention was delivered following problem behavior during any treatment condition.

Researchers reported data as the mean rate per min for the problem behavior of both participants across all conditions. When data from the treatment conditions were compared to baseline data (6.4, 6.45, 5.98 and 5.95), Susan's problem behavior significantly decreased during the NCR-visual conditions (0.45 and 0.08). Her mean rate of hitting also decreased during the NCR-vocal conditions (1.9 and 3.38), albeit to a lesser degree. The comparison of Jeff's mean rate of interrupting during baseline and treatment conditions was less pronounced. Data from the baseline conditions were reported as 5.68, 5.54, 6.26, and 6. Data from the NCR-vocal conditions (2.95 and 2.4) were similar to the data from the NCR-visual conditions (3.2 and 3.35). Even though treatment effects on problem behavior were less pronounced for Jeff when compared to Susan's treatment effects, Jeff's problem behavior occurred approximately half as frequently during both treatment conditions as compared to baseline conditions.

Overall results of this study suggest the effects of NCR are more significantly enhanced when NCR is delivered with a digital timer than with vocal instructions. Authors did not specifically report who implemented treatment during this study (e.g., graduate student researchers). However, it appears the behavior-change agents possessed some expertise in ABA and all treatment sessions were conducted in private rooms.

Further research is needed to determine if NCR with signals, such as a timer, would be equally effective in reducing problem behavior for younger individuals and when delivered in a classroom setting by teachers or paraprofessionals.

Ringdahl et al. (2010) extended research conducted by Gouboth et al. (2007) and Schadler et al. (2009) by evaluating the effects of NCR plus EXT (NCR) schedule density with the use of signals. Researchers recruited one 23-year old male participant (Justin) who had previously been diagnosed with developmental disabilities, including autism. Justin exhibited aggression towards others and SIB, which an FA determined to be maintained by access to items. Researchers implemented an alternating treatments design with a control condition, a signal condition with dense and lean NCR schedules, and a no-signal condition with dense and lean NCR schedules. During the control condition, researchers provided Justin with continuous access to preferred items. The signal condition was implemented on either a dense NCR schedule of FT 1 min or a lean NCR schedule of FT 5 min during which Justin was shown a countdown timer matching the appropriate FT schedule. Researchers provided reinforcement to Justin when the timer sounded at the end of the FT interval. The dense and lean NCR schedules were determined based on the schedule (FT 2 min) used during the FA tangible condition. The no-signal conditions were similar to the signal conditions except a timer was not used.

Results indicated more significant or faster reductions in problem behavior during the signal conditions as opposed to the no-signal conditions. In addition, signal conditions proved more stable when dense NCR schedules were implemented rather than lean NCR schedules. Justin demonstrated problem behavior at a mean rate of 12.6 per min during

the FA tangible condition. When implementing the signal and no-signal conditions on a dense NCR schedule, results indicated no incidents during the control condition, and mean rates per min of 1.0 during the signal condition and 5.6 during the no-signal condition. When implementing the signal and no-signal conditions on a lean NCR schedule, results indicated mean rates per min of 0.4 during the control condition, 1.4 during the signal condition, and 4.8 during the no-signal condition. These outcomes are consistent with results from previous studies.

Limitations of this study are congruent with the Gouboth et al. (2007) and Schadler et al. (2009) studies: only one individual participated in the study, researchers examined the effects of NCR on the problem behavior of an older individual (i.e., an adult) rather than on younger participants, and authors provided little information regarding the level of ABA expertise of those implementing treatment. Although the research setting was not specifically described, it was likely a clinical setting. Given these limitations, additional research is needed to determine if NCR with signals is a practical and effective intervention for problem behavior reduction for younger individuals in the natural setting by readily available staff.

Current research certainly suggests the effects of NCR plus EXT on problem behavior reduction are significantly enhanced by signals. However, one cannot ignore certain limitations within the literature. Most research involves teenagers or adults and tends to recruit only one or two participants per study. Current research also appears to implement treatment in non-classroom settings. Finally, research involving NCR and signals tends to be implemented by researchers instead of readily available classroom

staff members with limited to no expertise in ABA.

Additional research is needed to determine if NCR implemented with signals, such as a visually diminishing timer, can effectively reduce problem behavior demonstrated by young children with autism in the classroom setting when implemented by classroom staff. By replicating and extending prior research, NCR with signals could be determined as an effective intervention for reducing problem behavior exhibited by young children in the natural classroom setting and a feasible strategy for educators.

The purpose of this study was to evaluate the effects of NCR plus EXT when enhanced using a visual timer in comparison to the effects of NCR plus EXT alone on reducing problem behavior of preschool-age children with ASD in the classroom setting. This study specifically addressed the following research question: What are the effects of NCR plus EXT when implemented with a visual timer as compared with NCR plus EXT alone on problem behavior of preschool-age children with ASD in the classroom setting?

CHAPTER III

METHOD

Participants

Nine preschoolers (eight males, one female) between 4 and 5 years of age were recruited as potential participants for this study. All potential participants were enrolled in a private day treatment program for children with autism occurring within four classrooms at two different public elementary schools (Site A and Site B). This day treatment program was similar to the public-school district preschool program for children with autism in regards to service time (approximately 25 hrs. per week), staff to student ratio (1 staff member for every 2 students), and level of staff training. Potential participants were required to pass the following screening measures to participate in the study: (1) engage in problem behavior in need of intervention not likely maintained by automatic reinforcement, (2) complete a more and less skill assessment with at least 80% accuracy, and (3) engage in problem behavior during the majority of pre-experimental observation sessions for at least 50% of intervals using a partial time sampling procedure. Five (four males, one female) of the nine initially recruited preschoolers were able to pass the first and second screening measures. Three male preschoolers (4-year-old Andrew, 5-year old Michael, and 5-year-old Henri) ultimately qualified to participate in the experimental phase of the study by also passing the third screening measure.

All three participants had each been previously diagnosed with autism and mood disorder by a licensed clinical social worker. Prior to research, the public school's Early

Childhood Assessment Center had determined that Michael and Henri met criteria for having a disability under IDEIA (Individuals with Disabilities Education Improvement Act) under the classification of Autism. Specifically, Michael had received scores of Very Likely Probability of Autism (88) using the Gilliam Autism Rating Scale, Third Edition (GARS-3); Significant Delay using the Preschool Language Scale, 4th Edition; Very Elevated Level of Concern for Adaptive Skills using the Conners Early Childhood assessment; and Significant Delay in Counting Skills using the Learning Accomplishment Profile-Diagnostic Edition. Henri had received scores of Very Likely Probability of Autism (112) using the GARS-3, and Clinically Significant under the categories of Adaptive Skills and Behavioral Symptoms Index using the Behavioral Assessment System for Children, 2nd Edition (BASC-2). Andrew had also received a score of 111 (Very Likely Probability of Autism) using the GARS-3 from the public school's Early Childhood Assessment Center.

One principle teacher (Sarah) and two paraprofessionals (Maggie and Caroline) participated in the study (hereafter referred to by name or as staff members). All functional analysis, baseline, and experimental sessions were implemented by the same staff member with the same participant as a consistent teacher-student dyad (i.e., Maggie with Andrew, Caroline with Michael, Sarah with Henri). All staff members had completed a Bachelor's level degree in Human Development or Behavioral Science, but none possessed a teaching certificate. All of the staff members' educational and training experience to date had been provided by the day treatment program organization, including some behavior analytic training (approximately 15 hr per year of employment).

All staff members were female, and between 25 and 38 years old.

Setting and Materials

Maggie worked with Andrew in one-to-one work sessions in a classroom at Site A for all observation and experimental sessions. These work sessions consisted uniquely of letter identification. The classroom measured 6 m by 6 m and contained tables, chairs, filing cabinets, bookcases of books, and typical classroom materials. All pre-experimental measures also took place in the classroom, except for the behavioral skills training for Maggie. This training took place in the school faculty lounge measuring 5 m by 9 m and contained tables, chairs, couches, and a kitchen.

Michael and Henri attended the same classroom at Site B where they engaged in individualized work sessions for all observation and experimental sessions. During Michael's work sessions, Caroline asked him to identify the functions of body parts and periodically observe a peer engaged in a separate work program. Sarah worked with Henri in one-to-one work sessions during which he was asked to identify letters. Behavior skills training for Caroline and Sarah also took place in the classroom. This classroom measured 4 m by 8 m and contained tables, chairs, filing cabinets, bookcases of books, and typical classroom materials. All interviews and the more and less skill assessment took place in the office attached to the classroom. The office measured 4 m by 4 m and contained chairs, tables, filing cabinets, a small kitchen area, and personal items belonging to staff.

A MotivAider® (a timer on a repeating cycle with a vibration setting) was used to

signal the FT schedule to staff members during NCR plus EXT (hereafter referred to as NCR) treatment conditions. The MotivAider® was similar to devices used in previous studies to signal FT schedules (Austin & Soeda, 2008; O'Callaghan, Allen, Powell, & Salama, 2006). An iPad® using the Time Timer® app with an audible beep was used to signal the FT schedule (i.e., availability of a break) to participants during NCR plus EXT with signals (hereafter referred to as NCR-S) treatment conditions. The Time Timer® app is similar to the Time Timer® device (Grey, Healy, Leader, & Hayes, 2009). Both are timers with a movable red wedge that diminishes to accurately indicate the passage of time. However, the Time Timer® app can be set using units of time in seconds, minutes, and hours while the Time Timer® device can only be set using minutes. The Time Timer® app was selected over the Time Timer® device because the student researcher predicted FT schedules would likely be in seconds rather than minutes.

All FA, baseline, and experimental sessions were recorded using an iPad®. A Swivl® device was initially used in conjunction with an iPad® to record baseline sessions and some treatment sessions for Andrew, but its use was discontinued due to technical challenges. A wireless microphone, a wireless earbud, iPads®, and a smartphone timer app (timer) were used during all FA sessions. The timer was also used during treatment conditions to track 15 s breaks.

Pre-Experimental Measures

Prior to implementing any pre-experimental measures, the student researcher approached classroom teachers and paraprofessionals to request their consent to

participate in the study using IRB approved forms. Once consent was obtained, the student researcher began conducting pre-experimental measures to identify potential participants. No data collection occurred for any potential participant prior to obtaining parental consent using IRB approved forms.

Preliminary Interview

During the preliminary interview (see Appendix A), the student researcher asked classroom teachers and paraprofessionals to briefly describe any problem behavior they had observed, estimate how frequently it occurred, and hypothesize the likely function(s) of the problem behavior (i.e., attention, escape, access to tangibles, automatic reinforcement). The student researcher then approached the parents of any preschool student whose problem behavior appeared to meet criteria for participation in the study. Preschool students whose parents gave consent were then screened using a more and less skill assessment.

More and Less Skill Assessment

The student researcher conducted a brief assessment (see Appendix B) to determine if potential participants understood more and less using the Time Timer® app and two iPads®. During the assessment, each potential participant was presented with two iPads® preloaded with screenshots of the Time Timer® app. The screenshots depicted red wedges varying from 17 to 83 percent of a complete red circle. The student researcher introduced the assessment by pointing to one of the two iPads®, making a descriptive statement (e.g., “This is more.”), and asking the potential participant to point

to the iPad depicting more or less in relation to the other (e.g., “Point to more.”). The student researcher gave the potential participant a small treat following a correct response and implemented a least to most prompting system (Libby, Weiss, Bancroft, & Ahearn, 2008) following an incorrect response. This preliminary procedure was completed once for the concept of more and once for the concept of less.

The student researcher continued the more and less skill assessment by asking potential participants to point to more or less over 10 trials. A small edible item was given to the potential participant immediately following all correct responses. The student researcher implemented a least to most prompting system following all incorrect responses. Potential participants who scored less than 80% accuracy were removed from the study.

Three of the four potential participants who did not pass this screening measure received scores significantly below the required 80% accuracy. One potential participant completed the assessment with 60% accuracy and subsequently received discrete trial training (DTT) related to the skill to determine if he could improve his performance. Six DDT sessions lasting approximately 5 min were conducted over several school days. Data gathered during the DDT sessions indicated he was unable to perform above 60% accuracy during any single session.

The intent of this assessment was to ascertain a probable understanding of a visually diminishing timer. However, the assessment was only able to directly measure recognition of a red wedge that was larger or smaller in comparison to another. It cannot necessarily be assumed that potential participants specifically understood the abstract

concept of more or less time.

Open-Ended Interview

An open-ended interview (see Appendix C) similar to the interview developed by Hanley (2012) was conducted with the classroom teacher of each potential participant who passed the more and less skill assessment. Information gathered during the open-ended interview was used to determine an operational definition of problem behavior and hypothesize the probable function(s). This interview was also used to determine FA conditions, and the specific reinforcement and activities to be used during FA, baseline, and treatment conditions.

Initial Observations

The student researcher observed each potential participant for three to six 10-min observation sessions during which data were gathered regarding the topography and frequency of problem behavior (see Appendix D). The student researcher used a 15-s partial interval time sampling procedure to record the occurrence of problem behavior. Potential participants who demonstrated problem behavior during less than 50% of intervals for the majority of observations were removed from the study.

Functional Analyses

Dependent Variables and Response Measurement

The dependent variable for each participant was the occurrence of disruptive behavior using the same 15-s partial interval time sampling procedure implemented

during initial observation sessions. Data were reported as the percentage of 15-s intervals during which problem behavior occurred (see Appendix E). An operational definition was developed based on information gathered during the open-ended interview and initial observations for each participant.

Andrew. Disruption for Andrew was defined as hitting (self or others with an open palm or closed fist from a distance of at least 6 inches), interacting with materials without permission (touching with any part of his hand(s) any materials on the instructional area table without an instruction to do or a staff member handing him the object with the exception of tracing flashcard letters with his finger), getting out of his chair without permission (any instance when no part of his bottom directly contacted the seat of the chair without an instruction to do so), leaving the instructional area (pushing his chair more than 6 inches away from its original position at the start of the work session or as repositioned by the teacher during the work session unless instructed to do so by a staff member), not following directions (not beginning to follow a staff member's direction within 3 s), responding inappropriately to instructional questions (giving the same incorrect response after being told by the teacher it was incorrect (e.g., "No, try again," "It's not B."), giving any vocal response other than a one letter response when asked to identify a flashcard letter with the exceptions of making a request for help and a non-word vocalization lasting less than 1 s), interrupting a staff member during instructional sequences (making any word or non-word vocalizations when a staff member was talking or within 1 s of a staff member asking him to sit quietly), and turning away from instruction (covering both eyes with any part of his body or any

materials for more than 1 s, closing both eyes for more than 1 s, turning his head at least 45 degrees away from a flashcard presented to him for more than 1 s).

Michael. Disruption for Michael was defined as aggression (hitting self or others with an open palm or closed fist from a distance of at least 6 inches, kicking any body part of another person with one foot or both feet, any scratching motion with his fingernail(s) on direct skin or clothing covering any body part of another person, pulling on any clothing item worn by another person with enough force to displace the clothing by at least 2 inches, pulling any part of another person's arm or hand with enough force to displace it by at least 6 inches), grabbing materials (grasping in a closed fist any item on the instructional table or being held by another person and displacing it by at least 6 inches unless instructed to do so by a staff member), getting out of his chair without permission (any instance when no part of his bottom directly contacted the seat of the chair for at least 1 s without an instruction to do so), leaving the instructional area (pushing his chair more than 6 inches away from its original position at the start of the work session or as repositioned by a staff member during the work session unless instructed to do so), not following directions (not beginning to follow a staff member's direction within 3 s), responding inappropriately to instructional questions (making any non-word vocalization lasting more than 1 s, verbally indicating a refusal to respond (e.g., "I don't know," "I don't want to," "No."), repeating the same incorrect response after being told to make another attempt (e.g., "Try again," "What else could it be?"), giving no response after 5 s of a request to do so), turning away from instruction (turning his head at least 90 degrees away from a staff member or a peer he was asked to observe

for more than 3 s, covering both eyes with any body part or his t-shirt for more than 1 s, closing eyes for more than 1 s with the exception of when yawning), interrupting a staff member who was working with a peer (making any vocalizations while a staff member was working with a peer with the exceptions of coughing and yawning), and reprimanding peers (telling a peer how to respond to an instructional question (e.g., "No, that's B not D."), telling a peer to select a specific item ("Choose the dinosaur not the truck."), telling a peer to stop engaging in a certain behavior (e.g., "Stop touching her. She's my teacher.") with the exception of when the peer is touching Michael with any body part or any hand-held item).

Henri. Disruption for Henri was defined as aggression (hitting others with an open palm or closed fist from a distance of at least 6 inches, kicking any body part of another person with one foot or both feet from a distance of at least 6 inches), leaving the instructional area without permission (lying on the floor, sitting under the instructional table, pushing his chair more than 12 inches away from its original position at the start of the work session or as repositioned by a staff member during the work session unless instructed to do so, sitting on the floor more than 12 inches away from his chair), not following directions (not beginning to follow a direction within 3 s, not having completed following a direction within 3 s of the second request), responding inappropriately to instructional questions to identify a letter (giving unrelated responses (e.g., a number, a shape) with the exception of saying a word that starts with the same letter as on the presented flashcard, saying multiple incorrect letters with less than 1 s in between the different letters, making any non-word vocalization lasting more than 1 s, verbally

indicating refusal to respond (e.g., “I don’t know,” “It’s too hard,” “No.”), not responding with a letter answer within 5 s of a second request to respond (e.g., “You need to try,” “It’s time to work. What letter?”), repeating the same incorrect response after being told to make another attempt (e.g., “Try again,” “No, not B.”)), and turning away from instruction. (turning his head more than 45 degrees away from a flashcard for more than 3 s, covering both eyes with any body part or any materials for more than 3 s).

Procedures

Teachers for all three participants hypothesized that their disruptive behavior was primarily maintained by escape from task demands. However, an FA was conducted for each participant to increase the probability of implementing function-matched reinforcement during NCR and NCR-S sessions. All FA procedures were implemented similar to those outlined by Iwata et al. (1994) with the exclusion of an alone condition. Based on information reported by classroom teachers, none of the participant’s disruptive behavior appeared to be maintained by automatic reinforcement. Maggie, Caroline, and Sarah conducted the FA for Andrew, Michael, and Henri respectively under the direction of the student researcher via a microphone and wireless earbud system. This allowed the student researcher to prompt staff members regarding how to appropriately respond throughout each condition. The student researcher also described all procedures to staff members prior to their conducting the first FA session.

All FA sessions were conducted using a multielement design with three conditions in the following fixed sequence: attention, control, escape. A fixed sequence was selected to maximize the effects of the preceding condition as an establishing

operation on the next condition (Hammond, Iwata, Rooker, Fritz, & Bloom, 2013). One to two FA sessions were conducted per day over consecutive school days until a stable data trend was achieved and the more probable function of problem behavior was determined (e.g., a clear separation of the escape data path from the attention and control data paths). During each FA session, conditions lasted 5 min with a 1 min interval between conditions. Staff participants wore a different color shirt during each condition to help participants differentiate the conditions (i.e., a red shirt during the attention condition, a green shirt during the control condition, a blue shirt during the escape condition). The specific characteristics of each condition are described as follows.

Attention. During the attention condition, each participant was given access to moderately easy activities (drawing supplies for Andrew, familiar puzzles for Michael and Henri). For Andrew, Maggie gave an instruction to do the assigned activities while she "did some work," then turned away from the participant and pretended to engage in paperwork. A similar procedure was used by Sarah for Henri. For Michael, Caroline asked him to do the assigned activities while she worked with another student approximately 1 ft away. Following any occurrence of disruptive behavior, the staff member turned to the participant and gave a brief redirection (e.g., "You need to get back to work.").

Control. During the control condition, each participant was given unfettered access to preferred activities and edible items (e.g., toys, pretzels, candy, chips). The staff member made no demands of the participant and provided prosocial comments lasting 1-3 s on an FT 20 s schedule. If the participant initiated a social interaction outside of the

FT schedule, the staff member briefly responded with a prosocial comment. Staff members gave no response following any occurrence of disruptive behavior.

Escape. During the escape condition, the staff member asked the participant to engage in a typical work session (i.e., identifying letters for Andrew and Henri, identifying functions of body parts or requiring peer observation for Michael) with the addition of the following 3-step prompting procedure: (1) the participant was given an instructional demand, (2) if after 5 s no response was given, the staff member asked the participant to try to respond, and (3) if after 5 s still no response was given, the staff member provided assistance (e.g., encouraged the participant to ask for help or modeled the correct response). The staff member removed all instructional materials and said, "You don't have to." immediately following any occurrence of disruptive behavior. Task demands were again presented following the absence of disruptive behavior for 30 s.

Behavior Skills Training

Staff members participated in a one-to-one 30 min behavior skills training (BST) with the student researcher similar to the model described by Parsons, Rollyson, and Reid (2012). All BST sessions occurred following experimental baseline sessions, and before NCR and NCR-S sessions began for the respective participant. Each BST incorporated the appropriate FT schedule for the corresponding participant (FT 15 s for Andrew, FT 22 s for Michael, FT 34 s for Henri) and a 15-s break.

First, the student researcher explained the NCR treatment by presenting needed materials (MotivAider®, timer, any needed instructional materials) and verbally

describing each step. The student researcher then twice modeled the NCR procedure by: (1) turning on the MotivAider® already set to the appropriate FT schedule, (2) maintaining task demands until the MotivAider® signaled the end of the FT interval via vibration, (3) cuing the availability of a break by saying, “Take a break,” (4) starting the break timer, (5) ignoring all behavior during the break, and (6) restarting the MotivAider® at the end of the 15-s break and reinitiating instruction. The student research then asked the staff member to practice this procedure until able to perform all steps with 100% accuracy as scored using a yes/no checklist for two consecutive iterations (see Appendix F). Any performance scoring less than 100% accuracy resulted in an immediate retraining of the incorrectly performed step(s) (Codding, Feinberg, Dunn, & Pace, 2005).

After staff members demonstrated mastery of the NCR treatment, the student researcher immediately began the NCR-S treatment training. The NCR-S training was similar to the NCR training with the substitution of an iPad® using the Time Timer® app for the MotivAider®. The Time Timer® app was set to audibly beep at the end of each FT interval. A yes/no checklist was also included to score staff members’ performance (see Appendix F).

Once staff members met criteria for implementing the NCR and NCR-S treatments, the student researcher began appropriate EXT procedure training. This consisted of explaining how to (1) maintain task demands during FT intervals using participant specific examples and (2) withhold the NCR break for 3-5 s if disruptive behavior occurred at the end of an FT interval to avoid adventitious reinforcement. The

student researcher modeled at least two examples of each step. The student researcher then asked the staff member to practice this procedure until able to perform all steps with 100% accuracy as scored using a yes/no checklist (see Appendix F) for two consecutive iterations.

NCR and NCR-S Treatments

Dependent Variables and Response Measurement

The primary dependent variable for each participant was the occurrence of disruptive behavior using the same 15-s partial interval time sampling procedure that was implemented during initial observations and FA sessions. Data were reported as the percentage of 15-s intervals during which problem behavior occurred (see Appendix G). The operational definition of disruptive behavior for each participant was the same as the definition used for FA sessions.

Experimental Design

The student researcher selected a multielement design for this study. Reasons for implementing this design included its ability to minimize sequence effects, minimal time requirements as compared to other experimental designs, and a randomization component that counteracted the possibility of multiple treatment interference (Cooper et al., 2007). Based on the results of the alternating treatments, additional design elements were unnecessary.

Procedures

All baseline and treatment sessions lasted 10 min and were conducted in the classroom during activities when problem behavior commonly occurred as reported by the classroom teacher. Activities were similar across all sessions for each participant, but varied across participants (i.e., during all baseline and treatment sessions, Andrew and Henri engaged in expressive letter identification, and Michael engaged in expressively identifying the functions of body parts). As a part of each participant's work program, staff members provided tokens and/or edible items accompanied by a brief statement (e.g., "That's great looking. You earned your point.") following appropriate attending behavior. During all baseline and treatment sessions, staff members varied how often they gave participants tangible reinforcement and did not consistently follow a pre-determined schedule.

Baseline sessions for each participant were conducted following his FA and prior to BST for the corresponding staff member. Baseline sessions continued for a minimum of five sessions and until the student researcher observed a stable trend that indicated a need for intervention. Immediately following BST for staff members, the NCR and NCR-S treatment sessions were initiated consistent with a multielement design and in quasi-random order. Specifically, NCR and NCR-S session order was randomized in clusters of even proportions (e.g., five NCR and five NCR-S sessions at a time) using the website random.org. This process was repeated as needed until treatment sessions were terminated.

The student researcher determined the FT schedule for each participant by

calculating the mean latency to the first disruptive behavior during baseline sessions as described by Lalli et al. (1997). The FT schedule specific to each participant was used across all NCR and NCR-S treatment sessions (FT 15 s for Andrew, FT 22 s for Michael, FT 34 s for Henri). Since all FA data indicated escape as the most likely function of disruptive behavior for each participant, a 15-s break was delivered following each FT interval. The length of time for the break was determined based on feasibility, the length of work sessions, and age of participants.

Typically, two NCR and/or NCR-S treatment sessions occurred per day 3-4 days a week over 5-6 weeks. This resulted in 10-13 sessions of each treatment per participant (i.e., 10 NCR and 11 NCR-S sessions for Andrew, 12 NCR and 12 NCR-S sessions for Michael, 12 NCR and 13 NCR-S sessions for Henri). Since sufficiently stable and separate data paths were never achieved for any of the three participants during the multielement phase of the study, research did not continue beyond this point (described in detail in Results and Discussion chapters).

Staff members were not responsible for any data collection during baseline or treatment sessions. Any error in treatment fidelity by staff members elicited a brief retraining immediately following the treatment session. The retraining was conducted as previously described (i.e., the student researcher retrained any incorrectly performed step(s) and require two consecutive observations of those steps implemented with 100% accuracy). All baseline and treatment sessions were digitally recorded using an iPad®. All data were recorded on the appropriate data sheet by viewing the digital recordings at a different location.

Baseline. Typically, two baseline sessions occurred per day 3-4 days a week over 1-2 weeks. The first 6 baseline sessions conducted for Michael were ultimately excluded due to significant time gaps between sessions and possible confounding variables (e.g., intermittent absences due to illness, changes to typical activities over several days due to holiday festivities, multiple weeks when school was not in session).

At the beginning of each baseline session, the student researcher instructed the staff member to interact with the participant in a usual manner, including any reinforcement programs or other behavior management practices already in place. Andrew's reinforcement program consisted of giving him a small edible item (e.g., fruit snack, Skittle®) of his choice for every three tokens earned and a short break during which he could eat it. During all baseline sessions, Andrew was given a mean of 2.8 edible items (range 2 to 4) with a mean break time of 28 s (range 8 to 36 s) to eat the edible item. No instruction was delivered during this break. The mean total amount of time during which instruction was suspended per baseline session was 82 s (range 56 s to 97 s). For Michael and Henri, staff members typically gave them a total of three tokens by the end of the session. If three tokens were earned, staff members allowed Michael and Henri to choose a small treat following the session.

NCR treatment. Prior to the first NCR treatment session, the staff member briefly explained to the participant that he would receive breaks throughout the work session and was to remain in his seat during the break. The staff member wore a MotivAider® (e.g., in a pocket, hooked to a waistband) that had been set to the pre-determined FT schedule for the given participant. Each time the MotivAider® vibrated,

the staff member told the participant to take a break. If disruptive behavior occurred simultaneously with the completion an FT interval, the staff member withheld the break for 3-5 s from when the disruptive behavior concluded to avoid potential adventitious reinforcement.

Staff members provided reinforcement to each participant contingent on appropriate attending behavior similar to baseline sessions. Per session, Andrew was given a mean of 2.1 edible items (range 1 to 3) with a mean break time of 28 s (range 19 to 42 s) to eat the edible item. The mean total amount of time during which instruction was suspended per NCR session was 57 s (range 26 to 76 s). Staff members continued to give Michael and Henri up to three tokens by the end of the session and the opportunity to choose a small treat following sessions when three tokens were earned.

NCR-S treatment. The NCR-S treatment sessions were similar to the NCR treatment sessions with the substitution of an iPad® using the Time Timer® app with an audible beep for the MotivAider®. At the beginning of the treatment session, the staff member placed the iPad® 1-2 ft away from the participant and within his view. All other aspects of the NCR-S treatment were similar to the NCR treatment as previously described.

Staff members provided reinforcement to each participant contingent on appropriate attending behavior similar to baseline and NCR sessions. Per session, Andrew was given a mean of 2.1 edible items (range 1 to 3) with a mean of 26 s (range 19 to 58 s) to eat the edible item. The mean total amount of time during which instruction was suspended per NCR-S session was 51 s (range 24 to 77 s). Staff members continued

to give Michael and Henri up to a total of three tokens by the end of the session and the opportunity to choose a small treat following sessions when three tokens were earned.

Interobserver Agreement

The student researcher acted as the primary data collector for all pre-experimental measures, FAs, BST, and all experimental conditions. A secondary data collector coded at least 40% of all FA and experimental conditions, except for Andrew due to an external hard drive failure and loss of digital recordings, to verify IOA (see Appendices G and H). For Andrew, 44% of FA conditions, 40% of baseline sessions, 10% of NCR sessions, and 18% of NCR-S sessions were coded. For Michael, 42% of FA conditions, 40% of baseline sessions, 42% of NCR sessions, and 42% of NCR-S sessions were coded. For Henri, 40% of FA conditions, 44% of baseline sessions, 42% of NCR sessions, and 42% of NCR-S sessions were coded.

The student researcher trained the secondary data collector and required her to demonstrate data coding accuracy at or above 90% before coding any research data. Additional training took place if at any time IOA fell below 90%. IOA was calculated by dividing the number of agreements by the total number of agreements and disagreements and multiplying by 100. The mean IOA for Andrew was 100% for FA conditions and 96.5% (range of 95% to 98%) for baseline sessions. IOA for NCR and NCR-S sessions were not recorded due to an external hard drive failure and loss of digital recordings. The mean IOA for Michael was 99% (range of 95% to 100%) for FA conditions, 95% (range of 90% to 100%) for baseline sessions, 95.5% (range of 82.5% to 100%) for NCR

sessions, and 94% (range of 90% to 97.5%) for NCR-S sessions. The mean IOA for Henri was 98.8% (range of 95 % to 100%) for FA conditions, 95% (range of 87.5% to 100%) for baseline sessions, 93.8% (range of 90% to 100%) for NCR sessions, and 96.2% (range of 94% to 100%) for NCR-S sessions.

Treatment Integrity

Treatment integrity was measured using yes/no checklists (see Appendix H) similar to those implemented during BST for staff members. The student researcher specifically measured if staff members had correctly implemented NCR and NCR-S treatments by (1) turning on the MotivAider® or iPad at the beginning of the work session or following 15-s breaks, (2) maintaining appropriate instructional demands until the MotivAider® or iPad signaled the end of the FT interval via vibration or an audible beep, (3) implementing the correct EXT procedure if disruptive behavior occurred simultaneously with the end of an FT interval, (4) cuing the availability of a break (e.g., “Take a break”), (5) starting the break timer, and (6) ignoring all behavior during the break.

The student researcher gathered treatment integrity data for one NCR session and two NCR-S sessions for Andrew, and all NCR and NCR-S sessions for Michael and Henri (see Appendix H). Treatment integrity was calculated by dividing the number of correctly implemented steps by the total number of steps and multiplying by 100 to generate a percentage. For Andrew, treatment integrity was 87.7% for the first NCR session, 90.1% for the first NCR-S session, and 92.8% for the second NCR-S session.

The remaining nine NCR and nine NCR-S sessions were not coded for treatment integrity due to an external hard drive failure and loss of digital recordings. For Michael, the mean treatment integrity was 95.2% (range 86% to 100%) for NCR sessions and 95.6% (range 81.3% to 100%) for NCR-S sessions. For Henri, the mean treatment integrity was 97.2% (range 92.6% to 100%) for NCR sessions and 97.6% (range 91% to 100%) for NCR-S sessions.

A secondary data collector coded data via digital recordings to verify treatment integrity of the critical treatment steps for NCR and NCR-S treatments. Treatment integrity IOA was calculated by dividing the number of agreements by the total number of agreements and disagreements and multiplying by 100. For Michael, the secondary data collector coded 40% of NCR sessions and 45% of NCR-S. The mean treatment integrity IOA was 96.6% (range of 91% to 100%) for NCR sessions and 96.4% (range of 92% to 100%) for NCR-S sessions. For Henri, the secondary data collector coded 42% of NCR sessions and 46% of NCR-S sessions. The mean treatment integrity IOA was 96.2% (range of 94% to 100%) for NCR sessions and 97.5% (range of 96% to 100%) for NCR-S sessions.

Consecutive NCR and NCR-S sessions were scored by both the primary researcher and secondary data collector until staff members demonstrated at least 90% treatment fidelity over two consecutive sessions of the same treatment condition. Retraining was conducted for any observed treatment integrity errors immediately following treatment sessions using a least to most prompting system (Codding et al., 2005).

Social Validity Measure

Social validity measures were implemented for staff members and participants following the completion of the study. Staff members were asked to anonymously complete an online questionnaire using Google® forms (see Appendix I). The student researcher implemented a Likert scale (i.e., strongly agree, agree, somewhat agree, somewhat disagree, disagree, strongly disagree) for staff members to rate ease of implementation, perceived treatment effectiveness, the likelihood of recommending NCR or NCR-S to others, a need for further training, and the likelihood of future implementation for each treatment condition. Staff members were also asked to indicate their overall preference for the NCR treatment versus the NCR-S treatment.

The social validity measure for participants consisted of the student researcher asking participants to rate how much they liked the NCR and NCR-S treatments, and which treatment they preferred overall. A developmentally appropriate visual representation of a Likert scale (i.e., frowny face, straight face, smiley face) was used for participants to rate the treatment conditions. The student researcher presented the three faces, explained what each face meant, and asked participants to point to the face corresponding to how they felt about each treatment condition. The student researcher measured participants' overall treatment preference by presenting pictures representing the treatment conditions and asking them to point to the picture they preferred (see Appendix J).

CHAPTER IV

RESULTS

Functional Analyses

Figure 1 shows the results of the FA administered to each participant. For Andrew, disruptive behavior occurred at consistently high and stable levels during the escape condition with a mean of 96.7% (range 90% to 100%). Disruptive behavior did not occur during the first attention session (session 1) but was observed at a moderate level of 40% during both sessions 4 and 7 with a mean of 23.3% (range 0% to 40%). Disruptive behavior remained low and stable during all control sessions with a mean of 6.7% (range 5% to 10%). When comparing data paths, a clear and significant separation was observed between the escape condition and other FA conditions. These data indicated escape as the most likely function of disruptive behavior for Andrew.

For Michael, the highest levels of disruptive behavior occurred during the escape condition with a mean of 45% (range 20% to 70%). A decreasing trend was observed during the final two escape sessions; however, a clear separation persisted throughout the entire escape data path when compared to other data paths. During the attention condition, disruptive behavior occurred at mostly low levels with a mean of 15% (range 5% to 40%). Following the second attention session (session 4 at 40%), staff members reported that a puzzle had been inadvertently included and was likely too difficult for Michael to complete independently. This puzzle was not included during any other attention sessions. Data during the control condition followed a stable and decreasing

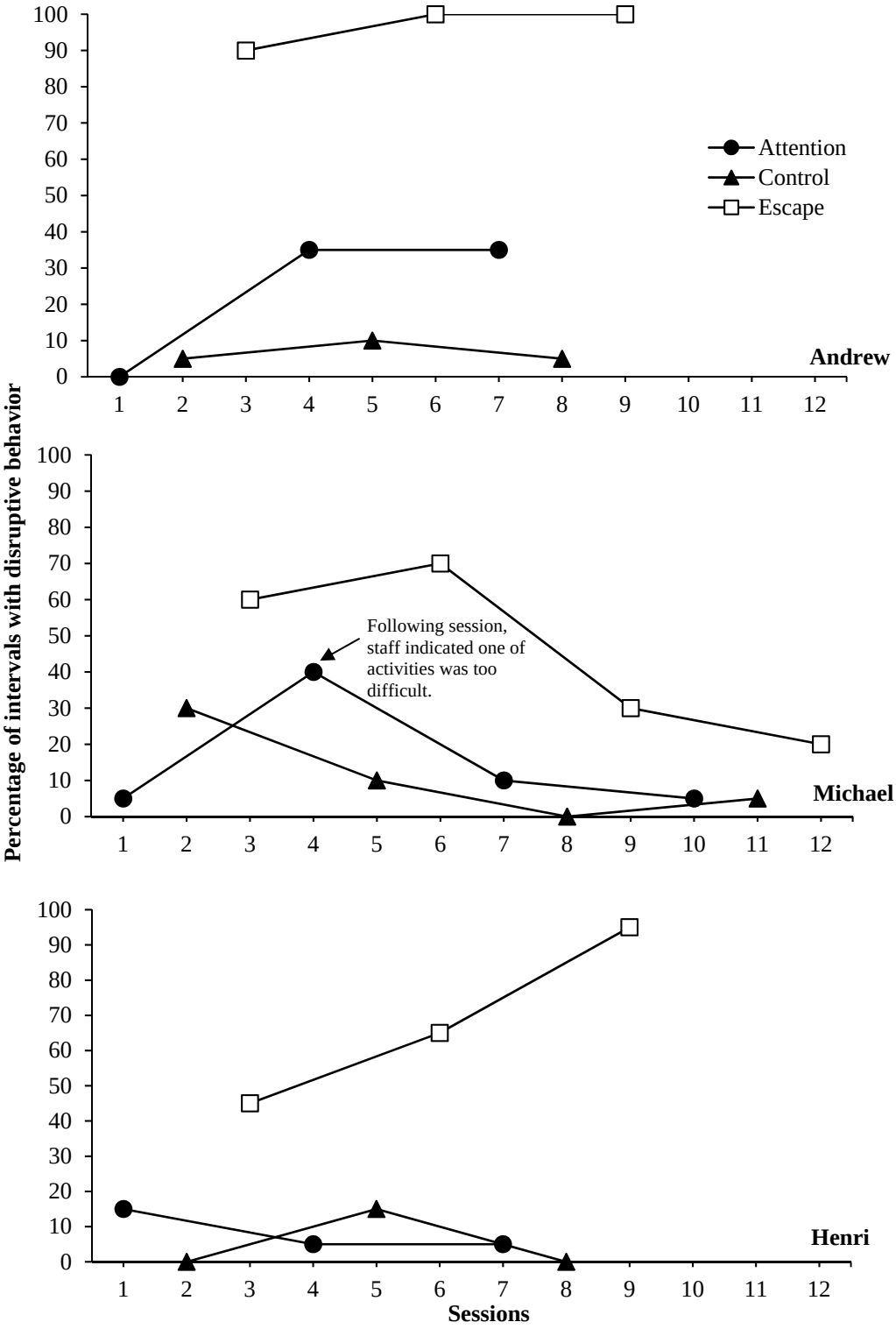

Figure 1. Percentages of intervals during which Andrew, Michael, and Henri engaged in disruptive behavior during functional analyses.

path with a slight increase during the final session (session 11). Disruptive behavior occurred at a mean of 11.3% (range 0% to 30%). When comparing the data paths, escape was the most likely function of disruptive behavior for Michael.

For Henri, disruptive behavior occurred at a stable and increasing rate during the escape condition with a mean of 68.3% (range 45% to 95%). A significant separation was observed between the escape condition data path and the other FA data paths. Disruptive behavior occurred at stable and low levels with a mean of 8.3% (range 5 to 15%) during the attention condition and a mean of 5% (range 0 to 15%) during the control condition.

NCR and NCR-S Treatments

Figure 2 shows the percentages of 15-s partial time sampling intervals during which disruptive behaviors occurred for each participant throughout baseline, NCR, and NCR-S sessions. When comparing treatment sessions with baseline, results varied significantly between participants.

Andrew

Andrew engaged in disruptive behavior during a mean of 60.5% of intervals (range 52.5% to 70%) during baseline. Levels of disruptive behavior decreased during session 3 as compared to session 2 and decreased slightly during session 5 as compared to session 4. However, overall baseline data indicated an increasing and stable trend. Disruptive behavior also occurred during at least 50% of intervals for all baseline sessions, indicating a need for intervention.

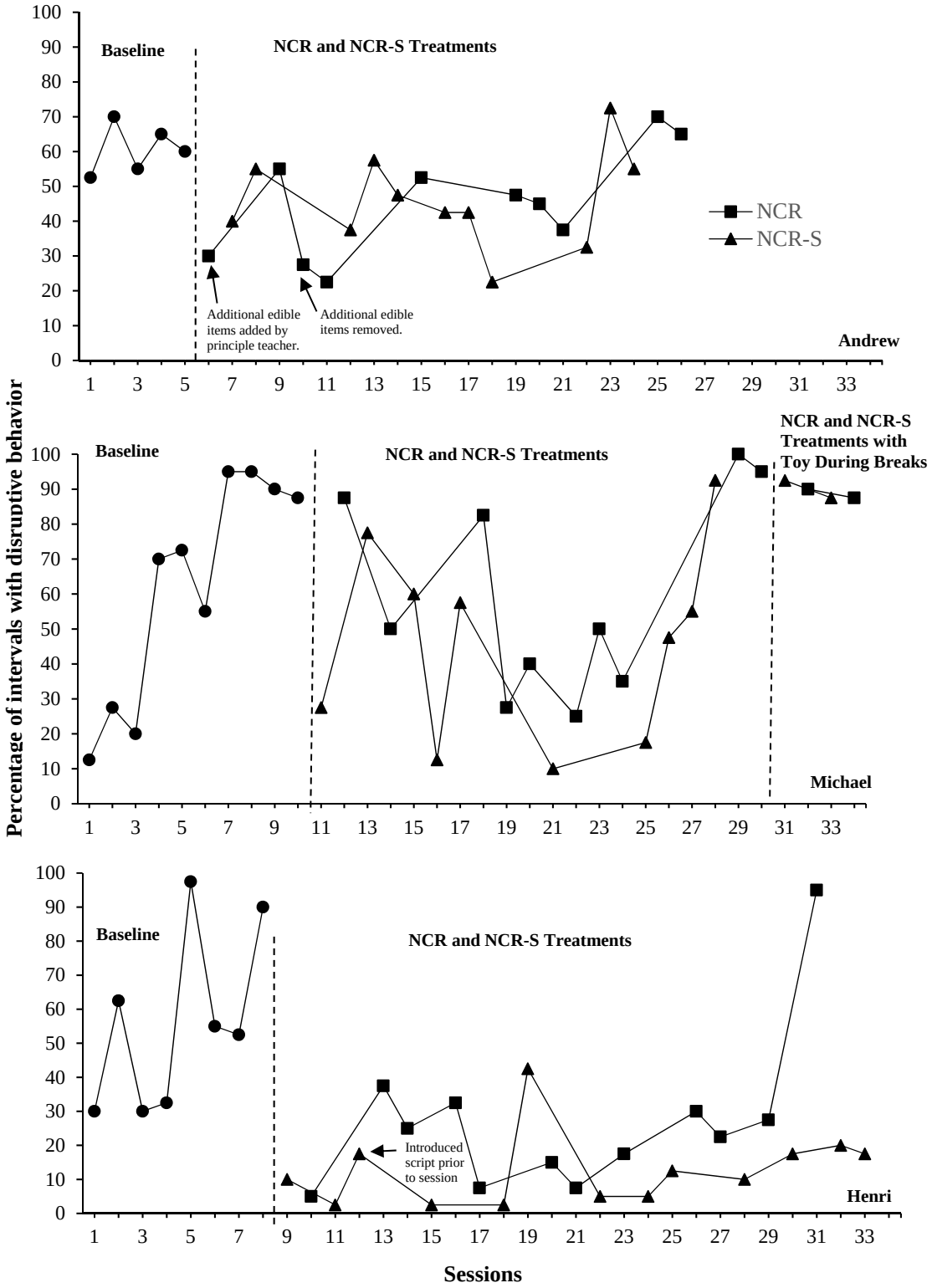

Figure 2. Percentages of intervals during which Andrew, Michael, and Henri engaged in disruptive behavior during baseline, NCR, and NCR-S sessions.

In comparison to baseline, disruptive behavior occurred at a mean of 45.3% (range 22.5% to 70%) during NCR sessions (15.2% lower than baseline) and a mean of 45.9% (range 22.5% to 72.5%) during NCR-S sessions (14.6% lower than baseline). Significant decreases in levels of disruptive behavior as compared to baseline were observed during some NCR and NCR-S sessions (notably sessions 6, 10, 11, and 21 for NCR and sessions 7, 12, 18, 22 for NCR-S). However, an overall stable decrease of disruptive behavior did not occur during NCR or NCR-S treatment sessions.

When comparing NCR and NCR-S data paths, little separation was initially observed. The NCR data path crossed the NCR-S data path prior to sessions 9 and 10. By session 10, the NCR data path had moderately decreased in comparison to the NCR-S data path, demonstrating a brief separation until data paths again crossed over immediately prior to session 15. From that point onwards, the NCR and NCR-S data paths maintained a relatively similar trend and level with little separation except for a brief moderate decrease during NCR-S session 18. Following session 22, the NCR-S data path trended significantly upwards, crossing the NCR data path prior to session 23 and again prior to session 24.

Both NCR and NCR-S treatment data paths were at least moderately variable, demonstrated no significant separation, and crossed over each other on five occasions. Given these results, the student researcher was unable to establish experimental control with this participant.

Michael

During baseline sessions, Michael demonstrated disruptive behavior for a mean of 62.5% (range 12.5% to 95%). Disruptive behavior was low during initial sessions, but significantly increased to at least 50% of intervals for the majority of baseline sessions (i.e., 7 out of 10 baseline sessions). Although there was a decrease in disruptive behavior during session 6 and a slight decrease during sessions 9 and 10, the data path demonstrated an overall increasing trend and high levels of disruption in need of intervention.

When compared to treatment sessions, Michael engaged in disruptive behavior for a mean of 64.2% (range 25% to 100%) during NCR sessions and a mean of 53.1% (range 10% to 92.5%) during NCR-S sessions. Results for the NCR and NCR-S treatment conditions were highly variable. Both NCR and NCR-S data paths demonstrated a somewhat decreasing trend, albeit unstable, until session 23 for NCR and session 25 for NCR-S. Both data paths then rapidly increased to high levels of disruption.

Significant separation was observed between the first NCR-S (session 11) and NCR (session 12) treatment sessions with disruption occurring significantly less during the NCR-S session as compared to the NCR session. Additional brief decreases in disruptive behavior were also observed during NCR-S sessions 16, 21, and 25 as compared to NCR sessions, resulting in some separation between data paths. However, data paths crossed frequently (prior to session 13, 15, 19, 20, 28) and the student researcher observed little overall separation between data paths.

Following session 30, the student researcher questioned if escape was indeed the

primary function of disruptive behavior given a lack of experimental control. Based on observation and information from the classroom teacher, the student researcher hypothesized that access to tangibles may have been the primary function of disruptive behavior. In order to test this hypothesis, the student researcher instructed the staff member to grant access to a preferred toy during all subsequent NCR and NCR-S condition breaks. The student researcher determined a preferred toy by conducting a multiple-stimulus without replacement preference assessment (MSWO; see Appendix K) prior to each session using procedures similar to those described by Carr, Nicolson, and Higbee (2000). Results indicated continued high rates of disruptive behavior during both NCR and NCR-S treatment sessions when the staff member allowed access to a preferred item with little separation between data paths. In summary, the student researcher was unable to establish experimental control with this participant.

Henri

Baseline data for Henri were somewhat variable. However, an overall increasing trend was observed with significant increases in disruptive behavior during sessions 2, 5, and 8. In other words, the level of Henri's disruptive behavior reflected a need for intervention with a mean of 56.3% (range 30% to 97.5%).

In comparison, disruptive behavior occurred at a mean of 26.9% (range 5% to 95%) during NCR sessions and a mean of 12.7% (range 2.5% to 42.5%) during NCR-S sessions. The NCR data path demonstrated lower levels and less variability than baseline, but a significant increase in disruptive behavior during the final session similar to sessions 5 and 8 during baseline. In contrast with baseline and NCR data paths, the NCR-

S data path was more stable, relatively flat (with the exception of session 19), significantly lower than baseline, and somewhat lower than NCR. A slightly increasing trend was observed beginning at session 25, continuing at sessions 30 and 32, but began to decrease at session 33.

A moderate separation occurred when comparing the majority of the NCR and NCR-S data paths with infrequent cross over (prior to sessions 11, 19, 22). Throughout initial treatment sessions, the student researcher observed that Henri engaged in higher rates of disruptive behavior during breaks than during instruction. Given this observation, a brief script was added immediately prior to session 12 and was used before all subsequent sessions to remind Henri of appropriate behavior during breaks ("When you take a break, you need to stay in your chair and your chair needs to stay at the table").

Based on these results, the student researcher was able to demonstrate some degree of experimental control indicating the NCR-S treatment may have been more effective than the NCR treatment for this participant. However, circumstances prohibited additional treatment sessions following the slight increase in disruptive behavior during NCR-S sessions 30 and 32 (e.g., Henri was absent for at least two weeks due to illness, the classroom teacher was required to make significant changes to Henri's daily reinforcement program when he returned). Since these events could have acted as confounding variables, treatment sessions concluded following session 33.

Social Validity Measure

Based on results from the NCR post-treatment questionnaire, all staff members

agreed that this treatment was easy to implement and would not require additional training to implement in the future. Two staff members somewhat agreed and one staff member somewhat disagreed that this treatment was effective and would recommend it to others. One staff member somewhat agreed and two staff members somewhat disagreed that they would implement this treatment in the future.

Based on results from the NCR-S post-treatment questionnaire, two staff members agreed and one staff member somewhat agreed that this treatment was easy to implement. One staff member agreed, one staff member somewhat agreed, and one staff member somewhat disagreed that this treatment was effective. One staff member agreed and two staff members somewhat agreed that they would recommend this treatment to others. All staff members agreed they would not require additional training to implement this treatment in the future. One staff member somewhat agreed and two staff members somewhat disagreed that they would implement this treatment in the future. Two of the three staff members preferred the NCR treatment to the NCR-S treatment. One staff member preferred the NCR-S to the NCR treatment.

When participants were asked how much they liked the NCR treatment, all three participants pointed to the straight face. When participants were asked how much they liked the NCR-S treatment, Andrew and Michael pointed to the smiley face and Henri pointed to the frowny face. When asked which treatment they preferred, Michael and Henri pointed to the NCR treatment icon and Andrew pointed to the NCR-S icon.

CHAPTER V

DISCUSSION

Results for Henri suggest NCR with signals may have been more effective than NCR alone in reducing his escape-maintained problem behavior. On the other hand, NCR and NCR-S data for Andrew and Michael were too variable for either to be considered an effective treatment and lacked evidence of experimental control. In light of these findings, the student researcher will primarily discuss the challenges and limitations encountered throughout the course of this study.

The first challenge consisted of identifying preschoolers with autism who demonstrated sufficiently high rates of problem behavior and an understanding of a visually diminishing timer. Based on the limited availability of preschoolers who met these criteria, NCR with a visual timer may not be an appropriate intervention for preschoolers with autism who manifest significant problem behavior.

The second challenge dealt with the difficulty of controlling a number of confounding variables within the natural classroom setting for the length of time required to conduct the study. One possible confounding variable occurred when classroom staff added edible items to Andrew's edible reinforcer bin in the middle of the study. These additional edible items took more time to consume, which in turn required longer breaks from instruction, and appeared more highly preferred than other items. Measures were taken to present these edible items in smaller pieces; however, doing so appeared to evoke an increase in problem behavior. Following several treatment sessions, these edible items were removed from his reinforcer bin, which also may have evoked an increase in

problem behavior. In hindsight, the student researcher should have better explained that any modifications to reinforcement programs should be discussed before implementation.

Participant resistance to behavior change could have been a second confounding factor. Some participants might have been resistant to behavior change due to intermittent and inadvertent reinforcement of problem behavior by classroom staff over a significant period of time. In Michael's case, the student researcher observed instances of classroom staff temporarily removing task demands when Michael engaged in disruptive behavior (e.g., saying, "It looks like you are not ready to work, so I will come back to you in a minute," following which task demands were removed for up to several minutes) prior to treatment sessions and during non-treatment activities once treatment sessions began. The student researcher also observed instances of classroom staff allowing Andrew to engage in disruptive behavior (e.g., off-topic conversations) for brief periods of time instead of maintaining task demands. A prolonged intermittent reinforcement history of disruptive behavior could have been sufficient to maintain higher levels of problem behavior in spite of some reduction of disruptive behavior during NCR and NCR-S sessions. Requiring staff members to implement an extinction procedure during treatment sessions could have also contributed to variable levels of disruptive behavior if similar extinction procedures were not used at any other time.

A third challenge was encountered during the NCR-S treatment sessions. The student researcher had not planned to use an audible beep to signal the end of each FT interval. However, it was not feasible to position the Time Timer® within a readily available view of participants and staff members at the same time. It was also impractical

to ask staff members to visually monitor the Time Timer® without diverting their attention from student performance. Since an audible signal was added to NCR-S sessions, the student researcher cannot definitively conclude whether the visual timer or the audible signal possessed greater experimental control.

After reflecting on the research process, the student researcher was able to identify procedures that should have been executed differently. The first consideration consists of more extensive BST for treatment steps most likely be executed incorrectly. Based on treatment integrity data, staff members consistently maintained demands during instruction, signaled breaks appropriately, started the break timer correctly, and initiated instruction immediately following breaks with high levels of accuracy. Treatment integrity errors tended to occur due to (1) failure to deliver a break immediately following an FT interval, (2) delivering a break less than 3 s following disruptive behavior, and (3) the inability to always ignore all behavior during breaks. Given the difficulty staff members experienced implementing these steps in comparison with other steps, the student researcher should have conducted more in-depth BST prior to treatment sessions.

A second consideration relates to possibly misidentifying the function of a participant's disruptive behavior. For example, the student researcher should have included a tangible condition during Andrew's FA. Even though classroom staff did not provide information indicating his disruptive behavior was maintained by access to tangibles, the student researcher had observed that edible items and small toys had been a consistent part of his reinforcement program during work sessions. It is possible that his escape behavior could have been under at least partial control of tangible stimuli.

As a third consideration, the student researcher should have also considered implementing two types of attention conditions during the FAs of all participants to better analyze the function of disruptive behavior. The majority of attention from classroom staff to participants following disruptive behavior appeared to occur in the form of a redirection or reprimand. However, the student researcher did observe inconsistent prosocial comments by classroom staff following participants' disruptive behavior. By implementing a modified attention FA condition with prosocial comments as well as the attention FA condition with redirections and reprimands, some participants' FAs could have yielded different results.

Finally, the student researcher suspects participants were not always able to distinguish NCR sessions from typical work sessions without NCR breaks. The presence of the iPad® at the start of each NCR-S session likely signaled that breaks would be available even before the Time Timer® app was turned on. The student researcher observed several instances of a participant engaging in problem behavior prior to an NCR session that persisted well into the work session. In such cases, the participant may not have understood that breaks would be available throughout the work session until having experienced the first break. The student researcher could have incorporated a way to signal which type of treatment session was in process.

The student researcher offers the following recommendations for additional research. Firstly, future research should investigate whether a visual timer with an audible signal has greater experimental control than a visual timer without an audible beep. Secondly, additional research should evaluate the effects of NCR with signals on problem

behavior of older elementary children with autism (e.g., second graders) who might have a better understanding of visual timers. Thirdly, any participant related pre-screening measures during future research should consider if a more and less skills assessment is necessary. In other words, such a screening measure may not be necessarily when recruiting participants. Fourthly, a lower threshold for the occurrence of problem behavior may be appropriate as a criterion when recruiting participants (e.g., the occurrence of problem behavior during at least 30% of partial time sampling intervals instead of 50%). Lastly, social validity measures should be considered when determining how to incorporate NCR interventions into the classroom setting. For example, staff members agreed or somewhat agreed they would recommend NCR-S to others. However, two staff members somewhat disagreed that they would implement this intervention in the future even though they agreed it was easy to implement and they would not require additional training. Researchers should consider gathering more information regarding why classroom staff would recommend an intervention they may not implement themselves and problem-solve how to overcome this barrier. Researchers should also weigh an intervention's efficacy against student preference. For example, Henri's disruptive behavior significantly decreased during NCR-S sessions, but he indicated he preferred the NCR treatment and did not like the NCR-S treatment.

In conclusion, this study presents some evidence that NCR with signals was more effective than NCR alone in reducing problem behavior for one participant. However, overall data do not support NCR with signals as an effective intervention for preschoolers with autism. Additional research is necessary to determine if preschoolers with autism

may benefit from NCR when enhanced using signals in a natural special education setting. Further research should also explore at what age children with autism are most likely to benefit from NCR with signals in a natural special education setting.

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APPENDICES

Appendix A

Brief Caregiver Interview

Brief Caregiver Interview

Potential Participant: _____ **Site (A or B):** ____ **Today's Date:** _____

Respondent: _____ **Relationship to Student:** _____

Researcher: _____

1. How would you describe this student's problem behavior?

2. Approximately how often does this problem behavior occur (e.g., per min)

3. During which activities is problem behavior most likely to occur?

4. Does this problem behavior occur even when no one is interacting with the student?

5. What do you suspect the student is seeking by engaging in this problem behavior (i.e., what is the payoff for the student)?

Appendix B

More and Less Skill Assessment Data Sheet

Potential Participant #: _____ **Date:** _____ **Researcher:** _____

Instructions: Circle participant's responses. *Example: Set iPad® A to:* *15 s* *Set iPad® B to:* *45 s*

Trial 1:
Set iPad® A to: 30 s Set iPad® B to: 50 s
Cue: "Point to **LESS**."

Trial 2:
Set iPad® A to: 45 s Set iPad® B to: 10 s
Cue: "Point to **LESS**."

Trial 3:
Set iPad® A to: 50 s Set iPad® B to: 15 s
Cue: "Point to **MORE**."

Trial 4:
Set iPad® A to: 20 s Set iPad® B to: 55 s
Cue: "Point to **LESS**."

Trial 5:
Set iPad® A to: 30 s Set iPad® B to: 50 s
Cue: "Point to **MORE**."

Trial 6:
Set iPad® A to: 50 s Set iPad® B to: 10 s
Cue: "Point to **MORE**."

Trial 7:
Set iPad® A to: 20 s Set iPad® B to: 45 s
Cue: "Point to **LESS**."

Trial 8:
Set iPad® A to: 55 s Set iPad® B to: 25 s
Cue: "Point to **LESS**."

Trial 9:
Set iPad® A to: 45 s Set iPad® B to: 15 s
Cue: "Point to **MORE**."

Trial 10:
Set iPad® A to: 35 s Set iPad® B to: 10 s
Cue: "Point to **MORE**."

Correct Response Key:
Circled A/B = Correct response
Slash through A/B = Incorrect response

Trials									
1	2	3	4	5	6	7	8	9	10
A	B	A	B	B	A	A	B	A	A

Accuracy (%)

Appendix C

Caregiver/Informant Questionnaire

Caregiver/Informant Questionnaire

Adapted from Hanley (2012)

Participant: _____ **Site (A or B):** _____ **Today's Date:** _____

Respondent: _____ **Relationship to Student:** _____

Researcher: _____

BACKGROUND INFORMATION

- Describe language abilities:

- Describe play skills, preferred items, preferred toys and/or leisure activities:

PROBLEM BEHAVIORS

1. *Describe the problem behavior(s):*

   a. What do they look like?

   b. What is the *single most concerning* problem behavior (include intensity and potential for harm)?

   c. Are there additional concerning problem behaviors (no more than 3)?

   d. Are there precursor behaviors?

2. *Describe the conditions or situations under which they occur (antecedents)?*

   a. Time of day

   b. Activities

   c. People

   d. Transitions

3. *Describe what happens after the problem behavior (consequences)?*

   a. Peoples' reactions and responses

   b. Attempts to calm

   c. Attempts to distract

4. *Further Insights*

   a. Explain the possible reason(s) for problem behavior (what trying to communicate)

   b. Possible form of self-stimulation and why

Appendix D

Initial Observations Data Sheet

Initial Observations Data Sheet

Potential Participant: _____ **Date:** _____ **Start Time:** _____ **End Time:** _____

Total Time: ____ **min** ____ **s** **Data Collection Method:** Partial interval time sampling (15 s intervals)

15 s Interval	Video Time by 15 s interval	Occurrence of Disruptive Behavior		15 s Interval	Video Time by 15 s interval	Occurrence of Disruptive Behavior		15 s Interval	Video Time by 15 s interval	Occurrence of Disruptive Behavior	
1	:15-:30	Yes	No	15	3:45-4:00	Yes	No	29	7:15-7:30	Yes	No
2	:30-:45	Yes	No	16	4:00-4:15	Yes	No	30	7:30-7:45	Yes	No
3	:45-1:00	Yes	No	17	4:15-4:30	Yes	No	31	7:45-8:00	Yes	No
4	1:00-1:15	Yes	No	18	4:30-4:45	Yes	No	32	8:00-8:15	Yes	No
5	1:15-1:30	Yes	No	19	4:45-5:00	Yes	No	33	8:15-8:30	Yes	No
6	1:30-1:45	Yes	No	20	5:00-5:15	Yes	No	34	8:30-8:45	Yes	No
7	1:45-2:00	Yes	No	21	5:15-5:30	Yes	No	35	8:45-9:00	Yes	No
8	2:00-2:15	Yes	No	22	5:30-5:45	Yes	No	36	9:00-9:15	Yes	No
9	2:15-2:30	Yes	No	23	5:45-6:00	Yes	No	37	9:15-9:30	Yes	No
10	2:30-2:45	Yes	No	24	6:00-6:15	Yes	No	38	9:30-9:45	Yes	No
11	2:45-3:00	Yes	No	25	6:15-6:30	Yes	No	39	9:45-10:00	Yes	No
12	3:00-3:15	Yes	No	26	6:30-6:45	Yes	No	40	10:00-10:15	Yes	No
13	3:15-3:30	Yes	No	27	6:45-7:00	Yes	No				
14	3:30-3:45	Yes	No	28	7:00-7:15	Yes	No				
	Sub-Totals				**Sub-Totals**				**Sub-Totals**		

Total # of intervals WITH disruptive behavior: _____ **Total # of intervals WITHOUT any disruptive behavior:** _____

Total # of intervals with disruptive behavior/Total # of intervals = _____ X 100 = _____%

Comments regarding problem behavior:

Appendix E

Functional Analysis Data Sheet

Functional Analysis Data Sheet

Participant: _____ **Date:** _____ **Start Time:** _____ **End Time:** _____

Total Time: ____ **min** ___ **s** **Data Collection Method:** Partial interval time sampling (15 s intervals)

Name of Researcher: _____ **Role:** ☐ Primary researcher ☐ IOA researcher

FA Condition (check one): ☐ Attention Session #___ ☐ Control Session # ___ ☐ Escape Session #_____

15 s interval	Video Time	Occurrence of Disruptive Behavior	
0:00-0:15		Yes	No
0:15-0:30		Yes	No
0:30-0:45		Yes	No
0:45-1:00		Yes	No
1:00-1:15		Yes	No
1:15-1:30		Yes	No
1:30-1:45		Yes	No

15 s interval	Video Time	Occurrence of Disruptive Behavior	
1:45-2:00		Yes	No
2:00-2:15		Yes	No
2:15-2:30		Yes	No
2:30-2:45		Yes	No
2:45-3:00		Yes	No
3:00-3:15		Yes	No
3:15-3:30		Yes	No

15 s interval	Video Time	Occurrence of Disruptive Behavior	
3:30-3:45		Yes	No
3:45-4:00		Yes	No
4:00-4:15		Yes	No
4:15-4:30		Yes	No
4:30-4:45		Yes	No
4:45-5:00		Yes	No

Occurrence of Disruptive Behavior:

Total # of intervals with disruptive behavior/Total # of intervals = _____ X 100 = _____%

IOA:

Total # of agreements/(Total # of agreements + Total # of disagreements) = _____ X 100 = _____%

Appendix F

Behavior Skills Training Data Sheet

Behavior Skills Training Data Sheet

Staff Member: _____ **Date:** _____ **Site: (A/B):** _____ **Researcher:** _____

Session Type: ☐ NCR ☐ NCR-S

BST *without* Extinction Procedure at end of FT interval:

Practice Interval	Teacher starts MotivAider® or iPad® at beginning of practice interval?		Teacher maintains instructional demands?		Teacher cues break at end of FT interval (i.e., "Take a break.")?		Teacher starts break timer?		Teacher ignores all bx during break?		Teacher restarts MotivAider® or iPad® following break and resumes instruction?	
1	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
2	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
3	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
4	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
5	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO

BST *with* Extinction Procedure at end of FT interval:

Practice Interval	Teacher starts MotivAider® or iPad® at beginning of practice interval?		Teacher maintains instructional demands?		Absence of disruptive bx for 3-5 s before NCR/NCR-S break (EXT procedure)?		Teacher cues break following EXT procedure (i.e., "Take a break.")?		Teacher starts break timer?		Teacher ignores all bx during break?		Teacher restarts MotivAider® or iPad® following break and resumes instruction?	
1	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
2	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
3	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
4	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO
5	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO	YES	NO

Appendix G

Partial Interval Time Sampling Data Sheet

Partial Interval Time Sampling Data Sheet

Participant: _____ **Date:** _____ **Start Time:** _____ **End Time:** _____

Total Time: ____ **min** ____ **s** **Data Collection Method:** Partial interval time sampling (15 s intervals)

Name of Researcher: _____ **Role (Primary researcher/IOA researcher):** _____

Original Data or IOA Data (check one)? ☐ Original Data ☐ IOA

Experimental Condition (check one): ☐ Baseline Session _____ ☐ NCR Session _____ ☐ NCR-S Session _____

# of Breaks (if applicable): _____ **Time (s) to 1st disruptive behavior:** _____

15 s Interval	Video Time by 15 s interval	Occurrence of Disruptive Behavior		15 s Interval	Video Time by 15 s interval	Occurrence of Disruptive Behavior		15 s Interval	Video Time by 15 s interval	Occurrence of Disruptive Behavior	
1	:15-:30	Yes	No	15	3:45-4:00	Yes	No	29	7:15-7:30	Yes	No
2	:30-:45	Yes	No	16	4:00-4:15	Yes	No	30	7:30-7:45	Yes	No
3	:45-1:00	Yes	No	17	4:15-4:30	Yes	No	31	7:45-8:00	Yes	No
4	1:00-1:15	Yes	No	18	4:30-4:45	Yes	No	32	8:00-8:15	Yes	No
5	1:15-1:30	Yes	No	19	4:45-5:00	Yes	No	33	8:15-8:30	Yes	No
6	1:30-1:45	Yes	No	20	5:00-5:15	Yes	No	34	8:30-8:45	Yes	No
7	1:45-2:00	Yes	No	21	5:15-5:30	Yes	No	35	8:45-9:00	Yes	No
8	2:00-2:15	Yes	No	22	5:30-5:45	Yes	No	36	9:00-9:15	Yes	No
9	2:15-2:30	Yes	No	23	5:45-6:00	Yes	No	37	9:15-9:30	Yes	No
10	2:30-2:45	Yes	No	24	6:00-6:15	Yes	No	38	9:30-9:45	Yes	No
11	2:45-3:00	Yes	No	25	6:15-6:30	Yes	No	39	9:45-10:00	Yes	No
12	3:00-3:15	Yes	No	26	6:30-6:45	Yes	No	40	10:00-10:15	Yes	No
13	3:15-3:30	Yes	No	27	6:45-7:00	Yes	No				
14	3:30-3:45	Yes	No	28	7:00-7:15	Yes	No				
	Sub-Totals				**Sub-Totals**				**Sub-Totals**		

Total # of intervals WITH disruptive behavior: _____ **Total # of intervals WITHOUT any disruptive behavior:** _____

Total # of intervals with disruptive behavior/Total # of intervals = _____ X 100 = _____%

IOA:

Total # of agreements/(Total # of agreements + Total # of disagreements) = _____ X 100 = _____%

Appendix H

Treatment Integrity Data Sheet

Treatment Integrity Data Sheet

Participant: _____ **Digital Recording Date:** _____ **Start Time:** _____ **End Time:** _____ **FT interval:** ___ s

Name of Researcher: _____ **Role (check one):** ☐ Primary researcher ☐ IOA researcher

Date Coding Data: _____ **Reason (check one):** ☐ Teacher Tx Integrity ☐ IOA

Experimental Condition (check one): ☐ NCR session # _____ ☐ NCR-S session #_____

Starts MotivAider® or iPad® at Beginning of Session? YES NO

FT Interval ____ s	**Teacher maintains instructional demands?**		**Disruptive bx at end of FT interval?**		**If YES, absence of disruptive bx for 3-5 s before NCR/NCR-S break (EXT procedure)?**			**Teacher cues break at end of FT interval or following EXT procedure (i.e., "Take a break.")?**		**Teacher starts break timer?**		**Teacher ignores all bx during break?**		**Teacher restarts MotivAider® or iPad® following break and resumes instruction?**	
1	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
2	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
3	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
4	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
5	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
6	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
7	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
8	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
9	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO
10	YES	NO	YES	NO	YES	NO	NA	YES	NO	YES	NO	YES	NO	YES	NO

Treatment Integrity Accuracy:

Total # steps completed correctly: _____ Total # of steps: _____

Total # of steps completed correctly/total number of steps = _____ X 100 = _____%

IOA:

Total # of agreements/(Total # of agreements + Total # of disagreements) = _____ X 100 = _____%

Appendix I

Staff Member Questionnaire

Please complete this survey regarding your experience implementing interventions during the research study. All answers will be anonymous.

Breaks Using the iPad Timer

Please complete the following questionnaire related to your experience implementing the breaks using the iPad timer.

1. I found this intervention easy to implement.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Somewhat Disagree
- ◯ Somewhat Agree
- ◯ Agree
- ◯ Strongly Agree

2. I found this intervention to be effective.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Somewhat Disagree
- ◯ Somewhat Agree
- ◯ Agree
- ◯ Strongly Agree

3. I would recommend this intervention to others.

Mark only one oval.

- ◯ Strongly Disagree
- ◯ Disagree
- ◯ Somewhat Disagree
- ◯ Somewhat Agree
- ◯ Agree
- ◯ Strongly Agree

4. I feel I could implement this intervention again without additional training.
Mark only one oval.

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Somewhat Agree
- Agree
- Strongly Agree

5. I believe I will implement this intervention in the future.
Mark only one oval.

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Somewhat Agree
- Agree
- Strongly Agree

Breaks Using the MotivAider

Please complete the following questionnaire related to your experience implementing the breaks using the MotivAider.

1. I found this intervention easy to implement.
Mark only one oval.

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Somewhat Agree
- Agree
- Strongly Agree

2. I found this intervention to be effective.
Mark only one oval.

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Somewhat Agree
- Agree
- Strongly Agree

3. I would recommend this intervention to others.
Mark only one oval.

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Somewhat Agree
- Agree
- Strongly Agree

4. I feel I could implement this intervention again without additional training.
Mark only one oval.

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Somewhat Agree
- Agree
- Strongly Agree

5. I believe I will implement this intervention in the future.
Mark only one oval.

- Strongly Disagree
- Disagree
- Somewhat Disagree
- Somewhat Agree
- Agree
- Strongly Agree

Preferred Intervention

Which intervention did you prefer more?
Mark only one oval.

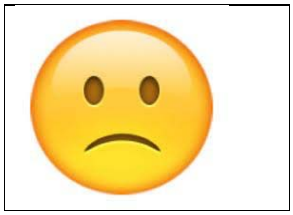
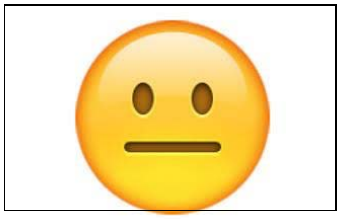
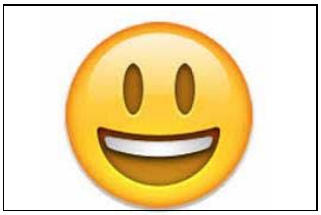
- Breaks with the iPad timer
- Breaks with the MotivAider

Appendix J

Participant Questionnaire

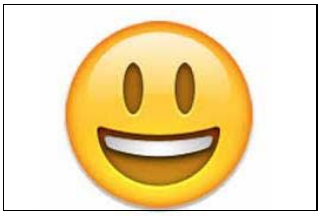
Participant Questionnaire

1. When the teacher gave me a break with no iPad timer, I felt:

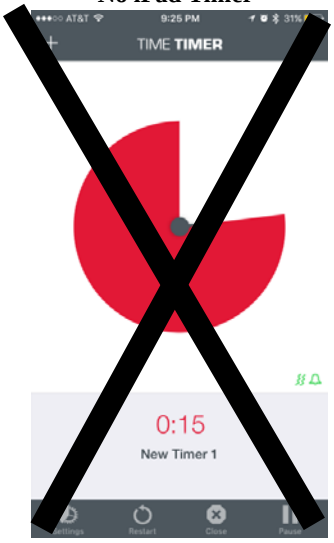
2. When the teacher gave me a break with the iPad timer, I felt:



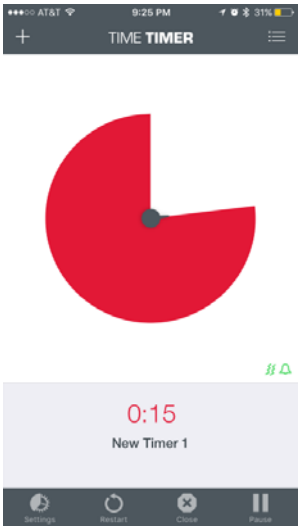


3. Which way did you like more?

No iPad Timer



With iPad Timer



Appendix K

MSWO Preference Assessment Data Sheet

MSWO Preference Assessment Data Sheet

(Carr, Nicolson, & Higbee; 2000)

Date: ______________________ Time: ______________________

Item	Rank by Trial 1	2	3	Sum of Trials (1+2+3)	Overall Rank (Smallest # is 1)

Date: ______________________ Time: ______________________

Item	Rank by Trial 1	2	3	Sum of Trials (1+2+3)	Overall Rank (Smallest # is 1)

Date: ______________________ Time: ______________________

Item	Rank by Trial 1	2	3	Sum of Trials (1+2+3)	Overall Rank (Smallest # is 1)