

INCREASED PARENT REINFORCEMENT OF EXISTING MANDS IN CHILDREN
WITH AUTISM: EFFECTS ON PROBLEM BEHAVIOR

By

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To Travis, my former student who inspired this study

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CHAPTER I

Introduction

Problem behavior such as aggression, self-injury, and property destruction occurs frequently in children and adults with autism and other developmental disabilities (DD) and is associated with poor prognoses in a number of life domains. Seven to 15% of adults with DD may have serious problem behavior (Emerson et al., 2001; Qureshi & Alborz, 1992), while 33% of young children with autism have been found to have clinical levels of problem behavior (Hartley, Sikora, & McCoy, 2008), representing rates of 3 to 5 times that of typical children (Baker, Blacher, Crnic, & Edelbrock, 2002; Baker et al., 2003; Feldman, Hancock, Rielly, Minnes, & Cairns, 2000). Furthermore, unlike many typical children who demonstrate problem behavior temporarily between ages 2 and 3 (Alink et al., 2006; Tremblay, 2004), problem behavior in children with DD tends to be highly persistent over time (Emerson & Robertson, 1996; Green, O'Reilly, Itchon, & Sigafoos, 2005), which can in turn lead to restricted educational (Parmenter, Einfeld, Tonge, & Dempster, 1998; Yianni-Coudurier et al., 2008) and residential (Borthwick-Duffy, Eyman, & White, 1987) placements, and may put these individuals at greater risk of abuse by staff and other caregivers (Rusch, Hall, & Griffin, 1986).

Decades of research into the causes of problem behavior for people with DD have found that these behaviors often serve a variety of common social functions for the individual, such as gaining the attention of others (Fischer, Iwata, & Worsdell, 1997; Kodak, Northup, & Kelley, 2007; Lindauer, Zarcone, Richman, & Schroeder, 2002),

avoiding or escaping aversive tasks (Carr, Newsom, & Binkoff, 1980; Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990), and gaining access to preferred activities, items, or foods (Hagopian, Wilson, & Wilder, 2001; Lalli & Kates, 1998). Interestingly, studies of response classes in children and adults with DD have shown that these individuals often have multiple means of meeting these same needs, including various forms of severe problem behavior (Albin, O'Brien, & Horner, 1995; Derby, Fisher, Piazza, Wilke, & Johnson, 1998; Lalli, Mace, Wohn, & Livezey, 1995; Sprague & Horner, 1992; Vollmer, Iwata, Smith, & Rodgers, 1992), milder forms of problem behavior (Harding et al., 2001; Lieving, Hagopian, Long, & O'Connor, 2004; Magee & Ellis, 2000; Richman, Wacker, Asmus, Casey, & Andelman, 1999), precursor behavior (innocuous behaviors that reliably precede problem behavior) (Borrero & Borrero, 2008; Langdon, Carr, & Owen-DeSchryver, 2008; Najdowski, Wallace, Ellsworth, MacAleese, & Cleveland, 2008; Smith & Churchill, 2002), and existing mands (Bowman, Fisher, Thompson, & Piazza, 1997; Grow, Kelley, Roane, & Shillingsburg, 2008). These studies have indicated that some children and adults with DD and problem behavior in fact have a variety of behaviors, some problematic and some not, to select from and use to access reinforcement.

Response Classes and Response Class Hierarchies in Individuals with DD

The multiple responses in an individual's behavioral repertoire that are maintained by the same reinforcer are said to make up a response class (Carr, 1988). Such responses are also described as functionally equivalent, in that each behavior serves the same function. When an individual emits response class members in a predictable

order, these responses are described as existing within a response class hierarchy (Lalli et al., 1995; Richman et al., 1999). The probability with which each behavior in a response class is selected and the order in which each is emitted is known to be affected by a number of factors, including the immediacy, quality, magnitude, and consistency of reinforcement associated with each response, as well as its history of punishment and the amount of effort needed to engage in the behavior (Sprague, 2005). Notably, with the exception of response effort, all of these factors are controlled in large part by facets of an individual's environment, and are particularly affected by the responses of the individual's interacting partner; therefore, the ways in which the interacting partner responds to the multiple behaviors of a person with DD may greatly affect the efficiency of each response, thereby affecting which response the person with DD uses to access reinforcement and whether or not it is problematic (Drasgow, Halle, & Phillips, 2001; Halle, Brady, & Drasgow, 2004). Because a primary factor affecting response selection is the amount of effort involved in each response, it follows that equalizing reinforcement across multiple members of a response class might result in some persons with DD choosing to access reinforcement through more desirable responses that are less effortful than problem behavior. In other words, if all other dimensions of reinforcement are controlled for, it is likely that children with DD would emit the least effortful response needed to produce the reinforcer (Harding et al., 2001; Lalli et al., 1995; Langdon et al., 2008; McGee & Ellis, 2002), thus conforming to the Law of Least Effort (Skinner, 1938).

An Important Variation in Response Class Study Methods

Two primary types of reinforcement and extinction procedures have been used in studies of response classes. The first and more frequent procedure involves contingency reversals, in which severe problem behavior is reinforced while alternative behaviors are placed on extinction with these contingencies reversed in comparison conditions (Borrero & Borrero, 2008; Bowman et al., 1997; Derby et al., 1997; Lalli et al., 1995; Richman et al., 1999; Smith & Churchill, 2002). If participants allocate to problem behavior during phases in which problem behavior is reinforced and alternative behavior is on extinction, and then allocate to alternative behavior during phases in which alternative behavior is reinforced and problem behavior is on extinction, it is determined that the two types of behavior are maintained by the same reinforcer. While these types of examinations have found that topographies of problem behavior, precursor behavior, and existing mands may be members of the same response class, they have not allowed for the investigation of participant choice between multiple responses when all produce reinforcement. In other words, during contingency reversals it is unclear whether participant problem behavior decreases due to participants demonstrating a preference for the alternative behavior or due to the effects of extinction of problem behavior.

Other studies that have examined response classes of problem behavior and participant preference for various response class members have investigated the effects of continually reinforcing severe problem behavior while alternating reinforcement and extinction of mild problem behavior (Harding et al., 2001; Lieving et al., 2004; McGee & Ellis, 2002) or precursor behavior (Langdon et al., 2008). These studies found that not only were these topographies sensitive to the same reinforcer, but when all were

reinforced on a continuous schedule the participant would choose to engage in one topography over another, and would often allocate to the response that appeared to require the least effort (Lalli et al; Richman et al.), thus decreasing severe problem behavior.

Previous studies of responses classes using the described methods have shown that severe problem behavior, mild problem behavior, precursor behavior, and existing mands may exist within response classes or response class hierarchies in some individuals with DD. Representative response class studies of each type of dependent variable are briefly reviewed, with an emphasis on describing studies that incorporated an analysis of participant choice between problem and alternative behaviors when both produced reinforcement. Interestingly, there has been a trend over time of response class studies targeting increasingly milder, and more adaptive, response class members. For this reason, studies are reviewed in an approximately chronological fashion and demonstrate an increasing focus on milder and more adaptive alternative responses to problem behavior over time.

Response Class Studies of Multiple Forms of Severe Problem Behavior

Early studies of response classes and problem behavior tended to focus on covariation of multiple topographies of severe problem behavior within response classes with little regard for probabilities of mild versus severe problem behavior or response class hierarchies (Derby et al., 1998; Sprague & Horner, 1992; Vollmer et al., 1992). Specifically, these studies focused on functionally equivalent forms of self-injury, aggression, destruction, and tantrums, and their covariation during reinforcement,

punishment, and extinction procedures. For example, Vollmer et al. initially targeted a participant's self-injurious behavior during a functional analysis and found that aggression and disruption tended to co-occur with the self-injury. The authors then implemented a function-based treatment plan and presented a graph of topography and its frequencies across conditions, showing that SIB, aggression, and disruption all increased during baseline and decreased during intervention. Furthermore, in the second baseline condition, trends for each of the problem behaviors followed similar trajectories. Because the responses covaried across conditions, Vollmer et al. hypothesized that the different topographies were members of the same response class.

Lalli et al. (1995) conducted one of the first investigations of a response class hierarchy of severe problem behavior. The authors reported a co-occurrence of escape-maintained screaming, aggression, and self-injury during their participant's functional analysis. Lalli et al. tested the order of these behaviors by sequentially providing escape contingent on each topography of problem behavior while placing others on extinction and recording the latency to response for each topography. Lalli et al. found that when self-injury was reinforced, the participant tended to engage in screaming, then aggression, then self-injury; when aggression was reinforced, the participant typically engaged in screaming, then aggression; and when screaming was reinforced, the participant engaged in screaming with occasional aggression and no self-injury. Lalli et al. concluded that each topography was a member of an escape-maintained response class hierarchy; however Lalli et al. did not examine participant allocation to these responses when all produced reinforcement.

Response Class Studies of Mild and Severe Problem Behavior

Harding et al. (2001) investigated response classes of mild versus severe problem behavior in two children with DD when both mild and severe problem behaviors were reinforced. Tantrums and task refusal demonstrated by both participants were grouped into one mild topography variable while aggression and destruction, also shown by each participant, were combined into one severe topography variable. The authors then conducted home-based functional analysis conditions and alternated between providing the reinforcer contingent on severe problem behavior only and providing the reinforcer contingent on either severe or mild problem behavior. When severe problem behavior alone produced the reinforcer, severe problem behavior occurred during up to 25% of intervals, while mild problem behavior was variable. When both severe and mild problem behavior produced the reinforcer, severe problem behavior immediately decreased to zero and remained at that level, while mild problem behavior continued to occur and became more stable. Therefore, when severe problem behavior was the only response that produced the reinforcer, participants engaged in severe problem behavior. When the reinforcer was also made available in response to mild problem behavior, participants allocated entirely toward mild problem behavior. Harding et al. argued that mild and severe problem behaviors were members of the same response class for each participant, in that either set of behaviors could be selected by the participant to produce the reinforcer. Furthermore, that only mild problem behavior was observed in conditions in which both mild and severe problem behavior were reinforced suggests that (a) participants preferred to engage in mild responses over severe responses to access the reinforcer, possibly because they required less effort, and (b) the two types of responses

may have existed within a response class hierarchy for each participant, in which mild problem behaviors were typically emitted before severe problem behaviors. In fact, Harding et al. included data on latency to response and found that when mild problem behavior was placed on extinction, mild behavior occurred before severe behavior for 100% and 93% of trials per participant. This order of responding would explain why both mild and severe problem behavior was observed when only severe behavior was reinforced, in that participants engaged in mild problem behavior first, then allocated to severe when mild did not produce reinforcement. Similarly, when mild and severe problem behavior were reinforced, only mild behavior was observed because participants engaged in mild behavior first, then ceased engaging in response options once mild problem behavior produced reinforcement.

Magee and Ellis (2000) and Lieving et al. (2004) studied participant allocation to mild and severe topographies of problem behavior when both types of responses were reinforced. In both studies, rates of multiple mild and severe problem behaviors were examined when (a) all topographies produced reinforcement and (b) as extinction was staggered across responses in a general order of increasing severity. Both investigations found that when all problem behaviors produced reinforcement, only the mildest topographies of problem behaviors were observed. Second, when mildest problem behaviors were placed on extinction, more severe problem behaviors increased. This pattern continued in both studies with a bias towards increases in responses that appeared to require the least effort. Magee and Ellis stated that the systematic increases in frequency of more severe problem behavior as milder problem behavior was placed on

extinction demonstrated that the dependent variables were maintained by the same reinforcer, or part of the same response class, and constituted a response class hierarchy.

Response Class Studies of Precursor Behavior and Problem Behavior

More recently, studies of response classes of problem behavior have expanded target behaviors to include responses described as *precursor behaviors*, or behaviors that reliably precede more severe problem behavior (Borrero & Borrero, 2008; Langdon et al., 2008; Najdowski et al., 2008; Smith & Churchill, 2002). Because the term *precursor behavior* is primarily defined by its order in preceding more severe problem behavior, and not by its form or topography, operational definitions of precursor behaviors have varied widely and have included (a) behaviors that could also be defined as mild problem behavior, such as screaming, crying, and loud vocalizations (Borrero & Borrero; Smith & Churchill); (b) idiosyncratic body movements (Langdon et al.); and (c) responses that could also be classified as mands, such as reaching for objects and demanding toys (Najdowski et al.). Similar to studies of mild versus severe problem behavior, most studies of precursor behavior have used contingency reversals to examine frequencies and functions of each type of response during each condition. Each study found evidence that precursor and severe problem behavior were functionally equivalent members of the same response class, but only one study used a design that allowed for investigations of participant allocation between responses when both were reinforced. Langdon et al. alternated conditions in which problem behavior alone produced reinforcement with conditions in which both problem behavior and precursor behavior produced reinforcement. Similar to the findings of Harding et al. (2001) and Magee and Ellis

(2000), Langdon et al. found that when both problem behavior and precursor behavior produced reinforcement, participants chose to engage in the milder response option, which in this study was precursor behavior.

Response Class Studies of Existing Mands and Problem Behavior

While previous studies of response classes of precursor and problem behavior have occasionally included dependent variables that could also be categorized as existing mands (Najdowski et al., 2008; Smith & Churchill, 2002), two studies have explicitly examined problem behavior and existing mands as potential members of the same response class (Bowman et al., 1997; Grow et al., 2008). Grow et al. used functional analysis procedures to identify variables maintaining participant problem behavior and placed problem behavior on extinction to induce participants to allocate to other response class members. The authors then identified the first occurring mand for each participant, which included saying “don’t”, shaking head “no”, and reaching for objects, respectively. Once the participant emitted a non-problematic mand for the reinforcer, it was reinforced while problem behavior was kept on extinction. This procedure resulted in decreased problem behavior and increased manding across participants, suggesting that reinforcing existing child mands in combination with extinction decreased functionally equivalent problem behavior. Bowman et al. (1997) reported two cases of undifferentiated functional analysis outcomes in which it was hypothesized that problem behavior functioned to increase the probability that others would comply with participants’ mands. The authors then conducted functional analysis sessions in which they alternated providing the reinforcer in response to problem behavior with providing the reinforcer in

response to participants' existing mands. Bowman et al. found that when existing mands were reinforced and problem behavior was on extinction, manding occurred frequently and problem behavior occurred rarely or not at all. Grow et al. and Bowman et al. concluded that participants' existing mands were functionally equivalent (Grow et al.) or functionally-related (Bowman et al.) to participants' problem behaviors, and that reinforcement of mands combined with extinction of problem behavior resulted in decreased problem behavior; however, because neither study included a condition in which both types of responses were reinforced, there was no examination of participant allocation between problem behavior and existing mands when both produced reinforcement, nor could any implications be drawn regarding hierarchical relations between the two dependent variables.

Summary and Research Questions

While previous studies of response classes of problem behavior, precursor behavior, and existing mands have found evidence that these responses may exist within the same response class as topographies of problem behavior, no studies to date have examined participant allocation between problem behavior and functionally equivalent existing mands when both responses produce reinforcement. Including a condition in which both problem behavior and existing mands can be used to access the reinforcer would allow further examination of participant choice and order of selection between these two competing behaviors. Furthermore, Grow et al. (2008) was the only study to reinforce existing mands as part of a treatment, as opposed to the sole purpose of examining a response class. Grow et al. found that once participants were induced to

display a mand, reinforcement of this mand combined with extinction of problem behavior decreased problem behavior for all participants. Empirical literature on response classes and problem behavior might be extended by further studies examining functional relations between problem behaviors and existing mands as a basis for intervention in problem behavior. Continuing to study not only functionally equivalent topographies of problem behavior, but functionally equivalent topographies of appropriate and problem behavior may help develop interventions that set the context for individuals with DD to engage in appropriate responses over problem behavior.

The purpose of this study was to examine the effects of increased parent reinforcement of existing child mands on functionally equivalent problem behavior in children with DD. In doing so, we attempted to answer the following research questions: (a) would extinction analyses of problem behavior and existing mands find that mands and problem behavior were members of the same response class; (b) would increasing reinforcement of existing child mands result in decreases in functionally equivalent problem behavior when problem behavior continued to produce reinforcement; (c) could the procedure be implemented by parents; and (d) would parents be able maintain procedures and results at home?

CHAPTER II

Method

Participants, Settings, and Materials

The present study was approved by the Vanderbilt University Institutional Review Board on April 6, 2010. After approval, potential participants were recruited through flyers posted in the Vanderbilt Kennedy Center (VKC), emails to local listservs of parents of children with DD available through the VKC recruitment coordinator Lynnette Henderson, and an ad placed on the VKC Study Finder website. Parents who responded to recruitment materials underwent a 2-step gated screening process, consisting of a telephone interview and in-home observation. The script for the telephone interview is provided in Appendix A.

The purpose of the telephone interview was to identify the child's primary caregiver, confirm the child's age and disability, confirm that English was spoken at home, and confirm that both problem behavior and manding occurred regularly in the home and that both may have been socially reinforced and maintained. If the interview indicated an English-speaking primary caregiver for the child and that the child participant (a) was between 2 and 8 years old, (b) was diagnosed with a developmental disability, (c) engaged in disruptive, destructive, aggressive, or self-injurious problem behavior and manding at home, and (d) had problem behavior and manding that may have been socially maintained, the dyad was considered appropriate for in-home

screening procedures. Parents who reported residing outside of a 1.5 hour driving radius were also excluded from the study, due to time and cost constraints. The purpose of the in-home screening observation was to confirm the presence of disruptive, destructive, aggressive, or self-injurious behavior and manding demonstrated by the child towards the parent in the same social condition (i.e., attention, escape, tangible), and to ensure that the parent did not already reinforce all existing child mands.

Sixteen parents responded to recruitment materials and were contacted by phone for a screening interview. Of the 16 phone interview participants, 9 were screened out of the study based on their responses during the interview. Three participants were screened out for not having forms of problem behavior relevant to the study (i.e. parents described problem behavior as hyperactivity, or saying “No”), two were screened out for residing outside of the study travel radius, one child was not diagnosed with a developmental disability, one child’s problem behavior was described as extremely high in severity (i.e. causing tissue damage) and it was not thought safe to reinforce problem behavior of such severity, and two families were placed on waiting lists because the study was full at the time of their interviews.

A total of seven potential child participants, ages 2 to 8, were screened at home for the existence of problem behavior and mands occurring in the same social condition. Child diagnoses as reported by parents indicated that three of the children were diagnosed with autism spectrum disorder; two children were diagnosed with Angelman’s Syndrome; one child was diagnosed with sensory processing disorder; and one child was diagnosed with pervasive developmental disorder – not otherwise specified. Potential parent

participants were also screened to ensure that they did not already reinforce all child mands. Screening observations were conducted by placing the child and parent in preference assessment, tangible, free play, escape, and attention conditions, each lasting 5 min. Parents were coached to set up the relevant context for each condition (i.e. divert their attention, place demands, or restrict toys or food) but were not coached on how to respond to problem behavior or mands. Further information on screening is included in the section on study procedures. Of the seven parent-child dyads screened at home, three children were screened out of the study due to lack of problem behavior, one child was screened out because he did not demonstrate manding in the same condition as problem behavior, and one parent ceased responding to experimenter emails and phone calls, leaving two parent-child dyads as participants. No parents were screened out from participation based on parent criteria.

Two children with autism and their mothers participated in the full study. NS was described by his mother as a 2-year 10-month-old Caucasian boy who had been diagnosed with high-functioning autism and exhibited disruptive and aggressive behavior at home towards both his mother and his 1-year 4-month-old brother. He communicated verbally using sentences and followed 1-step directions. NS was not taking any prescribed medications. NS's mother was a married, 34-year-old Caucasian woman with a bachelor's level education and some graduate course experience, and was a stay-at-home mom at the time of the study.

JA was described by his mother as a 5-year 6-month-old boy who had been diagnosed with autism and exhibited disruptive, destructive, aggressive, and self-

injurious behavior. He primarily communicated through gestures and one-word utterances, though occasionally used three-word sentences in the form of “I want _____”, and followed 1-step directions. JA was taking Seroquel and Risperidone as medication for mood and behavior throughout the course of the study, as well as Trazodone and Melatonin for sleep. JA’s mother was a 37-year-old Caucasian woman with a high school degree and some college course experience, was married, and worked full-time from home.

All sessions were conducted in participants’ homes using parents as interventionists. For NS, sessions were conducted in his bedroom which was 10 by 15 feet and had a crib, toys, and books apart from materials used for study sessions which are described below. NS’s younger brother was also present during sessions. Sessions for NS were conducted 0-4 times per week ($M = 2$) for 10 weeks and videotaped for subsequent data analysis. For JA, sessions were conducted in the family living room which was 15 by 16 feet and had a couch, armchair, lamp, books, DVDs, and television apart from study materials described below. Occasionally all or part of JA’s sessions were held in his parents’ bedroom, which was 12 by 15 feet and had a bed, dresser, and television, or JA’s bedroom, which was 6 by 15 feet and had a bed, dresser, books, and toys. Sessions for JA were conducted 1-4 times per week ($M = 3$) for 14 weeks and videotaped for subsequent data analysis.

Study materials included a large bag of toys and other play items brought by the experimenter primarily for use in preference assessment, tangible, and escape (clean up) conditions. Items in the bag included multiple types of sensory balls, a light up toy cell

phone with sound, a light up and vibration sensory toy, a slinky, alphabet tracing cards and marker, animal cards, a dinosaur magnet book, plastic beads, a water-based sensory toy, a slap bracelet, and a picture book. Parents also provided favorite toys of their children for use in the study, including a handheld video game, matchbox cars, and a train set. Foods were also used when parents reported that problem behaviors occurred in tangible-food situations. Foods were provided by parents and included cookies, peanut butter, and candy. For his escape condition, JA's mother provided a variety of file folder matching tasks. Other materials brought to sessions by the experimenter were a digital video camera, tripod, laptop, and stopwatch.

Dependent Variables

During the initial functional analysis, data were collected on problem behaviors, such as disruption, destruction, aggression, and self-injury, as well as potential functionally equivalent existing mands, such as verbal requests for toys, saying "no," signing for items, asking for help, or handing snacks to a parent to be opened. To be considered a mand, a response had to meet criteria for intentional communication as defined by (a) a gesture, vocalization, and/or verbalization (b) directed towards the parent that (c) served a communicative function (Wetherby, 2006; Wetherby & Prizant, 1990) and did not fall into any of the categories for problem behavior. Also, symbolic behavior, such as words, signs, and conventional gestures without indicators of coordinated attention were deemed acts of communication (Wetherby).

All problem behaviors were recorded. Mands were recorded if they met criteria

for intentional communication and if the perceived communicative function of the mand was to obtain the reinforcer relevant to the current functional analysis condition. For example, in the escape condition, mands emitted in response to a parent demand that could function to escape or avoid the demand, such as saying “no” or signing for a break, would be considered potential functionally equivalent mands. In the tangible condition, mands emitted in response to the onset of toy or food restriction that could function to gain or maintain possession of restricted items, such as verbal requests, signs, or gestures for the toys or food being restricted, were considered potential functionally equivalent mands. In the attention and free play conditions, any verbal or gestural statement directed towards the parent was considered a potential functionally equivalent mand for attention and/or toys. If the child reached to his mother to be picked up, tried to lead her by the hand, showed her a toy, or called her name, all of these behaviors would be considered potential functionally equivalent mands during attention and free play conditions.

NS’s target problem behaviors were (a) disruption, such as throwing and knocking over objects, flailing arms and legs, or screaming; and (b) aggression, such as hitting, kicking, pushing, headbutting, or pulling the hair of his mother or younger brother. NS’s target existing mands were verbal requests for toys, such as “my turn,” “I want to play,” and “a few more minutes” that were observed to occur in response to the initiation of toy restriction and hypothesized to have tangible functions. Saying “No” in response to toy restriction was also considered a mand for NS.

JA’s target problem behaviors were (a) disruption, such as screaming, yelling, stomping, blowing his nose, spitting, and throwing objects; (b) destruction, such as

hitting household objects such as lamps or the television, biting furniture, or tearing paper; (c) aggression, such as hitting, kicking, pushing, headbutting, or biting his parent; and (d) self-injury, such as banging his head on the floor or table, biting himself, or jumping and landing on his knees. JA's target mand was saying "No," which was observed to occur in response to the initiation of demands and hypothesized to serve an escape function.

Data Collection and Interobserver Agreement

Data were collected by digitally videotaping each session for later coding using ProCoder for Digital Video (Tapp, 2003). Child problem behavior and existing mands were measured using continuous event recording for each variable, which produced a rate of all target behaviors per 5 min session. A second observer independently coded data for NS and JA during 35.7% and 40% of the functional analysis sessions, respectively, 33% of first baseline sessions for both participants, 75% and 36% of first intervention sessions, respectively, 100% and 50% of second baseline sessions, respectively, 60% and 30% of second intervention sessions, respectively, and for JA, 33% of third baseline sessions and 75% of third intervention sessions, respectively. Finally, 50% of NS's schedule-thinning sessions were coded by a second observer. Interobserver agreement (IOA) was calculated for each dependent variable using exact agreement in MOOSES (Tapp, Wehby, & Ellis, 1995), in which each occurrence of a target behavior was the center of a 5-second window. If the second observer also counted a target behavior within that time interval, it was coded as an agreement. If the second observer did not, or if the

second observer coded an occurrence of a target behavior when the primary observer did not within a 5-second window, it was coded as a disagreement. IOA was then calculated for each dependent variable by dividing the number of agreements by the number of agreements plus disagreements and multiplying by 100%.

Each IOA session was randomly selected from every three chronologically occurring data collection sessions in each condition. The second observer was trained by coding sessions from the initial function analysis for each participant that were not selected for IOA until the second observer was able to code sessions with at least 80% accuracy three times consecutively.

Detailed interobserver estimates for each dependent variable during each phase are displayed for each participant in Table 1. For JA, mean total interobserver agreement for problem behavior across all phases of the study was 95% (range, 80% to 100%), and 96% (range, 75% to 100%) for existing mands. For NS, mean total agreement for problem behavior across all phases of the study was 96% (range, 85% to 100%), and 93% (range, 71% to 100%) for existing mands.

Table 1

Phase	<i>Interobserver Agreement</i>									
	JA					NS				
	<u>Problem Behavior</u>		<u>Mands</u>		<u>Other</u>	<u>Problem Behavior</u>		<u>Mands</u>		
	<i>M</i>	(Range)	<i>M</i>	(Range)	<i>M</i>	(Range)	<i>M</i>	(Range)	<i>M</i>	(Range)
FA	94%	(86%, 100%)	87%	(75%, 100%)			100%	(NA)	83%	(71%, 100%)
Baseline 1	82%	(NA)	88%	(NA)			100%	(NA)	100%	(NA)
Intervention 1	100%	(NA)	100%	(NA)			100%	(NA)	89%	(80%, 100%)
Baseline 2	94%	(89%, 100%)	95%	(90%, 100%)			85%	(NA)	100%	(NA)
Intervention 2	100%	(NA)	100%	(NA)			95%	(86%, 100%)	95%	(86%, 100%)
Baseline 3	100%	(NA)	100%	(NA)						
Intervention 3	97.7%	(80%, 100%)	100%	(NA)	97%	(75%, 100%)				
Schedule Thinning							95%	(88%, 100%)	92%	(83%, 100%)

Experimental Design

The study was conducted in two phases. First a functional analysis was conducted at home by parents using a multielement design as described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1984) and Harding, Wacker, Berg, Lee, and Dolezal (2009). Next, a treatment analysis was conducted within an A-B-A-B withdrawal design in which parents were coached to deliver the maintaining reinforcer contingent on problem behavior alone in the baseline condition and contingent on either problem behavior or hypothesized functionally equivalent existing mands in the intervention condition. In JA's case, the selected escape task (doing file folder work) ceased to evoke the dependent variables during the first intervention phase, as indicated by a decrease in both manding and problem behavior in the escape condition. A new escape task was then selected (being told to go to the bathroom) which evoked the target behaviors. Because the task was changed during first intervention phase, we implemented an additional return to baseline and return to intervention for JA, resulting in an A-B-A-B-A-B design. For NS, a schedule-thinning condition followed the second intervention phase in an effort to decrease his frequency of manding and increase his tolerance for delay to reinforcement, resulting in an A-B-A-B-C design. Phase change decisions during the treatment analysis were based on trend, level, and variability of problem behavior.

Procedure

Screening observations. Participating dyads were initially screened at home using a descriptive assessment to confirm that child problem behavior and child mands

occurred in the same social condition and that parents did not already reinforce all child mands. Screening observations were conducted by placing the child and parent in preference assessment, tangible, free play, escape, and attention conditions, each lasting 5 min. The preference assessment consisted of providing the child with an array of toys and materials brought by the presenter as well as parent-reported favorite toys owned by the family. Items with which the child engaged for the longest periods of time were noted and used during tangible conditions. In attention, escape, and tangible conditions, parents were coached to set up the relevant context for each condition (i.e. divert their attention, place demands, or restrict toys or food) but were not coached on how to respond to problem behavior or mands. These sessions were descriptive as opposed to experimental in order to observe natural parent responses to child problem behavior and mands to determine whether parents met screening criteria of not already reinforcing all child mands.

Attention, demand, tangible, and free play conditions were evaluated for both participants during screening at home. In the attention condition, the parent diverted her attention by pretending to read a magazine, talk on the phone, or have a conversation with the experimenter or another adult in the room. The purpose of the attention condition was to assess whether problem behavior was associated with lack of attention from parents. In the tangible condition, the child was briefly allowed to play with preferred toys identified in the preference assessment, after which the toys were restricted by the parent. The purpose of the tangible condition was to assess whether problem behavior was associated with restricted access to toys. In the escape condition, the parent

tried to get the child to engage in a task that was reported to be aversive to the child. The purpose of the escape condition was to assess whether problem behavior was associated with parent demands. In the toy play condition, the child was provided with multiple preferred toys identified in the preference assessment and continuous parent attention with no demands or instructions on how the child was to play. The purpose of the toy play condition was to determine whether problem behavior would persist in a condition in which all other programmed establishing operations were absent (i.e. the child was provided with noncontingent parent attention, access to toys, and lack of demands), which could indicate that the occurrence of problem behavior was not associated with social conditions. The toy play condition also provided a second purpose as a control condition to which rates of problem behavior in other conditions could be compared.

Participants were kept in each condition for 5 min. Parent report was used to inform some screening session conditions. For example, if a parent reported that restricting favorite foods was often associated with problem behavior, a tangible-food condition was conducted in addition to the tangible-toy condition. Additional escape conditions alternative to clean-up were also incorporated into screening when parents reported specific demand situations as triggering problem behavior, such as being prompted to complete file folder work for JA.

Functional analysis. After being screened into the full study, JA and NS's mothers implemented functional analysis conditions with their children based on methods described by Iwata et al. (1982/1984) and Harding et al. (2009), with some modifications based on parent report. Conditions were counterbalanced and lasted 5 min. Attention,

demand, tangible, and free play conditions were evaluated for both participants. In the attention condition, the parent diverted her attention by pretending to read a magazine, talk on the phone, have a conversation with the experimenter, or, for NS, engage in activities with NS's younger brother. If the child engaged in problem behavior, the parent provided attention in the form of reprimands ($M = 3.13$ s, range of 1 to 10 s for NS; $M = 2.5$ s, range 1 to 5 s for JA), while all mands were ignored. The purpose of the attention condition was to test whether problem behavior was maintained by attention from parents. In the tangible condition, child participants were briefly allowed to play with preferred toys identified in the preference assessment, after which the toys were restricted by the parent. The parent then ignored all child mands for toys and briefly returned the toys ($M = 46$ s, range of 15 to 80 s for NS; $M = 34.75$ s, range of 27 to 74 s for JA) to the child contingent on problem behavior. Parents restricted toys an average of 4.5 times per FA tangible session for NS (range, 3 to 6), and an average of 6.5 times per FA tangible session for JA (range, 6 to 7). The purpose of the tangible condition was to test whether problem behavior might be maintained by access to toys. In the escape condition, the parent placed demands on the child, usually in the form of cleaning up toys for NS or doing file folder work for JA. If NS or JA did not comply with demands, the parent implemented a 3-step prompting sequence, consisting of a verbal, then modeling, then physical prompt to ensure compliance. If either child engaged in problem behavior, the parent provided a short break ($M = 37$ s, range of 30 to 45 s for NS; $M = 32$ s, range of 25 to 37 s for JA) from demands. Parents placed demands 4 times per FA escape session for NS and an average of 5.5 times per FA escape session for JA (range, 5 to 6). The

purpose of the escape condition was to test whether problem behavior might be maintained by escape from demands. In the toy play condition, the child was provided with multiple preferred toys and continuous parent attention with no demands or instructions on how the child was to play. The purpose of the toy play condition was to determine whether problem behavior would persist in a condition in which all other programmed consequences were already present for the child (i.e. parent attention, access to toys, lack of demands), which would indicate that problem behavior was maintained by other, possibly automatic, reinforcers. The toy play condition also provided a second purpose as a control condition to which rates of problem behavior in other functional analysis conditions could be compared.

Treatment analysis. Baseline sessions were conducted in the functional analysis condition associated with the highest level of problem behavior and target mands, which was the tangible condition for NS and the escape condition for JA. During each 5 minute session, NS's mother restricted toys ($M = 4$ times per baseline session, no range) and JA's mother placed demands ($M = 6.5$ times per baseline session, range 5 to 7) while providing the relevant reinforcer contingent on problem behavior only ($M = 50.25$ s, range of 20 to 111 s for NS; $M = 42.65$ s, range of 23 to 53 s for JA).

During intervention, problem behavior continued to produce reinforcement; however parents were also instructed to provide the reinforcer contingent on target mands. Therefore, in intervention sessions, when NS's mother restricted preferred toys ($M = 4.5$ times per intervention session, range 4 to 6), NS could either engage in problem behavior or verbally request the toys to regain toy possession ($M = 59.23$ s, range of 38 to

103 s). When JA's mother attempted to guide him through file folder work, or, after switching to a new escape task, told him to go to the bathroom ($M = 6.78$ times per intervention session, range 6 to 7), he could either use problem behavior or the word "No" to receive a break from demands ($M = 44.26$ s, range of 29 to 62 s). No mands were directly taught to either participant; nor were they prompted to use their mands during baseline or treatment sessions. The effects of increasing parent reinforcement of potential functionally equivalent existing mands were evaluated in an A-B-A-B withdrawal design for NS and an A-B-A-B-A-B withdrawal design for JA.

Schedule thinning. At the end of the second intervention phase, NS's mother elected to implement a schedule thinning condition in an attempt to teach NS to tolerate periods during which his mands would not be reinforced. The schedule thinning condition was conducted in the same tangible condition as baseline and intervention sessions. The procedure consisted of a multiple schedule arrangement in which a card indicated the availability and non-availability of reinforcement (Hagopian, Bruzek, Bowman, & Jennett, 2007; Hanley, Iwata, & Thompson, 2001; Najdowski et al., 2008; Sidener, Shabani, Carr, & Roland, 2006). One side of the card was green and displayed NS's name and picture; the other side was red and displayed the word *mom* and his mother's picture. When the card on the green side, NS's mands for toys or problem behaviors were reinforced ($M = 44.65$ s, range of 30 to 60 s). When the card was on the red side, NS's mands and problem behaviors were not reinforced. During the schedule thinning condition, the card was turned to NS's side for the first 2 min of the session while a visual timer displayed the amount of time left during which his mands would be

reinforced. After 2 min, the card was flipped to his mother's side for 30 s, during which his mands for toys were not reinforced. After 30 s, the card was flipped back to NS's side for the remaining 2 min. Aside from the multiple schedule, the same procedures were used as previous intervention sessions in that NS's mother briefly provided him with preferred toys before restricting them ($M = 4.5$ times per session, range 3 to 6). When the card was on the green side, NS's mands or problem behavior would get the toys back for another brief period. When the card was on the red side, neither NS's mands nor problem behavior would get the toys back. These procedures were verbally explained to NS and modeled before beginning schedule thinning.

Priming. During the final intervention condition for JA, priming sessions were conducted immediately prior to several data collection sessions in order to increase JA's contact with the contingencies associated with manding. Priming sessions began on the fourth day of the third intervention condition and were concluded on the eighth day of that condition, thereby conducted prior to five intervention sessions. During priming sessions, JA's mother would place a demand on JA and then immediately prompt him to mand for a break from demands (i.e., "Go potty. Say 'No.'") while placing problem behavior on extinction. Therefore when JA emitted his target mand he would receive a break from demands, while demands continued in response to problem behavior. In other ways priming procedures resembled intervention procedures in that priming sessions lasted 5 min, involved the same demands as intervention procedures, and held the opportunity of accessing the same reinforcer. After the priming session JA received a 5 minute break, then the intervention session was conducted in the same manner as

previous intervention sessions in that manding was not prompted and either manding or problem behavior produced a break from demands.

Parent training. Parents were taught to implement all experimental conditions through a combination of experimenter coaching (Ward-Horner & Sturmey, 2008) and videofeedback (Velderman, Bakermans-Kranenburg, Juffer, & Van IJzendoorn, 2006). Specifically, once target problem behaviors and mands had been selected during the initial functional analysis, parents were shown video clips collected in previous sessions of their children engaging in multiple examples of all target behaviors. Parents were instructed to provide or withhold the relevant reinforcer contingent on these target behaviors. During live sessions, parents were verbally prompted to deliver or withhold the reinforcer contingent on the target behaviors for each condition. Parents were given praise for correctly implementing procedures and given corrective feedback in response to errors. During the functional analysis and baseline sessions, parents were instructed to ignore target child mands and provide the relevant reinforcer contingent on problem behavior only. During treatment sessions, parents were instructed to provide the reinforcer contingent on either problem behavior or target mands. Parents were presented with video feedback sessions before implementation of each new phase or condition to identify the child behaviors they would be reinforcing or placing on extinction.

Procedural fidelity (PF) on parent and experimenter implementation of procedures was calculated for 38.6% of sessions for JA and 47.6% of sessions for NS. As with IOA sessions, each PF session was randomly selected from every three chronologically occurring sessions in each condition. During the functional analysis sessions, PF was

collected on 40% of sessions for JA and 50% for NS. During first baseline, PF was collected on 33% of sessions for both JA and NS. During first intervention, PF was collected on 45% of sessions (42.8% old task and 50% new task) for JA and 50% of sessions for NS. During second baseline, PF was collected on 50% of sessions for JA and 100% of sessions for NS. During second intervention, PF was collected on 33% of sessions for JA and 40% of sessions for NS. For JA, PF was collected on 33% of third baseline and third intervention sessions, each. For NS, PF on experimenter coaching was collected on 50% of schedule thinning sessions; video feedback did not occur during this phase. If parent procedural fidelity fell to less than 80%, parents were provided with video feedback at each session until parent procedural fidelity improved to greater than 80%. PF on experimenter implementation of video feedback was calculated for 50% of sessions for JA and NS.

Detailed procedural fidelity data are presented on each parent's implementation of reinforcement of problem behavior and reinforcement (or extinction) of existing mands during each phase of the study in Table 2. Procedural fidelity for experimenter coaching and videofeedback during each phase of the study is displayed in Table 3. Parent procedural fidelity data indicate that, on average, parents were able to implement study procedures with a satisfactory level of integrity, with average parent procedural fidelity levels for procedure components ranging from 78% to 100%. Furthermore, NS's mother was able to implement procedures effectively during baseline and intervention phases with very little coaching from the experimenter; however JA's mother required sustained frequent coaching to implement procedures effectively throughout the study. Average

experimenter procedural fidelity was also satisfactory and ranged from 83% to 100% per component. Parent and experimenter procedural fidelity was somewhat lower during NS's schedule thinning condition, with average parent procedural fidelity ranging from 71% to 100% and average experimenter procedural fidelity of 78%.

Table 2

Phase	<i>Parent Procedural fidelity</i>							
	JA's Mother				NS's Mother			
	<u>Rf Problem Behavior</u>		<u>Rf/Ignore Mands</u>		<u>Rf Problem Behavior</u>		<u>Rf/Ignore Mands</u>	
	<i>M</i>	(Range)	<i>M</i>	(Range)	<i>M</i>	(Range)	<i>M</i>	(Range)
FA	78%	(29%, 100%)	95%	(75%, 100%)	94%	(67%, 100%)	93%	(59%, 100%)
Baseline 1	82%	(NA)	88%	(NA)	100%	(NA)	100%	(NA)
Intervention 1	100%	(NA)	100%	(NA)	100%	(NA)	100%	(NA)
Baseline 2	94%	(89%, 100%)	95%	(90%, 100%)	100%	(NA)	100%	(NA)
Intervention 2	100%	(NA)	100%	(NA)	100%	(NA)	100%	(NA)
Baseline 3	78%	(NA)	100%	(NA)				
Intervention 3	100%	(NA)	100%	(NA)				
Schedule Thinning					71%	(67%, 75%)	100%	(NA)

Table 3

Phase	<i>Experimenter Procedural fidelity</i>					
	JA			NS		
	<u>Videofeedback</u>	<u>Coaching</u>		<u>Videofeedback</u>	<u>Coaching</u>	
	<i>M</i>	<i>M</i>	(Range)	<i>M</i>	<i>M</i>	(Range)
FA	100%	83%	(33%, 100%)	100%	86%	(14%, 100%)
Baseline 1	86%	86%	(NA)	100%	100%	(NA)
Intervention 1	100%	100%	(NA)	100%	100%	(NA)
Baseline 2	100%	100%	(NA)	100%	100%	(NA)
Intervention 2	100%	100%	(NA)	100%	100%	(NA)
Baseline 3	100%	86%	(NA)			
Intervention 3	100%	100%	(NA)			
Schedule Thinning				NA	78%	(75%, 80%)

Chapter III

Results

Functional Analysis

The results of the functional analyses for NS and JA are presented in Figure 1 and Figure 2, respectively. For each participant, frequency of problem behavior per 5 min session is depicted in the upper panel and the frequency of existing mands per 5 min session is depicted in the lower panel. NS showed differentiated responding for problem behavior in tangible and escape conditions, with problem behavior occurring at a higher and more stable level in tangible than escape ($M = 10.75$ and $M = 5$ responses, respectively). NS's rate of existing mands was highest in tangible and attention conditions ($M = 23.25$ and $M = 24.3$ responses, respectively). These results suggested that NS demonstrated problem behavior and existing mands that were both maintained by access to tangible items. JA showed differentiated responding for problem behavior in tangible and escape conditions ($M = 17.6$ and $M = 16.4$ responses, respectively), with problem behavior in both conditions occurring at high and stable rates compared with rates of problem behavior in attention and free play conditions. Differentiated responding for manding emerged over time in the escape condition ($M = 22.3$ responses per session for the last 3 sessions). These results indicated escape functions for both problem behavior and mands for JA.

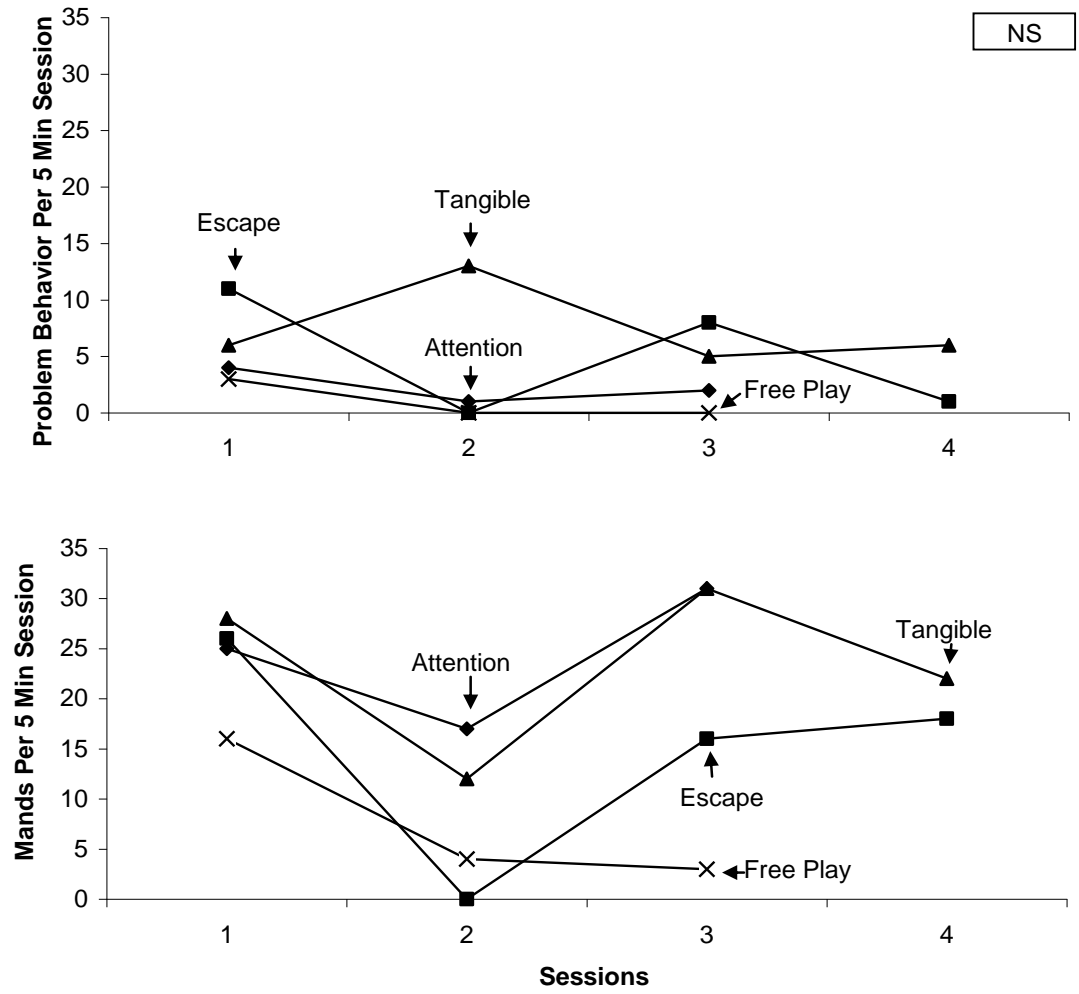


Figure 1. Rates of problem behavior and mands per 5 min session across functional analysis conditions for NS.

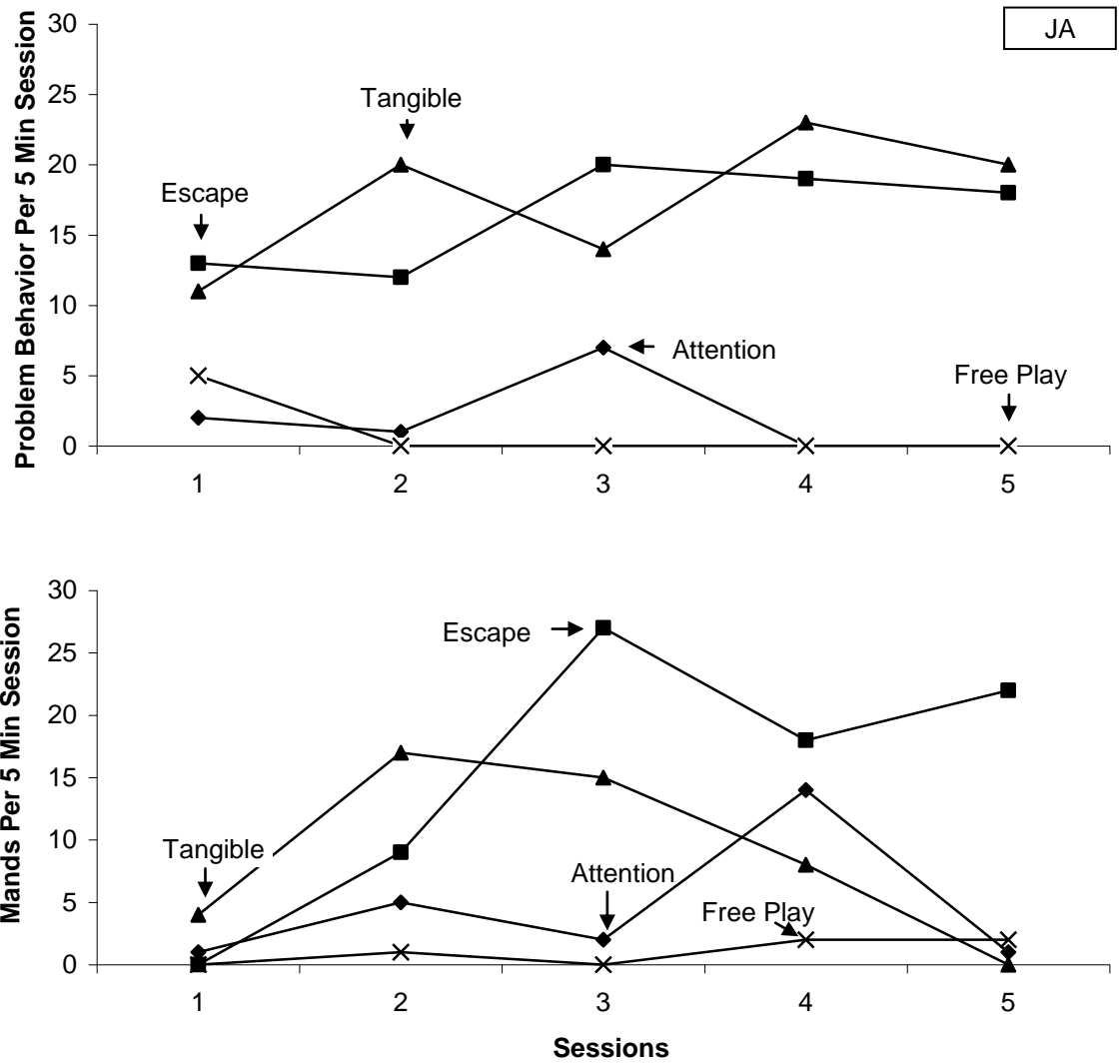


Figure 2. Rates of problem behavior and mands per 5 min session across functional analysis conditions for JA.

Treatment Analysis

Figure 3 and Figure 4 present the effects of reinforcement of existing mands on frequency of problem behavior and mands for NS and JA, respectively. In each graph, frequency of problem behavior is presented on the upper panel and frequency of mands is presented on the lower panel.

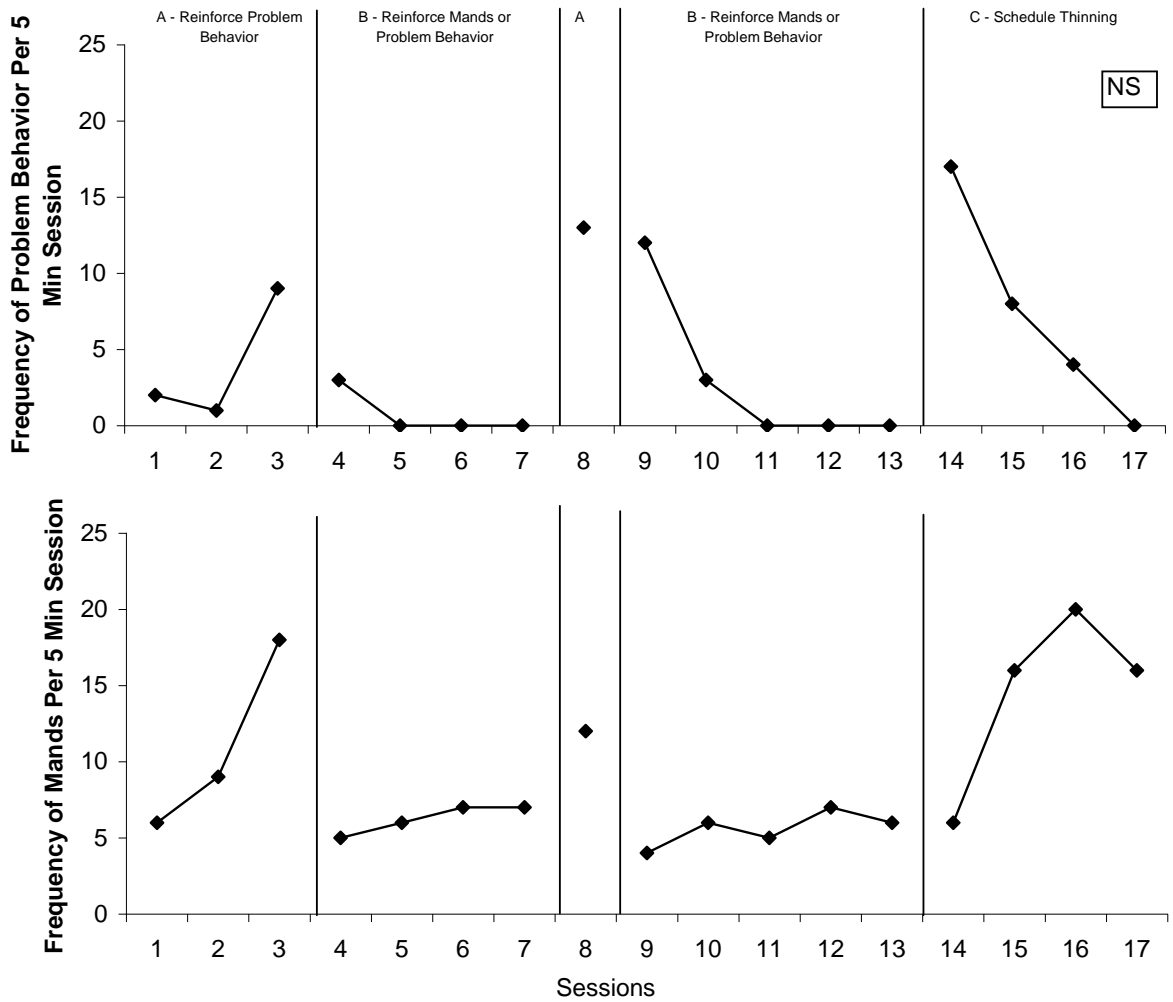


Figure 3. Frequency of problem behavior and mands across sessions for NS.

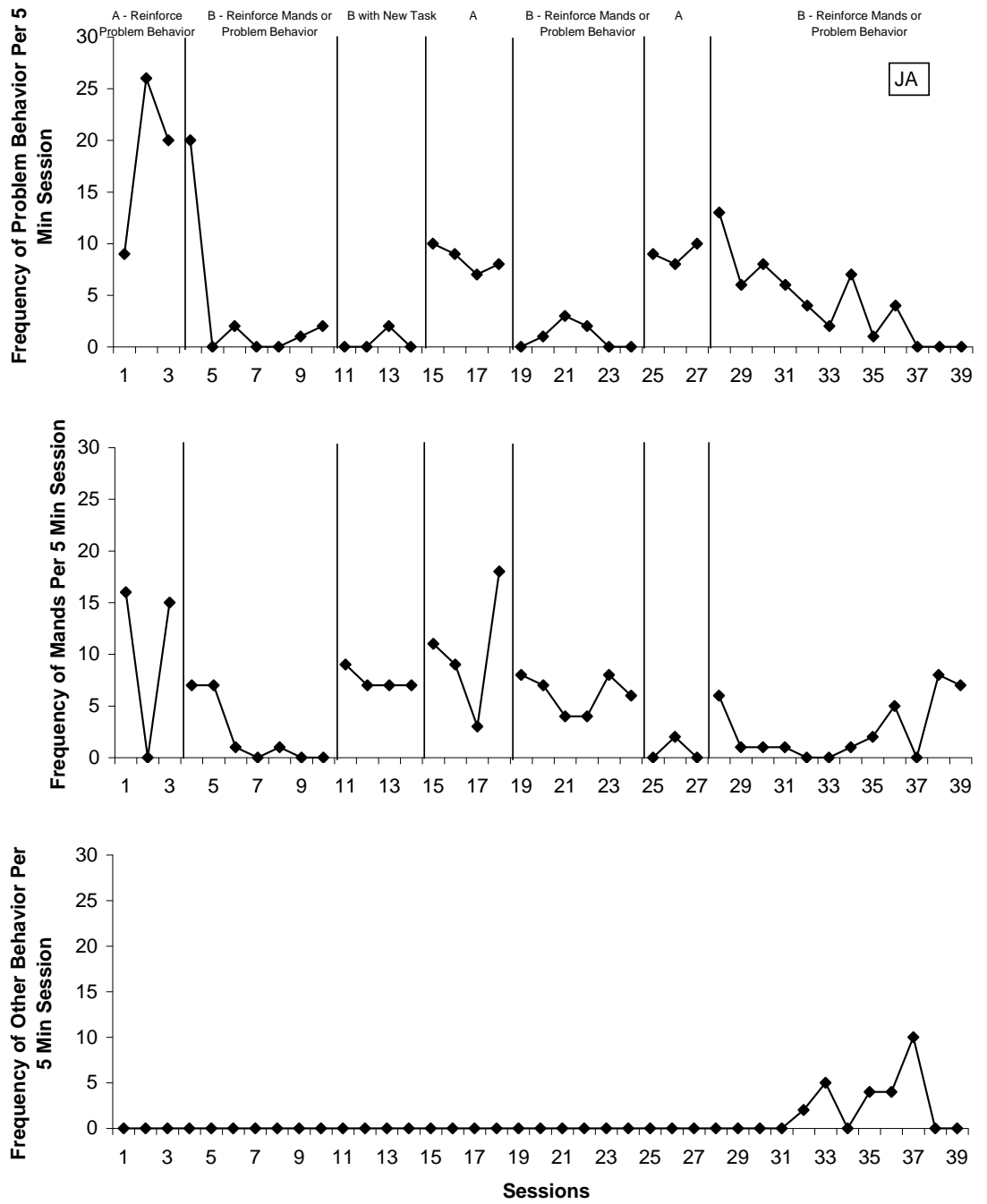


Figure 4. Frequency of problem behavior and mands across sessions for JA.

NS. Problem behavior and mands occurred in accelerating trends for NS during baseline, with 2 instances of problem behavior and 6 mands occurring in the first session and 9 instances of problem behavior and 18 mands in the final session of first baseline. Upon implementation of parent reinforcement of existing child mands, both problem behavior and mands immediately decreased to 5 and 3 responses per session, respectively. After this initial session, problem behavior did not occur for the remainder of the first intervention phase while existing mands remained stable with a range of 5 to 7 responses ($M = 6.25$). Upon reintroduction of baseline and withdrawal of reinforcement of existing mands, child problem behavior immediately increased from zero to 13 responses per session. NS's mands increased as well during this session from 7 to 12 responses per session. Intervention was then reintroduced, followed by a slight decrease in problem behavior to 12 responses per session and a decrease in mands to 4. Over the course of the remaining intervention sessions NS's problem behavior showed a decreasing trend, reaching zero at the third session and remaining at zero for the remainder of intervention sessions. Manding became stable at a level similar to that observed during the first intervention phase ($M = 5.6$) and ranged from 4 to 7 responses per session. During the additional schedule thinning condition implemented for NS, problem behavior initially increased sharply, then gradually decreased to zero by the last session with a range of zero to 17 responses ($M = 8$). Existing mands initially remained at the same level, then accelerated sharply for the next two sessions before decreasing slightly to 16 responses during the last schedule thinning session (range 6 to 21, $M = 14.75$).

JA. Figure 4 presents the results of baseline and reinforcement of existing mands on frequency of problem behavior and mands for JA. JA's problem behavior occurred in an accelerating trend during the initial baseline phase with a range of 9 to 26 responses per session ($M = 18.3$), while rate of manding was variable with a range of zero to 16 responses per session and showed a flat trend ($M = 10.3$). During parent reinforcement of existing mands, problem behavior remained stable in the first session and then decreased to range between zero and 2 responses per session for the remainder of the first intervention phase. Manding initially remained stable at 7 responses for the first two intervention sessions, then decreased to range between zero and 1 responses per session. Because neither problem behavior nor manding continued to occur in the escape task (file folder work), a new escape task was initiated based on parent report (being told/taken to use the bathroom). Upon initiation of the new escape task, while still in the first intervention phase, existing mands immediately increased to 9 responses and stabilized at 7 responses per session for the remainder of the condition. During first intervention with the new task, problem behavior ranged between zero and 2 responses per session ($M = 0.5$). The new escape task was used with JA for the remainder of the study. Upon reintroduction of baseline conditions, problem behavior immediately increased from zero to 10 responses per session and remained stable with a range of 7 to 10 responses per session ($M = 8.5$). During second baseline, manding rates became more variable, ranging from 3 to 18 responses per session ($M = 10.25$). Upon return to intervention, problem behavior immediately decreased to zero and ranged from zero to 3 responses per session throughout the second intervention phase ($M = 1$). Manding rates became more stable than the previous baseline phase with a range of 4 to 8 responses per session ($M = 6.16$);

however manding occurred at more variable rates than during the previous intervention phase.

Because there was a procedural change during the first intervention phase (changing the escape task from file folder work to bathrooming), another return to baseline and another return to intervention phase was added in order to demonstrate sufficient replications of the functional relation with the new escape task and end the study in the intervention phase. After returning to the third baseline phase, problem behavior immediately increased from zero to 9 responses per session while manding immediately decreased from 6 to zero responses per session. During third baseline, problem behavior ranged from 8 to 10 responses per session ($M = 9$) and manding ranged from zero to 2 ($M = 0.67$), reaching its lowest level up to that point. The third intervention phase was then initiated, after which both problem behavior and manding initially increased from 10 to 13 responses and zero to 7 responses, respectively. Manding then decreased to 1 response per session for the next two intervention sessions while problem behavior occurred at rates similar to baseline levels. Priming sessions, described in the procedures section, were then implemented to help JA contact the contingencies associated with the intervention. Priming sessions occurred immediately prior to intervention sessions on days four through eight, inclusive, of the third intervention phase. After day eight of this phase, priming was stopped and the remaining intervention sessions occurred without priming.

During the third intervention phase, problem behavior displayed a steady downward trend and ranged from zero to 13 responses ($M = 4.17$). Problem behavior reached zero on the 10th day of intervention and remained at zero for three consecutive

sessions at which point the phase was concluded. Manding displayed more variability in trend and level during third intervention, ranging from zero to 8 responses ($M = 2.75$). After an initial increase during the first session of the third intervention phase, manding decreased to a low level with a flat trend for the next seven sessions, ranging from zero to two responses. After the eighth session, manding increased in level and trend, ranging from zero to 8 responses per session for the remaining four sessions ($M = 5$). During the final two intervention sessions, rates of manding resembled those of previous intervention phases at 8 and 7 responses, respectively.

On the fifth day of the third intervention phase, JA began to display a response not previously observed in the study, referred to as *other behavior*. JA engaged in this behavior while orienting towards his mother as a consistent response to the initiation of demands; however the behavior did not fall under definitions of either problem behavior or existing mands. JA's *other behavior* was a vocalization that typically took the phonetic form of "Ow" or "Ah" and was emitted in response to a demand while orienting towards his mother. *Other behavior* was extremely variable and ranged from zero to 10 responses per session ($M = 3.25$). While *other behavior* demonstrated an increasing trend in the first six sessions after its emergence, it decreased to zero during the final two intervention sessions.

Social Validity and Maintenance Questionnaires

Social validity and maintenance questionnaires were provided to parents after completion of the study, and are presented in Appendix B and Appendix C. Parent participants indicated an average rating of 3.5 out of 5 for social validity of increased

parent reinforcement of child mands, and a rating of 3.8 out of 5 regarding parents' abilities and willingness to maintain the intervention on their own. Across social validity and maintenance questionnaires, the lowest average rating for a questionnaire item was 3, or neutral, and the highest average rating was 4.5. Items that received neutral average ratings from the social validity questionnaire included "I enjoyed implementing the behavior management strategy with my child," "I think I will use the behavior management strategy with my child in the future," and "The behavior management strategy was a good fit for my child." The item that received a neutral average rating from the maintenance questionnaire was, "I use the behavior management strategy as trained." Items receiving a 4.5 average rating, which is half of a point away from "very much so," were "I am more aware of my child's attempts to communicate with me," and "I am more aware of how my behavior impacts my child's behavior."

Chapter IV

Discussion

Previous studies of responses classes in individuals with DD have shown that severe problem behavior, mild problem behavior, precursor behavior, and existing mands may exist within response classes or response class hierarchies in some children and adults. The present study extended such response class examinations to investigate child choice between problem behavior and functionally equivalent existing mands when both produce reinforcement. Specifically, this study attempted to answer four research questions. The first research question asked whether extinction analyses of problem behavior and existing mands would confirm that existing mands and problem behavior were maintained by the same reinforcer and were therefore members of the same response class. Participants' results during this phase of the study support this interpretation. During the first two baseline conditions, when the reinforcer was provided contingent on problem behavior alone, both problem behavior and manding occurred at elevated rates. During the first two intervention conditions, when the reinforcer was provided in response to either problem behavior or existing mands, manding continued to occur at elevated rates while problem behavior decreased to low to zero levels. Therefore, when problem behavior was the only response that produced the reinforcer, participants engaged in problem behavior. When the reinforcer was also made available in response to existing mands, participants allocated almost entirely to that response. These results suggest that both participants had problem behavior and existing mands that were

members of the same response class, and participants could select from either response to produce the reinforcer.

The second research question addressed whether child participants would choose to engage in existing mands, thus decreasing functionally equivalent problem behavior, when reinforcement was available for either response. In fact, for both participants, the first two intervention conditions were associated with continued manding and relatively immediate and large reductions in problem behavior in comparison to baseline rates, even though reinforcement was still available for problem behavior. Therefore, results indicate that both participants chose to engage in existing mands over problem behavior to produce the reinforcer. These findings are consistent with an interpretation that existing mands and problem behavior may have existed within a response class hierarchy for each participant, in that providing reinforcement contingent upon an earlier-occurring response in the hierarchy (mands) may have precluded the demonstration of responses occurring later in the hierarchy (problem behavior) (Harding et al., 2001; Lalli et al., 1995; Langdon et al., 2008; Najdowski et al., 2008). A hierarchical effect would explain why both mands and problem behavior were observed when only problem behavior was reinforced, and would suggest that participants engaged in manding first, then allocated to problem behavior when mands did not produce reinforcement. Similarly, when mands and problem behavior were reinforced, problem behavior may have decreased because participants engaged in manding first, which produced the reinforcer, making allocating to problem behavior unnecessary. Further supporting a response class hierarchy interpretation is previous research identifying a bias towards less effortful responses being emitted earlier than more effortful responses within response class hierarchies

(Lalli et al.; Richman et al., 1999). It is possible that engaging in existing mands was less effortful for NS and JA than engaging in problem behavior, and that when both produced the maintaining reinforcer, participants maximized response efficiency by manding for the reinforcer.

The third and fourth research questions asked whether parents could implement and maintain the procedures involved in increased reinforcement of existing child mands. The procedural fidelity data indicate that, when provided with coaching and videofeedback, parents were able to implement procedures with integrity; however, JA's mother required a high level of coaching throughout the study to effectively implement procedures. Second, social validity and maintenance questionnaires suggested that parents were somewhat ambivalent regarding both the social value of the procedures and their likelihood of maintaining the procedures at home. Attempts were made to conduct maintenance observations with NS and his mother, however his mother declined to participate, providing another indication that she may not have been interested in maintaining study procedures.

Alternate Explanations

Alternate explanations can be made regarding the hypothesis that participants' mands and problem behavior were members of the same response class. It is also possible that while manding was an operant response for each participant, problem behavior was actually respondent behavior and represented an extinction burst or "emotional response" to presentation of an aversive stimulus (demands/toy restriction) and mands not producing reinforcement. If this explanation were the case, the increase in problem

behavior observed during baseline sessions may be more accurately described as an escalation in behavior rather than allocation to another member of a response class hierarchy (Albin et al., 1995). However, JA's behavior during the study makes it appear unlikely that this alternate explanation was true for him. Because JA's problem behavior functioned to avoid or escape demands, and he typically emitted his mands and problem behavior in immediate response to the instruction to go to the bathroom and was then reinforced with termination of the demand, JA never actually came into contact with the aversive stimulus (bathroom) during study sessions. Therefore, if problem behavior was respondent behavior occurring in response to a conditioned stimulus (demand to go to the bathroom), over time, when JA was never actually made to go to the bathroom and therefore did not experience the unconditioned stimulus, he would have experienced respondent extinction and his problem behavior would have decreased, at least until he was actually taken to the bathroom and re-experienced the unconditioned stimulus. However, JA was never taken to the bathroom, and he continued to consistently emit problem behavior, as well as mands, in response to parent demands. Furthermore, during third baseline and intervention, JA had some sessions in which he did not mand at all but immediately engaged in problem behavior, suggesting problem behavior was not occurring as an extinction burst or emotional response to mands being placed on extinction. This response pattern suggests that JA's problem behavior was in fact operant, like his mands, and was reinforced by avoiding or escaping going to the bathroom.

NS, on the other hand, demonstrated problem behavior maintained by positive reinforcement in the form of access to toys and regularly experienced the aversive stimulus of toy restriction. When his requests for toys were reinforced, he rarely allocated

to problem behavior; however, when toys were taken away and his requests were not reinforced, he quickly engaged in problem behavior. While he typically stopped engaging in problem behavior once toys were returned, he sometimes continued to engage in problem behavior, even though he was in possession of the hypothesized reinforcer. This pattern of behavior suggests that the alternate explanation could have been true during at least some sessions for NS, in that problem behavior may have sometimes occurred as an extinction burst or emotional response to toys being taken away and mands for toys not producing the reinforcer. If this were the case, reinforcing existing mands may have prevented problem behavior for NS not because the two variables were members of the same response class, but because responding to NS's mands prevented the occurrence of extinction bursts or emotional responses to toy restriction and extinction of mands.

JA's responding during his final baseline and intervention conditions also require examination and interpretation. During his third baseline condition, JA's manding rates decreased substantially, with manding not occurring at all during two of the three sessions in this phase. During previous baseline sessions, JA demonstrated elevated rates of manding and problem behavior even though manding did not produce reinforcement, resembling response patterns observed in previous studies of response class hierarchies (Harding et al., 2001; Lalli et al., 1995; Richman et al., 1999). However, during his third baseline phase, the two sessions with elevated problem behavior and zero manding show that during these sessions JA had stopped engaging in manding and begun allocating completely to problem behavior. In these sessions JA demonstrated a pattern of responding consistent with differential reinforcement, in that his frequency of reinforced responses (problem behavior) increased and allocation to responses that were not

producing reinforcement (existing mands) decreased (Richman et al.). Therefore, in this condition, while JA was not responding according to a response class hierarchy, he was maximizing response efficiency by decreasing a response that was on extinction in favor of one that produced the reinforcer, and, unlike manding, had a history of producing the reinforcer continuously throughout the study.

Once the third intervention phase began, JA continued to demonstrate relatively low rates of manding and high rates of problem behavior which continued to produce reinforcement. Therefore JA may not have discriminated that reinforcement was now available for manding as well as problem behavior. Furthermore, at this point JA's learning history within study conditions may have become a primary factor in his response allocation as well, in that problem behavior was continuously reinforced throughout the study, while manding sometimes produced the reinforcer and was sometimes on extinction. In other words, within intervention conditions reinforcement may have been equally provided for problem behavior and existing mands, however across all study sessions problem behavior produced more consistent reinforcement than existing mands, potentially resulting in carry over effects on JA's behavior. For this reason, priming sessions were initiated to increase JA's contact with reinforcement contingencies surrounding manding during the third intervention phase. Interestingly, soon after priming began, a response not observed previously in the study emerged that appeared, topographically, to exist somewhere between JA's target mand, "No," and JA's most frequent problem behavior, which was a brief, throaty growl or yell. JA engaged in this potential third response within the response class at variable rates with an increasing trend while manding remained low and problem behavior gradually decreased. During

the third to last intervention session, JA allocated solely to the novel behavior, while problem behavior and manding did not occur at all. Then, during the last two intervention sessions, the novel behavior returned to zero, problem behavior remained at zero, and manding increased to 8 and 7 responses per session, resembling rates of all three responses from previous intervention sessions.

Explanations for the emergence of the novel behavior and changes in allocation between all three responses during the final intervention phase are not clear. It is possible that the novel behavior was less effortful than either manding or problem behavior for JA, and, because it also produced the reinforcer, may have increased for this reason. Furthermore, JA's mother reported not having observed the novel behavior before, so unlike manding and problem behavior, the novel behavior may not have been associated with previous reinforcement, extinction, or punishment contingencies. Without such a learning history, this operant response may have occurred at more variable rates, and been more likely to extinguish. Alternatively, both JA's existing mands and problem behaviors were responses with lengthy histories of reinforcement and punishment, and may therefore have been more resistant to temporary changes in reinforcement schedules, thus returning to their previously observed orders and structures (Baer, 1981).

Limitations

A number of limitations of the present study need to be addressed. First, only two participant dyads completed the full study. It would have been preferable to have included at least three dyads to further assess child and parent characteristics associated with having problem behavior and functionally equivalent mands and to further evaluate

the effects of reinforcing existing child mands on problem behavior. Second, only one return to baseline data point was collected for NS, which does not allow for an analysis of variability or trend during this condition. This is problematic considering that NS may have experienced extinction bursts during this session that would have elevated his frequency of problem behavior and manding above that of a stable level of responding. The decision to return to intervention after one return to baseline session was made due to a request from NS's mother to discontinue baseline and return to the intervention condition. Third, no data were collected on latency to response for manding and problem behavior, therefore assertions that manding may have occurred prior to problem behavior in a manner consistent with a response class hierarchy are not supported with a temporal analysis. Similarly, assertions that participants may have engaged in manding rather than problem behavior because the former required less effort also lack empirical support, as no data were collected on effort. It is possible that participants allocated to manding not because it was less effortful, but because it had been punished less in the past than problem behavior. Fourth, procedural fidelity for parent and experimenter was lowest during the functional analysis phase of the study. While the low TI sessions were typically the first functional analysis sessions for each parent, with satisfactory TI occurring for the remainder of the functional analyses, the lowered TI could have resulted in less accurate functional analyses. Furthermore, functional analysis attention conditions were associated with a shorter duration of reinforcement than tangible and escape conditions, which could have resulted in parent attention being overlooked as a potential reinforcer for problem behavior. Another procedural issue is that there was a drift in duration of parent reinforcement over the course of the study, with steady increases in

average duration of reinforcement per session over time. However, this drift does not appear to have affected results, as the number of trials (or number of times parents initiated demands or toy restriction) remained stable and did not change in any systematic way across baseline and intervention conditions. An important study concern is that repeated testing of the intervention appeared to result in JA allocating more to problem behavior over time. Again, third baseline and intervention conditions were implemented due to necessary procedural changes during the first intervention condition; however, in similar analyses of allocation between problem behavior and alternative responses it may be important to keep sessions in which problem behavior alone is reinforced to a minimum to reduce the likelihood of increasing child allocation to problem behavior over time. Finally, social validity and maintenance of procedures and results were estimated using unvalidated questionnaires. This method of obtaining data on social validity and maintenance may produce biased or inaccurate information that should be interpreted with caution (Schwartz & Baer, 1991).

Implications for Research and Practice

Results of this study add to the literature on response classes of problem behavior in individuals with DD by demonstrating that some children with autism may have problem behavior and existing mands as members of the same response class, with possible hierarchical relations between the two types of responses. Specifically, in some contexts, mands for the reinforcer may be emitted first, and if mands do not produce reinforcement, some children may then allocate to functionally equivalent problem

behavior. Therefore, continuous reinforcement of existing mands may decrease demonstrations of functionally equivalent problem behavior in some children with DD.

Furthermore, as previous research has called for the development of interventions that increase the probability of individuals selecting non-problematic over problematic response class members to access reinforcement (Richman, 2008), this study adds to treatment literature in this area as well. In particular, this study demonstrated that when parents equally reinforce both types of responses, some children may choose to engage in appropriate behavior (mands) over functionally equivalent inappropriate behavior (problem behavior), thus reducing problem behavior. While parent participants did not rate the currently tested version of decreasing problem behavior through increased parent reinforcement of existing mands as highly useful or sustainable, this study may inform future interventions targeting existing alternative responses for the reduction of problem behavior in individuals with DD. In particular, for similar strategies to be more useful to parents, future applied investigations should add a focus on increasing child participants' tolerance of delayed reinforcement in response to existing mands or other alternative responses, and to tolerate these delays without allocating to problem behavior. An attempt to address this problem was made in the present study through the schedule thinning condition implemented with NS, however NS's mother found the procedures aversive, likely due to extinction bursts in both problem behavior and manding, and chose to end the phase before his behavior became fully stable. Future basic examinations of response classes of problem behavior in individuals with DD should examine relations between multiple problematic and non-problematic responses, such as multiple topographies of problem behavior and existing mands, and investigate how individual

and environmental factors may bias individuals' response selections towards problematic or non-problematic functionally equivalent behaviors.

APPENDIX A

Participant Screening Phone Interview

Script: Hello, this is Rachel Robertson. I am the student at Vanderbilt University who is running the study on a behavior strategy for children with disabilities and difficult behavior. I am calling to follow up on your interest in the study. First, I'd like to tell you about the study. The goal of the study is to help parents respond more to their child's communication behaviors at home. We believe this could decrease child problem behavior at home. The first step of the study is screening to see if you and your child are right for the study. Screening may take 2 to 6 visits over 1 to 3 weeks, and you will receive 20\$ for your time. If you qualify for the study we will make half-hour visits to your home 15 to 27 times over 3 to 6 months depending on your schedule. During these visits we will teach you the behavior strategy. You will also receive another 40\$ for your time. If at any time you wish to stop participating in the study, you are free to withdraw.

Are you interested in answering some questions to see if you and your child are right for the study? Answering these questions may take between 10 and 30 minutes. Would you like to answer these questions now or would you like me to call you back?

*If now, proceed. If person wants to be called back, take down a time to call again.

Intro Questions

Who would you say is your child's primary caregiver?

*If the person speaking identifies someone else, set up a time to speak to that person on the phone.

*If the person identifies him or herself, continue:

How old is your child?

Is your child male or female?

Is your child diagnosed with a disability?

-What disability is he/she diagnosed with?

What language do you speak with your child at home?

Problem Behavior

Does your child show any aggressive behavior at home?

What does this behavior look like?

-form of aggression towards others:

-how often does this behavior occur?

Does your child ever attempt to hurt him or herself at home?

What does this behavior look like?

-form of SIB:

-how often does this behavior occur?

Does your child show any destructive behavior, such as breaking things, at home?

What does this behavior look like?

-form of destructive behavior:

-how often does this behavior occur?

Does your child show any disruptive behavior, such as tantrums or throwing things, at home?

What does this behavior look like?

-form of disruptive behavior:

-how often does this behavior occur?

Which behavior are you most concerned about?

Which behavior occurs most frequently?

-Based on above answers, primary target behavior(s):

What tends to be going on at home when this behavior occurs?

Does it occur when you stop paying attention to your child?

Does it occur when you ask your child to do something he or she doesn't like to do?

Does it occur when your child can't have a toy or food he/she wants?

Does it occur when you're paying attention to someone else in the room?

Does it occur when you take a toy away from your child?

Does it stop when you start paying attention to your child?

Does it stop when you let your child go back to an activity he/she wants to do?

Does it stop when you give your child a toy, object, or food he/she wants?

Do you think he/she would do this behavior by him/herself if no one were around for long periods of time?

Does it occur when your child is told he/she can't do something he/she wanted to do?

Requesting

How does your child usually communicate with you at home?

- words?
- sounds?
- gestures?
- bringing you to things?
- visuals?
- other?

In what situations does your child communicate with you the most?

- when he or she wants your attention?
- when he/she doesn't want to do something?
- when he/she wants a toy, object, or food?
- other?

What do these request forms look like?

-i.e. reaching for something he/she wants and looking to you? Saying "No"?
Reaching up to get picked up? Asking verbally for a snack?

- how can you tell your child is asking you to do something?
 - he/she looks at you?
 - he/she says "mom/dad"
 - he/she gestures to you, etc.

Thank you! I will look over your responses and follow up with you next week about whether this study might be right for you and your child. Thanks again and I'll talk to you soon.

APPENDIX B

Social Validity Questionnaire

Parent: _____

Date: _____

Child: _____

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

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
Overall support	1. I enjoyed implementing the behavior management strategy with my child.	1	2	3	4	5
	2. I think I will use the behavior management strategy with my child in the future.	1	2	3	4	5
Fit/Ease	3. The behavior management strategy was easy to use with my child.	1	2	3	4	5
	4. The behavior management strategy was a good fit for my child.	1	2	3	4	5
Time/Burden	5. Using the behavior management strategy did not interfere with my home routines.	1	2	3	4	5
	6. Using the behavior management strategy did not take up too much of my time.	1	2	3	4	5
Produces positive effects	7. The behavior management strategy improved my child's behavior at home.	1	2	3	4	5
	8. The behavior management strategy improved my child's learning at home.	1	2	3	4	5
	9. The addition of the behavior management strategy improved the atmosphere in my home.	1	2	3	4	5

Please provide any comments about your experience with/opinion of the behavior management strategy:

APPENDIX C

Maintenance Questionnaire

Parent: _____

Date: _____

Child: _____

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

		Not at all		Somewhat		Very Much So
	10. I use the behavior management strategy as trained.	1	2	3	4	5
	11. Based on training from the study, I use some principles of the behavior management strategy to help manage my child's behavior.	1	2	3	4	5
	12. I'm more aware of my child's attempts to communicate with me.	1	2	3	4	5
	13. I'm more aware of the purpose of my child's problem behavior.	1	2	3	4	5
	14. I respond more to my child's communication attempts now than I did before the study.	1	2	3	4	5
	15. I respond less to my child's problem behavior now than I did before the study.	1	2	3	4	5
	16. I am more aware of how my behavior impacts my child's behavior.	1	2	3	4	5

Optional: Please provide any comments about how likely you are to continue using the behavior management strategy and why:

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