THE EFFECTS OF MODEL PROMPTS ON JOINT ATTENTION INITIATIONS IN CHILDREN WITH AUTISM

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The general purpose of the current study was to evaluate the effects of minimally intrusive prompting procedures and preferred stimuli on protodeclarative joint attention initiations in children diagnosed with autism spectrum disorder (ASD). Two boys and one girl diagnosed with ASD participated. The experimenter provided attention and social interaction following protodeclarative initiations throughout all phases of the study. During intervention, a model prompt was delivered every 30 s if the participant failed to initiate a bid for joint attention. Results for the first participant show that a model prompt was sufficient to increase the rate of protodeclarative initiations across stimulus sets. Generalization was seen across sets, but not across environments. Subsequently, the model prompt was sufficient to increase the rate of protodeclarative initiations across sets in a second setting (classroom). Results for the second participant are inconclusive. Data collected during the initial baseline condition show that she engaged in an incompatible verbal response across sets. When pictorial stimuli depicting high-interest items and activities were introduced, the rate of protodeclarative initiations increased over time. We then returned to original baseline condition and saw an initial decrease, followed by a steady increase in the rate of protodeclarative initiations. The third participant withdrew prematurely due to medical reasons. The findings of the current study show that minimally intrusive prompts and natural consequences may be sufficient to establish protodeclarative initiations in children. However, this finding may be limited to only those children for whom social interactions already function as reinforcers.
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CHAPTER 1
INTRODUCTION

Autism spectrum disorder (ASD) is defined by two core features: 1) deficits in socialization and communication and 2) restricted and repetitive behaviors (American Psychiatric Association, 2013). Although there is marked variability in the severity of these core features, the development of language and social skills are delayed in individuals diagnosed with ASD when compared to individuals who are typically developing (Dawson, Toth, Abbot, Osterling, Munson, Estes & Liaw, 2004; Matson, 2008; Mundy, Sigman, Ungerer, & Sherman, 1986; Whalen & Schreibman, 2006). A characteristic deficit in individuals diagnosed with ASD is in the area of joint attention (JA), broadly defined as sharing the experience of a social event between two or more persons (Dawson, Toth, Abbott, Osterling, Munson, Estes, & Liaw, 2004; Isaksen & Holth, 2009; Jones & Carr, 2004; Mundy, Sigman, Ungerer, & Sherman, 1986; Mundy, Sigman, & Kasari, 1994; Sigman & Kasari, 1995; Tomasello, 1995; Whalen & Schreibman, 2006).

Joint attention has been documented as one of the earliest emerging social skills. It is characterized as one of the most important developmental milestones, and has been linked to the development of language and more complex social skills (Holth, 2006; Isaksen & Holth, 2009; Taylor & Hoch, 2008; Whalen & Schreibman, 2006). JA typically develops within the first several months of life, and by the end of a child’s first year she or he can typically respond to others’ joint attention initiations. By contrast, children diagnosed with ASD often show less eye contact as well as deficits in other social interactions characteristic of joint attention. Further, deficits in JA have been linked to delays in language development as well as the development of later developing complex social skills such as empathy and establishing and maintaining
meaningful relationships (Holth, 2005; Holth, Vandbakk, Finstad, Gronnerud, & Sorensen, 2009; Jones & Carr, 2004; Whalen & Schreibman, 2006).

JA is often defined as the coordination of attention to an event or stimulus between two or more people for the purpose of sharing it (Dawson, Toth, Abbott, Osterling, Munson, Estes, & Liaw, 2004; Jones & Carr, 2004; Mundy, Sigman, Ungerer, & Sherman, 1986; Mundy, Sigman, & Kasari, 1994; Sigman & Kasari, 1995; Tomasello, 1995; Whalen & Schreibman, 2006). When defining JA, an overarching theme is the sharing of attention, or eye contact, with another person, plus a contextually relevant response (e.g., gesture, comment, gaze shift, or smile). For example, Taylor and Hoch (2008) specified that to be counted as an instance of JA, the participant had to look from the target stimulus to their communicative partner and emit a contextually appropriate comment about that stimulus within 5 s of the shift in gaze. Similarly, Pollard, Betz, and Higbee (2012) stated that for a response to be counted as a JA initiation, the participant must first orient to the target stimulus, emit a contextually relevant statement regarding that stimulus, and then orient to their communicative partner within 2 s of making the comment.

The interaction between the speaker and the listener is broken into two distinct subclasses of JA: Responses to bids for attention and initiations for attention. Responses to bids for attention are best described as those instances of behavior that follow the behavior of another person, and are contextually relevant. For example, if someone points to a hot air balloon and says, “Wow! Look,” the child’s behavior of looking toward the balloon, and saying, “It is so big!” would be considered a response to a bid for JA. The ability to appropriately respond to bids for attention can be taught to individuals with ASD relatively easily (Taylor & Hoch, 2008; Whalen & Schreibman, 2003; Whalen & Schreibman, 2006). This is in contrast to initiations (or “bids”) for
joint attention. A bid for JA is often preceded by a change in stimulus conditions or a novel event, and functions to draw the attention of the communicative partner to that stimulus or event. Consider the example above. The presence of the hot air balloon set the occasion for the person who saw it to gesture toward it, look at the individual they were speaking to, comment, and then look back to the balloon in the sky. This chain of responses is best described as a bid for joint attention.

Researchers also categorize joint attention episodes based on motivating conditions and maintaining consequences (Isaken & Holth, 2009; Jones & Carr, 2004). Initiations for JA that are maintained by social consequences are often labeled “protodeclarative.” Protodeclarative behavior has been defined as directing the attention of another person to an interesting stimulus or event while shifting one’s own gaze to the listener, and may involve gesturing and pointing toward the item or event (Tomassello, 1995). Functionally, protodeclarative initiations the tact, as defined by Skinner (1957). The tact is defined as a verbal operant in which a response is evoked, by the presence of a particular event or object, or some stimulus property of an event or object (Holth, 2005; Isaksen & Holth, 2009), and maintained by social reinforcement (e.g., attention). With respect to function, the social exchange is key to protodeclarative initiations. The interaction itself functions to reinforce the behavior of the individual who initiated the interaction (Holth, 2005; Isaksen & Holth, 2009; Holth, 2010). In contrast, protoimperative initiations are described as “requests intended to make another person do something for one’s benefit” (Sarria, Gomez, & Tamarit, 1996, p. 51). Researchers often cast protoimperative initiations as similar to Skinner’s notion of the mand (Isaken & Holth, 2009; Skinner, 1957). In essence, the initiations functions to produce preferred stimuli, events, or enhanced enjoyment, or completion of games or activities. Whereas many individuals with ASD acquire the ability to
request needed or preferred people, items, or events, many fail to acquire protodeclarative behavior. Therefore, the focus of this study is on protodeclarative initiations made by children with ASD.

Several researchers have been successful in teaching both responses to and initiations for joint attention using behavior analytic procedures. For example, Pollard, Betz, and Higbee (2012) analyzed the use of a script fading procedure to teach initiations for joint attention with three children diagnosed with ASD. They found that scripted phrases and textual prompts were effective in teaching children with ASD to initiate bids for joint attention across contexts. It is important to note that Pollard et al. programmed for the delivery of social praise as a consequence for scripted and unscripted bids for attention throughout their study. Although the data suggest that script fading was an effective tool for teaching children with ASD to emit protodeclarative behavior, their data also suggest that this method might produce rigidity in spontaneous bids, as most bids were solely comprised of those phrases that were taught using textual prompts.

Taylor and Levin (1998) compared the effects of two prompting procedures with a control condition on protodeclarative initiations with a 9-year-old boy with ASD using a multielement design. Protodeclarative initiations were defined as independent verbal statements that were contextually relevant and were directed toward another person. During the tactile prompt condition an experimenter led the participant into a room and instructed him or her to play. A small vibrating device was placed in the participant’s pocket and was programmed to vibrate every 60 seconds. In the verbal prompt condition, the experimenter delivered an instruction and a verbal model prompt on every 60 seconds (e.g., “say, check out that purple dinosaur!”). During the control/no prompt condition, the participant was simply instructed to
play. The results showed that only the tactile prompt produced independent initiations during play contexts. These data suggest that minimally intrusive prompting procedures may be sufficient to produce independent protodeclarative initiations with individuals diagnosed with ASD.

Whalen and Schreibman (2003) evaluated the effects of a teaching procedure on the emergence of JA (both responses and initiations) with five children diagnosed with ASD and six typically developing children. Teaching was divided into two parts: response training and initiation training. During response training, participants were taught to appropriately respond to their hand being placed on an object, look toward and engage with novel items when they were presented, make eye contact with the speaker when a novel object was presented, follow a point, and follow a gaze shift. Initiation training consisted of teaching the participants to look from an object to the experimenter, and teaching the student to recruit attention by pointing to an object. During teaching sessions, correct responses were followed by prolonged access to preferred items. Errors were followed by brief removal of preferred items and full physical or hand over hand prompting. Immediately following the completion of the teaching procedure, researchers conducted post-training assessments identical to the each of the pre-baseline assessments, and maintenance probes three months later. There were no programmed consequences during baseline, post training, and follow-up assessments. Relative to baseline, JA responses and initiations increased following teaching for all participants. Although there was an improvement in both responses to and initiations of JA across participants, the gains made in JA initiations did not maintain for 3 of the 4 participants during the three-month follow-up. Further, gains made in JA responses were marginal (falling within the same range as those responses emitted during baseline) for 3 of the 4 participants. These findings are consistent with the literature to date,
which suggests that: a) responses to and initiations for JA are functionally separate repertoires (i.e., the development of one does not necessarily result in the emergence and/or maintenance of the other), and b) that component skills of JA (e.g., responding to bids) can be easily taught using arbitrary reinforcers. With protoimperative requesting or pointing, where responding is maintained by access to preferred items, the effects of training are relatively more likely to maintain over time. Protodeclarative behavior, however, may be acquired during training sessions, but may fail to maintain overtime if naturally occurring consequences fail to control the behavior (i.e., socially mediated consequences).

Whalen and Schreibman (2006) extended their previous findings by conducting further analyses on their (2003) data to evaluate the effects of the JA training on the emergence of affect and imitation (i.e., collateral effects) with 10 preschool-aged students diagnosed with ASD. They found that in addition to acquisition of the target behaviors, teaching JA led to an increase in the percent of intervals containing spontaneous speech, positive affect, and spontaneous imitation. This is consistent with previous research that suggests that the acquisition of JA has collateral effects on the emergence of other related skills. However, their data show a decrease in the target behaviors over time, again suggesting that the intervention was not sufficient to ensure maintenance. Although the results suggest that continued access to toys may have functioned as a reinforcer during sessions, it is also plausible that the programmed negative reinforcement contingency accounted for the acquisition of JA across participants. Further, the lack of maintenance over time may have been related to the negative reinforcement contingency in conjunction with the lack of programmed social reinforcers.

Taylor and Hoch (2008) used a multiple-baseline across participants design to assess the effects of socially mediated consequences and prompting procedures on the emergence of
protodeclarative and protoimperative behavior (both responses to and initiations of JA) with three children diagnosed with autism. The four dependent variables were a) the percent of trials in which the participant shifted their gaze from the stimulus to the listener, b) the percent of trials in which the participant emitted a contextually appropriate comment about the stimulus, c) the percentage of trials in which the participant looked back at the listener within 5 s after commenting on a stimulus, and d) the total number of protodeclarative initiations. In this study, protodeclarative initiations were defined as spontaneous statements about stimuli within the environment. Further, to be counted as an initiation, the participant had to also gesture toward the item they were commenting on, and make a directive statement prior to commenting. For example, when the participant noticed a puppy in the room, he or she would point to it, say: “Look!” and then say: “It’s a puppy!” The researchers used various prompting procedures to teach responding to bids for joint attention, and most-to-least intrusive prompting procedures to teach initiating bids for joint attention. During response training, the experimenter initiated a bid for JA and then waited for the participant to respond. If the participant failed to respond within 5 s, the experimenter provided a gestural prompt. If the participant did not respond to the gestural prompt within 2 s, the experimenter used physical guidance to turn the participant’s head toward the item. Once the participant turned their head toward the stimulus, the experimenter provided a vocal model, which all participants echoed 100% of the time. If the participant failed to then turn his or her head back toward the experimenter, the experimenter then gestured from the item toward their face. If the gestural prompt was not effective, the experimenter then instructed the participant to look at her.

A progressive time-delay prompting procedure was used to teach initiations. During initiation teaching sessions, the experimenter walked the participant to a specified item and
waited for 5 s to see if the participant would initiate a bid for JA. If the participant failed to initiate a bid, the experimenter physically guided him or her to point to the stimulus, provided a vocal model of an appropriate bid, and then physically guided the participant to look back at him or her. The programmed delay was increased by 2 s, with a maximum of 13 s. Once the participant completed each of the specified steps in both the response and initiation training sequence, the experimenter delivered an appropriate response to the statement and physically interacted with the participant (e.g., tickles or high-five). The participants acquired several of the component skills, including gaze shift to the stimulus and protodeclarative bids, but failed to demonstrate a generalized joint attention repertoire across uncontrived settings. Specifically, the data show that all participants’ behavior of shifting their gaze back to the listener remained variable even after training. These findings are consistent with the current literature, which suggests that to establish sustained and generalized protodeclarative repertoires, refined teaching methods might be needed.

When evaluating the procedures employed in each of these studies and the obtained results, one must consider the role of social motivation in the acquisition of JA. In each of the previously mentioned studies, experimenters employed somewhat artificial teaching procedures within a contrived context. That, in conjunction with relatively intrusive prompting procedures and the use of arbitrary consequences for engaging in the targeted response may account for the lack of maintenance and generality of protodeclarative initiations outside of the training context. The use of most to least prompting procedures in the aforementioned studies may have established the experimenters as discriminative stimuli for potentially aversive events (i.e., physical guidance) (Crockett & Hagopian, 2006). In these studies, naturally occurring social consequences may not have functioned as reinforcers, or the behavior may not have contacted
such reinforcers. Thus, the use of less intrusive prompting techniques, and the use of natural consequences should be considered when teaching children to independently initiate bids for joint attention.

Because the responses that comprise joint attention are both components of and prerequisites for a multitude of more complex skills, there is a pressing need for a refined method of teaching JA and identifying gaps in existing repertoires. For example, an individual may emit a bid for attention, but may not make eye contact with others, or an individual may only respond to bids, but may not initiate them reliably (Dube, 2004; Holth, 2006; Jones & Carr, 2004; Taylor & Hoch, 2008). Previous studies have identified methods to teach eye contact, gaze shift, and responding to and initiating bids for joint attention, but there has been limited success in establishing spontaneous (i.e., not directly prompted) bids for joint attention that are maintained by social consequences. Further, there is little evidence that teaching these skills (e.g., eye contact, gaze shift, vocal bids for attention) in a clinical setting results in reliable generalization across settings, people, and stimuli, nor is there sufficient evidence that these skills maintain over time. Our literature review failed to identify research studies that addressed these shortcomings. The current study seeks to extend the previous literature by evaluating the effects of minimally intrusive prompting procedures by assessing the effects of a model prompt without an accompanying instruction, preferred stimuli identified through preference and anecdotal assessments, and naturalistic consequences on protodeclarative initiations in children with ASD.
CHAPTER 2
METHOD

Participants and Setting

Three children with autism participated. Prior to the onset of this study, school staff identified several students who were enrolled for the 2013/2014 academic year as possible participants. The criteria for participation were as follows: The child must (a) attend the school where the study was being conducted, (b) have an autism diagnosis (ASD), (c) be able to communicate using spoken language, (e) have a robust mand and tact repertoire, (f) exhibit low rates of problem behavior, (g) show a deficit in joint attention, and (h) exhibit some appropriate play skills. The school’s policy is to enroll students for whom attention functions as a reinforcer in some context. Though this is not listed as a criteria for participation, it is, in fact, a criterion for admission, and should be noted. Once the three participants were identified, a formal recruitment letter and a questionnaire about the child’s likes and interests were sent home to each family. When the recruitment letter had been signed and returned, the participants’ classroom teachers were also given a questionnaire. The information gathered in the questionnaire was used to select the stimuli used in this study.

Desi was a 6-year-old boy who was diagnosed with pervasive developmental disorder, mixed developmental disorder, and mixed receptive-expressive language disorder. According to the Woodcock-Johnson III Test, Desi functioned as a 72 month old on broad reading, 65 months on broad math, and 70 months on broad written language, and had an IQ of 84 at the time he was recruited for participation in this study. Desi’s educational team also recommended him for the study because he frequently spoke in a whisper, and squealed and giggled while playing rather than talking to his peers. Also, Desi frequently denied requests for attention from his peers, and
rarely made eye contact when speaking to his peers and teachers. For example, Desi was playing on the floor with a train set during one of our sessions. While he was playing, his classmate walked up to him and asked if he could play with him and Desi responded, “No. I don’t want to.”

During another observation, Desi was asked if he would join a game his peers were playing and he said, “No, thank you.” Further, during play contexts, Desi typically played independently, did not play in close proximity to his peers, and rarely monitored what his peers were doing from across the room. For example, Desi frequently chose to play with less preferred activities when peers were engaging with highly preferred activities, and he would commonly play with those items across the room away from the other students.

Lucille was a 7-year-old girl who was diagnosed with autistic disorder, developmental coordination disorder, and adjustment disorder with anxiety. According to the Woodcock-Johnson III test, Lucille functioned at 79 months old on broad reading, 81 months on broad math, less than 60 months on broad written language, and had an IQ of 89 at the time she was recruited. Her educational team recommended Lucille for the study because she frequently mandated for attention from adults, but ignored her peers. Additionally, Lucille’s classroom teacher reported that she often emitted veiled mands (Glenn, 1983; Skinner, 1957) with a statement about what she wanted others to say or do, or would frequently emit nonsensical statements throughout the day. For example, Lucille was not able to draw sophisticated pictures – her drawing skills were limited to disconnected stick people. During play activities, she would often pick up the Magna Doodle, bring it over to her classroom staff, point, and say, “That’s Dora,” and wait for that person to draw Dora. Also, Lucille frequently recruited attention and information by phrasing statements in the form of questions – termed nonsensical speech, for the purposes of this thesis. One example of this was when Lucille walked up to her teacher, put her
hand on her belly and said, “You have a baby in your what?” (Her teacher was not pregnant). Another example of this behavior was when during a classroom observation session, Lucille said: “You’re tapin’ me with a what?” Later, during a lesson, she was able to correctly identify a video camera.

William was a 10-year-old male who was diagnosed with autistic disorder and mixed receptive-expressive language disorder. According to the Woodcock-Johnson III Test, William functioned as a 96 month old on broad reading, 92 month old on broad math, and 92 month old on broad written language, and had an IQ of 59 at the time he was recruited for participation in this study. William was also recruited by his educational team because he frequently made nonsensical sounds when playing with peers rather than talking to them. Further, William frequently denied requests made by his peers to join group games and activities. For example, while looking at a magazine, his classmate said, “Hey, do you want to come color with me?” William responded with, “No. I don’t think so.”

All baseline and intervention sessions were conducted in a room approximately 3.65 m x 3.65 m in size, containing a bookshelf with five shelves, a child’s size table with two chairs, 5 varying stimuli (preferred leisure items identified prior to the onset of the study for each participant), a small tripod with a video camera, a timer, and a MotivAider ©. Sessions were conducted 3-5 days a week depending on participant availability and lasted 20 minutes. All sessions were video recorded for the purposes of data collection, inter-observer agreement, and treatment integrity.

Classroom probes and classroom intervention (run with Desi) were conducted in the participant’s classroom. William and Desi’s classrooms are divided into two halves separated by a short hallway in which bathrooms are located. Each day the children are divided into two
groups and table lessons are run on both sides of the classroom. Lucille’s classroom is divided into three sections (lessons, social skills, and self-help). Classroom probes were run about every 4th session and were twenty minutes in duration. During classroom probes the experimenter taped what the participant was doing during the observation. Classroom probe sessions were conducted such that samples were taken throughout the day, so the participants’ behavior was recorded during various times (e.g., lessons, playtime, P.E., circle time, etc.).

Materials

Materials used in this study were (1) tangible items identified through preference and anecdotal assessments (See Tables 1, 2, and 3 for a list of materials included in the stimulus preference assessment with each participant), (2) experimenter selected tangible items used during the novel stimulus probe (see table 1), (3) a timer, (4) a MotivAider, (5) video camera and small tripod, and (6) a large bookshelf with 5 shelving units.

Materials used for part two of Lucille’s intervention were (1) images of preferred items, (2) a timer, (3) a video camera and small tripod, and (4) a small child-sized table with 2-3 child sized chairs.

Measurement and Interobserver Agreement

The experimenter and a trained observer collected frequency data on protodeclarative initiations emitted by each participant. Each session video was loaded onto a secure drive, de-identified, and scored using a paper data sheet, pencil, and timer. Once the data had been collected, the experimenter converted the data from a frequency count to rate by dividing the total number of initiations by the duration of the session in minutes. An initiation was scored if the participant made a comment about an ongoing or past event (e.g., talking about a video she or he was watching in class prior to the onset of the session, or comments about the holiday season
and Santa before winter break), stimuli in the environment, or when they requested information about other people in the environment. Additionally, to be scored as a protodeclarative initiation, the participant had to look at the stimulus and then switch his or her gaze from the stimulus or stimulus event to the listener, or make eye contact with the listener while talking (specifically during those times when she or he was talking about a stimulus or event not present in the room, or when asking a question pertaining to something not physically present). An initiation was scored if there was a brief (2-3s pause between comments) and when the participant emitted two differing statements in a row. For example, Desi often talked about what he wanted Santa to bring for Christmas. During session, Desi commented on a game and said, “My brother has that game. He got it for Christmas,” and the experimenter said, “That’s neat. I bet he likes it.” Desi said, “I hope I get another train. We have a big train and it goes around the tree.” The second comment was scored as an initiation because it was contextually dissimilar (i.e., it was not in reference to his brother). Data were also collected on unclear statements. Unclear statements were scored when the participant’s mouth moved but the volume was inaudible, and when participants produced various nonsensical sounds while playing with the experimenter or stimuli (these data were collected, but were not graphed). For Lucille, statements ending with a determining adjective (e.g., I’m a girl and you are a what?) were scored as nonsensical speech. Data were not collected on Lucille’s veiled mands.

Exact count per 10-s interval interobserver agreement (IOA) was calculated for at least 33% of sessions for each participant (Cooper, Heron, and Heward, 2007). The experimenter and a second trained observer viewed and scored sessions independently. Exact agreement was scored for (a) initiations with a gaze shift and (b) initiations without a gaze shift. For Lucille, exact IOA was also collected on (c) nonsensical speech with a gaze shift and (d) nonsensical
speech without a gaze shift. If there was a disagreement on the frequency of initiations, the type of initiation, or the occurrence of gaze shift, the interval was scored as a disagreement. For example, if the primary data collector indicated that there were two initiations during an interval and both contained a gaze shift, and the secondary data collector also indicated that there were two initiations, but one did not contain a gaze shift, the interval was scored as a disagreement. The average IOA across participants was 88% (range, 82% - 90%). The average IOA for Desi was 89.25% (range, 72% - 100%). The average IOA for the classroom intervention for Desi was 90% (range, 80% - 100%). The average IOA for baseline sessions for Lucille was 89% (range, 72% - 98%). The average IOA for pictorial stimulus sessions for Lucille was 82% (range, 74% - 92%). Lastly, the average IOA for William was 89% (range, 76% - 100%).

Procedural integrity (PI) data were also collected on at least 25% (range, 28% - 38%) of sessions for each participant. PI data were collected on the duration of sessions and access to pictorial stimuli (Lucille only). Data were also collected on the experimenter’s timely response to initiations (within 3-5s) and whether or not prompts were delivered on schedule (every 30 s unless the participant emitted an initiation). The average PI collected for Desi was 94% (range, 68% - 100%). The average PI collected for Lucille was 94% (range, 76% - 100%). The average PI collected for William was 100%. Interobserver agreement (IOA) was collected on at least 20% of PI collected. The average PI IOA for Desi was 93% (range, 75% - 100%). The average PI IOA for Lucille was 88% (range, 80% -100%). The average PI IOA for William was 92% (range 75% - 100%).

Procedure

Preference assessment. When Desi, Lucille, and William were selected as participants for this study, the experimenter sent home a questionnaire for parents about each child’s likes and
interests. Their educational team was given the same questionnaire. The data from the questionnaire were used to select stimuli for a preference assessment. A multiple stimulus without replacement (MSWO) preference assessment was conducted across 15 stimuli for each participant (DeLeon & Iwata, 1996). During this assessment, all 15 stimuli were presented in an array on two small tables on one side of the room. Once the participant was seated, the experimenter instructed him or her to select one toy to play with. The participant was allowed to interact with each stimulus item for 1 minute before they were instructed to clean up and that item was removed from the array. Once the item was removed from the array, the participant was instructed to pick again. This process continued until there were no items left to choose from. Due to the amount of stimuli included in the assessment, one pass (a single pass constituted one minute of interaction with each item, for a total of approximately 15 minutes) was conducted each day until either 5 passes had been completed, or a clear selection pattern had been established (see Tables 1-3). The items were ranked in order of preference and each item assigned to one of three stimulus sets. The sets were arranged such that the 1st, 2nd, and 3rd ranked stimuli are grouped with the fifteenth, fourteenth, and thirteenth stimuli respectively. The remaining 9 stimuli were grouped according to the same logic. William’s MSWO showed little differentiation, so his stimuli were grouped such that every third item was in the first stimulus Set (see Table 3). There were a total of 3 sets of stimuli per participant, and 5 stimuli in each set (see Tables 1 - 3).

**Baseline.** During baseline, the experimenter set a timer and instructed the participant to find something to play with. Stimuli were randomly arranged on the shelving unit prior to the onset of each session to reduce the possibility of selection by position bias, and decrease the predictability of the display across sessions. Only one Set was presented at a time. If the
participant emitted a protodeclarative statement, the experimenter responded with a single statement, a question about what the child said, or a confirmation of what the child said. All statements were delivered in a naturalistic manner. For example, during baseline Desi talked about Christmas approaching and said, “Santa is coming. I want a new train to go around my tree,” and the experimenter said, “That sounds cool.” Another example is when William was playing with the orange light-up ball. When the ball rolled out of the room, William said, “Oh no! Where’d it go?!?” The experimenter responded, “It rolled down the hall! Let’s go get it!” When the timer went off, the experimenter said, “It’s time to clean up and go back to class.” All sessions were 20 minutes.

Model prompt. These sessions were identical to baseline except that the experimenter emitted a verbal model of a protodeclarative statement every 30 seconds, if the participant had not emitted such a statement. The experimenter used a MotivAider to silently signal when 30 s had elapsed. The MotivAider was clipped on the experimenter’s pant or shoe and vibrated after the scheduled interval had elapsed. If the participant emitted a protodeclarative initiation (with or without eye contact) within the 30-s interval the experimenter responded with a statement, comment, or question about what the participant said and reset the MotivAider for 30 s. For example, Desi had been playing with a game called Pop the Pig ©, but had not emitted an initiation. After 30 s had elapsed without an initiation, the experimenter said, “Look! The pig’s belly gets bigger when he eats cheeseburgers!” Models were either about something the participant was engaging with or doing, something the experimenter was engaging with or doing, or they were contextually relevant in some other way (e.g., a holiday party the child had attended in their classroom that day). For example, the students were all having holiday parties before winter break, and Desi’s holiday party was being held immediately following session. When 30 s
had elapsed without an initiation, the experimenter said: “The holiday party will be a lot of fun! It’s exciting!”

A naturalistic statement, comment, or question, as in baseline, followed participants’ responses to protodeclarative statements made by the experimenter. For example, 30 s had elapsed without an initiation and Lucille was looking at a coloring book page that had been drawn on. The experimenter said, “Wow! That picture is beautiful!” Lucille responded and said, “I am no good at drawlin.” The experimenter then replied, “That’s okay.”

If, during the interval, the participant emitted a protodeclarative initiation, the experimenter responded with a confirmation, question, or naturalistic statement, comment, or question about what was said. For example, Desi talks about alligators and crocodiles often. During session, Desi pointed to a picture of an alligator and said, “An alligator’s mouth is shaped differently than a crocodile’s mouth.” The experimenter immediately replied saying, “That is really neat!” Another example of a response is, during session with Lucille she picked up the giant cheeseburger and said, “That’s a big cheeseburger!” The experimenter replied saying, “You’re right. That is a big cheeseburger!” Experimenters did not follow a script for delivering replies to initiations.

*Classroom baseline.* During classroom baseline, the experimenter brought a bin of toys from each set into the classroom during free play. If Desi emitted a protodeclarative statement to the experimenter, she responded in the same way described previously. For example, if Desi picked up a game and walked over to the experimenter and said, “My brother has this game at home,” the experimenter would say, “That’s awesome.” If Desi initiated to one of his peers, she or he typically responded appropriately. The experimenter did not prompt interactions during baseline. When the timer went off to signal the end of the session, the experimenter said, “It’s
time to clean up and go back to lessons.” To minimize the extent to which sessions detracted from the students’ daily lessons, session length was reduced to 5 minutes.

*Model prompt within the classroom (Desi only).* The experimenter asked the peer confederates to talk with Desi about the items they were playing with, events happening in the room, and things the other children were doing. Model prompts and instructions to interact with Desi were delivered on a 30-s schedule as in the original baseline condition. If, following an instruction, a confederate failed to initiate, the experimenter prompted her or him to do so by providing an example of something to say. For example, if the children were playing the Angry Birds game together, and 30 s had elapsed without a protodeclarative initiation emitted by Desi, then the experimenter would lean over to one of the peer confederates, tap his or her shoulder and point toward Desi. If the child failed to initiate to him, the experimenter would lean over to the peer confederate and say, “__ (child’s name) __, look at Desi and say, ‘My bird is going to knock your tower down!’”

*Classroom probes.* Classroom probes were conducted about every 4th session to check for generalization across environments. Sessions were twenty minutes in duration. During classroom probes, the student was recorded engaging in a variety of activities determined by their classroom teacher. Experimenter responses to initiations and requests were identical to baseline.

*Follow-up probe.* Two follow-up classroom probes were conducted with Desi following the classroom intervention. The first probe was conducted after 1 week, and the second was conducted 2 weeks following the termination of intervention. During probes, prompts were not delivered. Probes were 5 minutes in duration.

*Test stimulus probe.* Once follow-up probes were conducted, a test probe was conducted using novel stimuli that were randomly selected by the experimenter. Sessions were identical to
baseline. The test stimulus probe was conducted in the participant’s classroom and were 5 minutes in duration. There were 5 stimuli in the test Set (See Table 1).

*Pictorial stimulus baseline (Lucille only).* Lucille emitted veiled mands (Glenn, 1983) and nonsensical speech during sessions. These responses are incompatible with emitting protodeclarative initiations. Script fading procedures have been shown to be effective in teaching children with ASD to initiate and interact with their peers within a variety of contexts with minimal prompts (Betz, Higbee, & Reagon; 2008; Pollard, Betz, & Higbee, 2012). Additionally, they have been useful tools when teaching children with ASD more appropriate ways to recruit attention. To establish a baseline for a script fading procedure, four groups of stimuli with six images each were placed in a binder. The stimuli were images of preferred items or events. Data from the questionnaire were also used to identify and select preferred pictorial stimuli. For example, data from Lucille’s questionnaire indicated that she was fond of babies, unicorns, weddings, dancing, families, and watching children playing. Images were randomly selected by searching each of these terms using Google search engine. There were a total of 24 images across 4 sets, and six images from each category in each Set.

Sessions were conducted at a table with Lucille and the experimenter sitting next to one another. Lucille was shown each image for 60 s. As with the first intervention, all initiations were followed by a comment about the initiation or a statement of confirmation. For example, Lucille commented on one of the pictures and said, “That baby is so cute! He is sitting in a basket!” The experimenter replied, “That baby is cute!” Pictorial stimulus presentation baseline sessions were about 6 minutes and 30 seconds in duration, and were run in successive order such that there were 3 sessions between each presentation of a specific set. Stated differently, once a
session with Set 1 had been presented, Sets 2, 3, and 4 were presented before Set 1 was presented again. Sessions were conducted 3-5 days per week with 1-3 sessions per day.

As noted above, this condition was planned as a baseline for a script fading intervention. However, due to the pattern of results during this condition, we did not implement the script fading intervention (see results for further detail).

Experimental Design. A multiple baseline across stimulus sets was used to assess the effects of prompting procedures on protodeclarative initiations for joint attention. Sessions were run in successive order such that Set 1 sessions were conducted first, followed by Set 2 and Set 3 sessions, and then a classroom probe. Sessions that were 20 minutes in duration were run 1-2 times per day, 2-5 days per week. Desi’s classroom intervention (5-minute sessions) was run 3-5 days per week, with 1-3 sessions per day.

The experimental design used with Lucille can be described as an A-B-A withdrawal design (i.e., original baseline, followed by the pictorial stimulus condition, and back to the initial baseline). However, we never implemented formal intervention with her.
CHAPTER 3
RESULTS

Table 1 depicts the results from Desi’s multiple stimulus without replacement (MSWO) preference assessment. Desi’s most preferred items were Pop the Pig, the giant plastic cheeseburger (full of pretend food), and Angry Birds Space game. During baseline, Desi infrequently emitted protodeclarative initiations (see Figure 1). Following intervention with Set 1, the rate of protodeclarative initiations emitted by Desi increased but remained low initially, ranging between 0.2 and 0.4 initiations per minute. In session 24, the rate of protodeclarative initiations increased to 0.95 responses per minute and remained high relative to baseline in subsequent session, with a range between 0.55 and 1.4 responses per minute. Following intervention with Set 1, there was a slight increase in protodeclarative initiations with Set 2. However, the rate of initiations quickly decreased to approximately 0.1 responses per minute. Following intervention with Set 2, the rate of protodeclarative initiations increased to 0.35 responses per minute, and continued to increase ranging between 0.35 and 1.5 responses per minute. Rate of protodeclarative initiations remained low for the first seven sessions of baseline. However, the rate of initiations increased after that point, suggesting generalization across stimulus sets.

Despite these changes in rate of initiations during sessions, data from classroom probes showed little or no change in the rate of initiations (see Figure 2). Therefore, a classroom intervention was implemented to increase the rate of protodeclarative initiations throughout the day. Figure 3 shows the results from the classroom intervention with Desi. During baseline, the rate of independent initiations ranged from 0 to 0.5. Following intervention with Set 1, the rate of protodeclarative initiations increased (ranging between 0.2 and 4 responses per minute). These
results maintained during follow-up probes. Similarly, baseline data for Set 2 show that Desi infrequently emitted initiations. Only when intervention began did Desi emit protodeclarative initiations. Data from intervention with Set 2 show a variable rate of protodeclarative initiations following intervention (ranging between 0 and 3.8 responses per minute). Though there was a slight decrease in the rate of protodeclarative initiations during the follow-up probe for Set 2, the rate of initiations stayed elevated relative to baseline. Data from Set 3 show a similar trend. Data from baseline with Set 3 show that the rate of initiations became variable following intervention with Set 2, though they stayed low. Following intervention, there was a steady increase in protodeclarative initiations ranging between 1.2 and 4.6 responses per minute. The rate of protodeclarative initiations remained high during follow-up probes.

Data from the classroom probes shows that following the classroom intervention, there was an increase in the rate of protodeclarative initiations in the classroom (see Figure 2). Also, data collected during the test stimulus probe show that in the presence of novel items, the rate of protodeclarative initiations remained high.

Table 2 depicts the results from Lucille’s MSWO preference assessment, and shows the breakdown of the stimulus sets. The top three preferred items during the MSWO were the giant plastic cheeseburger, Legos (71 pc), and Angry Birds Space game. During baseline conditions, the rate of protodeclarative initiations ranged from 0 to 0.75 across sets. Although the rate of protodeclarative initiations was low during baseline, Lucille frequently emitted nonsensical statements and veiled mands during session (this is noted specifically because both veiled mands and nonsensical speech are incompatible with the target behavior, protodeclarative initiations). Data were not collected on veiled mands. However, data collected on initiations and nonsensical speech show that Lucille was emitting nonsensical speech and protodeclarative initiations at a
rate of about 2 responses per minute. Figures 4 and 5 show the average rate of protodeclarative initiations and nonsensical speech. Thus, each data point represents the average rate of responses across sets. Point 1, for example, represents the average rate of responses for the first sessions run with Sets 1-3 during the initial baseline. The first point shown for the pictorial stimulus baseline represents the average rate of responses for the first sessions run with Sets 1-4. Her data were shown as the average rate of responses for a parsimonious representation of her behavior throughout this study. Figures 4 and 5 show an average rate of protodeclarative initiations and nonsensical speech across two baseline phases (initial baseline and pictorial stimulus baseline).

Data collected during the pictorial stimulus baseline show a steady increasing trend in initiations over time. Because of this, we returned to initial baseline conditions. Once we returned to the initial baseline conditions, the rate of Lucille’s protodeclarative initiations dropped to about .5 responses per minute, but increased over time. By the final session, the rate of protodeclarative initiations had increased to about 2 responses per minute. During classroom probes, the rate of protodeclarative initiations and nonsensical speech remained variable (see Figure 2). Sessions with Lucille were discontinued as continued participation in this study interfered with the treatment of nonsensical speech and problem behavior.

Table 3 depicts the results from Williams’s MSWO preference assessment, and shows the breakdown of the stimulus sets. The top three preferred stimuli were coloring sheets and crayons, Jenja, and Find-It. During baseline conditions, the rate of protodeclarative initiations ranged from 0 to .3 responses per minute (see Figure 7). Following intervention with Set 1, the rate of initiations increased to about 0.7 responses per minute.

Data collected during classroom probes shows that William’s rate of protodeclarative behavior was variable (ranging between 0.5 and 0.85 responses per minute) (see Figure 8). The
jump up to 0.85 responses per minute corresponds with the change in conditions with Set 1. However, there was a decrease in responses per minute over time during subsequent sessions.

Sessions with William were discontinued prematurely due to a physical injury he suffered over summer break. Hence, we did not intervene with Sets 2 and 3. Sessions with William will be resumed once he makes a full recovery.
CHAPTER 4

DISCUSSION

Desi is the only participant thus far to complete the study as originally planned. During the initial intervention phase, his rate of initiations remained low and variable. There was a significant change in the rate of protodeclarative initiations at point 25 when Desi’s rate of initiations jumped from 0.1 responses per minute to about 1 response per minute. This change corresponds with his classroom Holiday Party. During session he talked about his likes and interests, and the things he hoped to get from Santa. From this point forward, the rate of initiations remained high and continued to increase over time.

Desi’s data show generalization across sets during the initial intervention within the session room. However, generalization across environments and people (i.e., classroom generalization) did not occur to a sufficient extent. Following the classroom intervention, Desi’s rate of protodeclarative initiations increased over time and maintained during the 1st and 2nd week follow-up probes. Generalization did not occur across sets during classroom sessions. His data suggest, however, that there was generalization to the test set comprised of various stimuli, which were not included during the MSWO preference assessment (See Table 1 for a list of stimuli included in the test set). However, pre-intervention data were not collected with this set, so this conclusion is tentative. Desi’s history with and exposure to each of the items in the test set are unknown.

Following the classroom intervention, there was a slight increase in the rate of protodeclarative initiations emitted by Desi during classroom probes. Anecdotally, there were also collateral changes in Desi’s behavior, which may be attributed to the intervention. Following intervention in the classroom, Desi began monitoring the behavior of his peers more
often. The proximity to his peers also decreased over time (during independent play activities he positioned himself closer to his classmates), and he began smiling more frequently. There were no data collected on these behaviors; the reported change in these behaviors is purely anecdotal. However, these observations are consistent with the findings of Whalen and Schreibman (2006) who also noted collateral changes in child behavior following response and initiation training to teach joint attention skills. Measures of collateral changes in behavior with children diagnosed with ASD should be considered for future studies on the acquisition and maintenance of JA.

William’s data are promising, but incomplete due to his premature (and hopefully temporary) withdrawal from the study. During baseline sessions within the session room, William infrequently emitted protodeclarative initiations. Following intervention, there was an increase in the rate of protodeclarative initiations with Set 1. Interestingly, there was a slight increase across Sets 2 and 3, and an increase in initiations within the classroom setting following intervention with Set 1. These changes did not maintain.

It should be noted that the topography of William’s initiations was limited to a handful of short phrases (no more than 7 or 8 different phrases). Common initiations included statements like, “Oh, look!,” “Wow! There it goes,” “Oh no!” William also frequently gestured toward items and events within the room, although those were not counted if unaccompanied by a statement about those stimuli or events. Therefore, it might be necessary to address the variability, duration, and quality of initiations for William.

Lucille’s data are also incomplete. Lucille’s nonsensical speech seemed to function to produce attention, and in turn, was identified as an incompatible response with protodeclarative initiations. Additionally, Lucille frequently emitted veiled mands throughout session. Because of this, we introduced the pictorial stimulus baseline with the intent to teach Lucille more
appropriate ways to recruit attention and comment on aspects of her environment. However, during this time, her prescribed medication was being titrated with the goal of weaning her off the medication. This may account for the increase in protodeclarative initiations during the pictorial stimuli baseline and return to baseline sessions (see Figure 4), and the simultaneous decrease in the rate of nonsensical speech (see Figure 5). Another consideration is Lucille’s history with early and intensive behavioral intervention. Lucille has a long history of responding in the presence of pictorial stimuli and receiving highly preferred items and activities following correct response. Although there was no formal intervention, the phase change to the pictorial stimulus baseline may, in and of itself, account for the change in Lucille’s behavior due to her specific learning history. Lucille’s rate of protodeclarative initiations during classroom probes also increased following the pictorial stimulus baseline condition and subsequent return to initial baseline sessions.

Several studies have shown that researchers have been successful in teaching both responses to and initiations for joint attention through the use of behavior analytic procedures (Krantz & McClannahan, 1993; Taylor & Hoch, 2008; Taylor & Levin, 1998; Whalen & Schreibman, 2003; Whalen & Schreibman, 2006). Although there have been numerous studies showing that these procedures are effective, there has been limited success teaching protodeclarative behavior. The current study contributes to the existing literature in several ways. First, naturally occurring consequences were programmed to follow initiations. Arbitrary and contrived reinforcers may function to establish new patterns of behavior, but often when those reinforcers are withdrawn the behavior ceases to occur, or decreases over time (Holth et al., 2009; Whalen & Schreibman, 2003).
A second contribution of the current study is the use of least intrusive prompting procedures. Previous research on the establishment of joint attention repertoires has included such prompting procedures as physical guidance (Jones, Carr, & Feeley, 2013; Pollard, Betz, & Higbee, 2012; Taylor & Hoch, 2008; Whalen and Schreibman, 2003; Whalen & Schreibman, 2006), graduated guidance (Jones et al., 2013; Taylor & Hoch, 2008), and instructions (Pierce & Schreibman, 1995; Taylor & Levin, 1998). These forms of prompting, though effective, may also establish the teacher or experimenter as a conditioned aversive stimulus in the presence of which the participants may engage in escape or avoidance behavior. In contrast, the minimally intrusive prompting used in the current study may be less likely to acquire aversive properties (Crockett & Hagopian, 2006).

In addition to these contributions, the current study had another interesting finding. Vocal models (or, for Lucille, picture prompts) were sufficient to establish protodeclarative initiations, and additional training was not necessary. Previous research on joint attention, specifically protodeclarative initiations, focused on teaching students how to initiate to familiar adults in a variety of contexts (Taylor & Hoch, 2008; Whalen & Schreibman, 2003; Whalen & Schreibman, 2006). However, in the current preparation, the participants were not prompted to initiate specific bids for joint attention. One possible explanation for this is that each of the participants had been in an early intensive behavioral intervention (EIBI) program before transitioning to the school from which they were recruited for this study. It is possible that this history had served to establish the presence of familiar adults and peers as discriminative stimuli for the availability of social reinforcers. This is in contrast to many children with ASD for whom social stimuli do not function as reinforcers for their behavior. For Desi, social stimuli appeared to already function as a reinforcer for his behavior, thus conditioning social stimuli as a reinforcer was not necessary.
The same appears to be true for William, though additional sessions are needed to explore this possibility.

Several limitations of the present study should be noted. First, the current intervention might only be appropriate for those students for whom social interaction serves as a reinforcer. Thus, for some children with autism, it might be necessary to establish social interactions as reinforcers prior to implementing the current intervention (Isaksen & Holth, 2009). A second limitation of this study was the duration of sessions. All participants attended session 3-5 times per week, which is equal to an hour and a half of academic time per student. This may have affected their rate of skill acquisition in the classroom. Reduced session duration may have been just as effective and it may not have had as great of an impact on their individual lesson time in their classrooms. Third, initial baseline data were not collected on the frequency of responding for the test stimuli used for Desi. Thus, these data are not a true measure of generalization. Additionally, there were no long-term maintenance probes for Desi. Though his data show maintenance at the first and second follow-up probe, additional data collection is needed to determine the effects of the current procedure on the rate of protodeclarative initiations. Lastly, experimental control was limited across participants. Desi’s initial evaluation was limited due to generalization across Sets. Lucille’s evaluation was also limited due to the variability of responding, and the increasing trend in the final phase. William’s evaluation remains incomplete.

The data from the current study suggest that for some children with ASD, social stimuli do function as reinforcers, and that clinicians can use the procedures described in this study to establish protodeclarative initiations with these individuals. Further research is needed to better identify those individuals for whom social stimuli are established reinforcers. Moreover, additional research is needed to identify more efficient ways to condition social stimuli as
reinforcers for those children for whom social consequences do not function as reinforcers (Dozier, Iwata, Thomason-Sassi, Worsdell, & Wilson, 2012; Isaksen & Holth, 2009). The methods employed in this study may be an appropriate intervention for children for whom some aspects of social interaction do function as reinforcers.

Table 1

*Results of Desi’s MSWO Preference Assessment*

<table>
<thead>
<tr>
<th>Stimuli</th>
<th>Rank</th>
<th>Set</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pop the Pig</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Giant Plastic Cheeseburger</td>
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<td>2</td>
</tr>
<tr>
<td>Angry Birds Space Game</td>
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<td>3</td>
</tr>
<tr>
<td>Light-up Ball</td>
<td>4</td>
<td>1</td>
</tr>
<tr>
<td>Barrel of Monkeys</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Books (set of 3)</td>
<td>6</td>
<td>2</td>
</tr>
<tr>
<td>Find-it</td>
<td>7</td>
<td>1</td>
</tr>
<tr>
<td>Legos (71 pc)</td>
<td>8</td>
<td>3</td>
</tr>
<tr>
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<td>2</td>
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<tr>
<td>Zingo</td>
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</tr>
<tr>
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<td>3</td>
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<td>Connect4</td>
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<tr>
<td>TrekBot</td>
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<tr>
<td>Twilight Ladybug</td>
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Table 2

*Results of Lucille’s MSWO Preference Assessment*

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<tbody>
<tr>
<td>Giant Plastic Cheeseburger</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Legos (71 pc)</td>
<td>2</td>
<td>2</td>
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<tr>
<td>Angry Birds Space Game</td>
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<td>3</td>
</tr>
<tr>
<td>Books (set 3)</td>
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<tr>
<td>Coloring book with crayons</td>
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<td>Toy Story Magnadoodle</td>
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<tr>
<td>Pull the String</td>
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<td>Sticky Mitts</td>
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<tr>
<td>Operation</td>
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Table 3

*Results of William’s MSWO Preference Assessment*

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<tr>
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<tr>
<td>Find-It</td>
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<td>3</td>
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<td>Tangrams</td>
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<td>Books (set of 3)</td>
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<td>2</td>
</tr>
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<td>TreckBot and HexBug</td>
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<td>3</td>
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<td>Connect4</td>
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<td>1</td>
</tr>
<tr>
<td>Legos (71 pc)</td>
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<td>2</td>
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<td>Barrel of Monkeys</td>
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<tr>
<td>Operation</td>
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<tr>
<td>Sticky Mitts</td>
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<td>Guess Who</td>
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<tr>
<td>Angry Birds Space Game</td>
<td>15</td>
<td>3</td>
</tr>
</tbody>
</table>
Figure 1. Rate of protodeclarative initiations during baseline and intervention sessions.
Figure 2. Rate of protodeclarative initiations during classroom probes. Closed squares indicate the rate of protodeclarative initiations during classroom probes (test stimuli not present). The open diamond indicates the rate of protodeclarative initiations during the test stimulus probe (test stimuli were present).
Figure 3. Rate of protodeclarative initiations during classroom baseline and intervention sessions.
Figure 4. Rate of Lucille’s protodeclarative initiations during baseline, pictorial stimulus condition, and return to baseline. Each data point represents the average rate of responses across Sets.

Figure 5. Rate of Lucille’s nonsensical speech during baseline, pictorial stimulus condition, and return to baseline. Each data point represents the average rate of responses across Sets.
Figure 6. Rate of Lucille’s protodeclarative initiations during classroom probes.
Figure 7. Rate of William’s protodeclarative initiations during baseline and intervention.
Figure 8. Rate of William’s protodeclarative initiations during classroom probes
REFERENCES


*Behavioral foundations of effective autism treatment* (pp. 73-89). Cornwall-on-Hudson, NY:
Sloan Publishing.

analysis of joint attention and the establishment of conditioned social reinforcers. *European
Journal of Behavior Analysis, 10*, 143-158.


Krantz, P.J. and McClannahan, L.E. (1993). Teaching children with autism to initiate to peers:


Burlington, MA: Elsevier Inc.

McDonald, P. F. (2008). Hey look, it’s a train! In E. Cipani (Ed.), *Triumphs in early autism
treatment* (pp. 55-69). New York: Springer.

MacDonald, R., Anderson, J., Dube, W.V., Geckeler, A., Green, G., Holcomb, W., Mansfield,


