

An Evaluation of the Use of Eye Gaze to Measure Preference for Individuals with
Multiple Disabilities

Thesis

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By

Geoffrey M. Wheeler, B.A.

College of Education and Human Ecology

The Ohio State University

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Thesis Committee:

Dr. Ralph Gardner, III, Advisor

Dr. Helen I. Malone

ABSTRACT

This study used duration of eye gaze toward a stimulus to measure preference. The study took place in two schools for students with mental retardation and developmental disabilities. All four participants were high school students who had a diagnosis of multiple disabilities. The observers used direct recording procedures to record choices made by the individuals and emissions of targeted behavior within a reversal design. The conditions included: Baseline, High-preferred, and Low-preferred. Results indicate that duration of eye gaze toward a stimulus is a promising method of measuring preference for individuals with multiple disabilities and that those preferred stimuli can function as reinforcers.

Dedicated to Courtney Fleming, whose vision will someday bring about far reaching results for members of an overlooked population yet waiting to make their choices known

“Some of us have ignored both the thesis that all persons are educable and the thesis that some persons are uneducable, and instead have experimented with ways to teach some previously unteachable people. Over a few centuries, those experiments have steadily reduced the size of the apparently ineducable group relative to the obviously educable group. Clearly, we have not finished that adventure. Why predict its outcome, when we could simply pursue it, and just as well without a prediction? Why not pursue it to see if there comes a day when there is such a small class of apparently ineducable persons left that it consists of one elderly person who is put forward as ineducable. If that day comes, it will be a very nice day. And the next day will be even better.” (D. M. Baer, 2002, cited in Heward, 2009, p. 456)

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VITA

March 11, 1982.....Born-Cincinnati, Ohio

2004.....B.A. Communication and Creative Writing

Certificate, Saint Louis University

2004-2008.....Private ABA Therapist, Saint Louis, Missouri

2008-2009.....Private ABA Therapist, Columbus, Ohio

FIELDS OF STUDY

Major Field: Education

Area of Emphasis: Special Education and Applied Behavior Analysis

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CHAPTER 1

INTRODUCTION

Although they encompass a vastly heterogeneous population, one commonly shared characteristic of individuals with multiple disabilities is their reliance on other people for sustenance and learning experiences (Petry & Maes, 2007). The educators and support staff who assist individuals with multiple disabilities must make every effort to structure their reciprocal interactions in a manner that results in the maximum number of opportunities for the individual to contribute to the instructional relationship and affect behavior (Petry & Maes).

Unfortunately, the complex feeding needs, sleeping habits, and medical episodes of individuals with multiple disabilities can disrupt even the most expertly designed and professionally executed program of instruction (Mednick, 2007). Borgioli and Kennedy (2003) conducted a survey of 19 individuals hospitalized at least once during the previous 5 years. In 46 reported hospital visits, the average school absence for the student was 28.9 days. Of the 46 transitions from school to hospital, only one included continued delivery

of the student's Individualized Education Program. Because consistent routines that allow students to anticipate events are essential for individuals with multiple disabilities (Mednick, 2007), this absence of instruction is potentially devastating to the student's ability to acquire and maintain skills.

The possibility of frequent, sometimes lengthy, medical interruptions to a student's education underscores the need to maximize instructional effectiveness for individuals with multiple disabilities. One example of efforts made in this area is using favored stimuli to teach individuals localization, attention shifting, and eye-hand coordination, thus improving their use of vision (Li, 2003).

Because of the motivational nature of reinforcing items, the ability of individuals with multiple disabilities to inform caregivers and educators of their preferences is an important feature of an effective instructional relationship. Peck (2004) designed an individualized book that provided individuals with multiple disabilities (including communication difficulties) with a means to communicate such details as preferred activities (e.g., a desire to walk in the sunny part of the building) to unfamiliar staff when transitioning. When used effectively, caregivers are able to bypass the time-consuming guesswork that might be required to interpret the idiosyncrasies of a new client's behavior and focus on the continuation of substantial instruction.

Sadly, in spite of the extreme needs of individuals with multiple disabilities and the efforts made on their behalf, a significant amount of the population is still not receiving the needed support for an appropriate education. For example, Arthur (2003)

found that one 5-hour school day for 10 school-aged children with severe and multiple disabilities consisted of 34.1% percent of time spent in isolation. Another study conducted by Foreman, Arthur-Kelly, Pascoe, and King (2004) observed the social interaction accessed by eight pairs of students with multiple disabilities (half in general education classrooms and half in special education classrooms) at 10 s intervals for a single day. Results indicated that communication occurred on 49% of observations in general education classrooms compared to 27% in special classes. Additionally, students in special education classes had no communication partner for 56% of the time compared to 31% of the time in general education classes. One possible explanation for the lack of interaction between individuals with multiple disabilities and those around them is the inability of the students to express their needs in a manner that allows peers or staff to understand and respond appropriately.

These sobering statistics reflect the crucial responsibility of those entrusted with caring for and instructing individuals with multiple disabilities to provide them with sufficient opportunities to communicate their unique wants and preferences (i.e., the extent to which the individual chooses one stimulus over another). An important consideration for professionals is whether or not a preferred stimulus functions as a reinforcer. In other words, does access to the stimulus that is contingent upon emission of a targeted behavior increase the future frequency of that behavior? To that end, equipping educators and care providers with effective, practical means of determining how best to motivate and challenge individuals with disabilities is crucial.

One strategy that has been proven to be effective in indentifying reinforcing stimuli for individuals with disabilities is the use of preference assessments (e.g., DeLeon et al., 2001; DeLeon & Iwata, 1996; Fisher et al., 1992; Green et al., 1988; Lattimore, Parsons, & Reid, 2002; Pace, Ivancic, Edwards, Iwata, & Page, 1985; Paclawskyj & Vollmer, 1995; Roane, Vollmer, Ringdahl, & Marcus, 1998; Taravella, Lerman, Contrucci, & Roane, 2000; Windsor, Piche, & Locke, 1994; Zhou, Iwata, Goff, & Shore, 2001), which are procedures used to determine the stimuli a person prefers, the relative preference (i.e., high or low) values of those stimuli (and the conditions under which those preference values remain in effect), and the value of the stimuli as reinforcers (Cooper, Heron, & Heward, 2007). The reinforcers indentified by preference assessments have been incorporated into intervention programs to place workers with disabilities in motivating jobs (Lattimore, Parsons, & Reid, 2002), increase on-task behavior (Paramore & Higbee, 2005), and reduce the instances of sleep disturbance (O'Reilly, Lancioni, & Sigafoos, 2004) and stereotypy (Ahearn, Clark, DeBar, & Florentino, 2005).

Purpose of the Study

The purpose of this study was to assess the preference of high school students with multiple disabilities by measuring duration of eye gaze. The study also investigated whether contingent access to preferred stimuli functioned as reinforcers (i.e., evoked an increase in targeted behavior).

Literature Review

The literature review covers three main topics: a) individuals with multiple disabilities, b) the progression of preference assessments, and c) characteristics of preference assessments.

Individuals with Multiple Disabilities

The term “multiple disabilities” refers to individuals who exhibit impairments which are concomitant, or occurring at the same time. Additionally, the combination (i.e., mental retardation-blindness or mental retardation-orthopedic impairment) causes such extreme educational needs that learners with multiple disabilities cannot be accommodated in special education programs that address just one of the impairments (U.S. Department of Education, 2004). As a result, they may encounter such challenges as motor difficulties, poor communication and social skills, poor cognitive skills, and difficulties with hearing and vision (Mednick, 2007). Additionally, individuals with multiple disabilities exhibit conditions that include (but are not limited to) cystic fibrosis, muscular dystrophy, multiple sclerosis, developmental delay, epilepsy, and cortical blindness (Mednick). Another common condition, cerebral palsy, is the most prevalent physical disability among school-age children (Heward, 2009). Because of the concomitant nature of multiple disabilities, some conditions are not mutually exclusive and may occur simultaneously.

Increasing Quality of Life for Individuals with Multiple Disabilities

Researchers and teachers are concerned with helping learners with multiple disabilities to more effectively interact with their environment. Individuals who can appropriately interact with their environment and learn skills are more likely to satisfy their needs and have a higher quality of life. Various studies have endeavored to improve the quality of life for individuals with multiple disabilities. Some targets of the interventions have been: (a) monitoring and affecting private events such as happiness and unhappiness (e.g., Davis, Young, Cherry, Dahman, & Rehfeldt, 2004; Green & Reid, 1996; Green & Reid, 1999; Green, Reid, Rollyson, & Passante, 2005), (b) improving communication opportunities (e.g., Lancioni et al., 2009; Schepis & Reid, 1995; Shih & Shih, 2009), and (c) developing and improving choice-making behavior (e.g., Kennedy & Haring, 1993; Lancioni et al., 2009; Reid, Green, & Parsons, 2003; Sigafoos & Dempsey, 1992). These studies have been important to the individuals served by them for various reasons.

First, if researchers and those who work closely with individuals with multiple disabilities can interpret their private events, they can use observable physical indicators (particularly of happiness) to evaluate the effectiveness of instruction (Green & Reid, 1996). Also, they can adjust conditions of the individuals' environments to determine what variables can be manipulated to increase their indices of happiness (Davis, Young, Cherry, Dahman, & Rehfeldt, 2004).

Second, improved communication opportunities are crucial for individuals with multiple disabilities because the physical, social, or emotional needs of the individual can more readily be expressed to those best in a position to meet them, increasing the likelihood that the actions taken by caregivers or other supportive individuals, whenever possible, are synchronous with their desires (Petry & Maes, 2007). This is critical because these individuals often do not have the mobility to access desired reinforcers in the environment themselves.

Finally, teaching individuals with multiple disabilities how to make choices and providing ample opportunities for them to emit the choice-making behavior allows them to control elements of their environment (Mednick, 2007). Additionally, preferred stimuli, objects, or activities can be built into the curriculum or used as reinforcers (Petry & Maes, 2007).

Behavior analysis and private events. Researchers have sought to improve the lives of individuals with multiple disabilities by increasing happiness (Davis, Young, Cherry, Dahman, & Rehfeldt, 2004; Green & Reid, 1996) and reducing unhappiness (Green & Reid, 1999; Green, Reid, Rollyson, & Passante, 2005). Because “happiness” and “unhappiness” are abstract, subjective terms, the experimenters in the aforementioned studies measured what they defined as observable indicators of each condition. Green et al. (1996) defined indices of happiness as “any facial expression or vocalization typically considered to be an indicator of happiness among people without disabilities including smiling, laughing, and yelling while smiling.” (Green et al., 1996,

pg. 69) Unhappiness was defined as “any facial expression or vocalization typically considered to be an indicator of unhappiness among people without disabilities such as frowning, grimacing, crying, or yelling without smiling” (Green et al., 1996, p. 69). Subsequent studies concerning private events (Davis, Young, Cherry, Dahman, & Rehfeldt, 2004; Green & Reid, 1999; Green, Reid, Rollyson, & Passante, 2005) adhered to the definitions of targeted private events developed by Green et al. (1996). Green and Reid (1999) sought to decrease indices of unhappiness that had been exhibited during therapeutic exercise routines by individuals with profound disabilities. By presenting highly preferred stimuli before, during, and after each exercise routine, the experimenters successfully reduced indices of unhappiness. Davis, Young, Cherry, Dahman, and Rehfeldt (2004) compared three treatments (i.e., typical programming using staff-selected materials, presentation of preferred stimuli plus social interaction, and social interaction alone with no stimuli present) to determine which resulted in the greatest indices of happiness of individuals with profound multiple disabilities. Results were that the combination of preferred stimuli and social interaction resulted in the highest indices of happiness. A program implemented by Green, Reid, Rollyson, and Passante (2005) that used presentation of preferred activities before, during, and after teaching sessions, discontinued identified nonpreferred activities, and provided a brief break and preferred activity following each occurrence of resistance reduced indices of unhappiness among individuals with profound multiple disabilities as well.

Communication. Individuals with multiple disabilities can benefit from support in expanding or improving communication skills (Arthur-Kelly, Foreman, Bennett, & Pascoe, 2008). The ability to communicate allows individuals to express needs and desires thereby obtaining environmental reinforcers and potentially avoiding punishing experiences. One tactic that has proven beneficial is the use of a voice output communication aid, or VOCA, to increase communicative exchanges between individuals with multiple disabilities and those entrusted with their care (e.g., Lancioni et al, 2009; Schepis & Reid, 1995). A study by Shih and Shih (2009) taught individuals with multiple disabilities to operate “multiple mice” with a combination of appendages to achieve total mouse functionality on a computer. For example, one individual used a combination of a mouse placed under his right hand, a trackball under his left thumb, and a third mouse under his left toe to execute the desired clicking motion. Both participants acquired full mouse pointing control, which could then be used with software to express personal needs or to socialize with peers.

Choice-making. Another important aim for researchers has been to provide individuals with disabilities with opportunities to make choices. Sigafoos and Dempsey (1992) examined the reliability of purported choice-making behaviors (e.g. moving toward or looking at an item) by presenting participants with desired or non-desired items and measuring their acceptance or refusal of the offered stimuli. The experimenters found that refusals of the stimuli were more frequent when participants were presented with an item opposite to what they had chosen (e.g., food vs. drink). These refusals of non-chosen

items indicated that the choice-making behavior that the experimenters observed (i.e., reaching toward an item, maintaining physical contact with the item for 3 s, looking at one of the items for at least 3 s, or demonstrating a facial expression indicative of pleasure) were reliable indices of choice. Another way that experimenters have improved choice-making for individuals with disabilities is by directly instructing the people who support them to provide more opportunities to emit the behavior (Reid, Green, & Parsons, 2003). Experimenters have also taught individuals to use microswitches (e.g., Kennedy & Haring, 1993; Lancioni et al., 2009). Kennedy and Haring asserted the importance of frequent preference assessments to determine what stimuli are motivating for individuals with disabilities.

A Brief Progression of Preference Assessments.

An early study addressing the importance of understanding and interpreting clients' preferences was conducted at Weston State Hospital with twenty women diagnosed with schizophrenia (Ruskin & Maley, 1972). Residents on a psychiatric ward, where a token economy was implemented, were monitored over a six-month period to determine the reinforcers they preferred. The researchers found that the types of items purchased changed over time with an increase in the purchases of grooming items (as opposed to edibles and cigarettes) that tended to correlate with improvements in performance and awareness (i.e., more effective interactions with the environment).

A later study conducted in 1985 by Pace, Ivancic, Edwards, Iwata, and Page sought to determine whether a preference assessment was effective in determining

reinforcers for individuals with profound mental retardation. The study was conducted by presenting various stimuli and measuring the participants' approach to individual items. If the participant approached the stimulus (item) within 5 s of presentation, he or she was granted access to the stimulus for another 5 s. Experiment II assessed the values of the participants' preferred stimuli, which were defined as stimuli that had been approached on at least 80% of the trials. Non-preferred stimuli were defined as stimuli that had been approached on 50% or less of the trials. The therapist presented a vocal request and delivered the stimulus contingent on the participant's response to the request. Results were that the contingent use of preferred stimuli increased the occurrence of the target behaviors (i.e., compliance to requests). The researchers concluded that the single stimulus preference assessment was an effective tool for determining reinforcers.

The findings of Pace et al. (1985) were extended by Fisher, Piazza, Bowman, Hagopian, Owens, and Slevin (1992) in a study that compared the effectiveness of what had come to be known as the "Pace et al. procedure" using a method of forced-choice to determine preference. For this study, rather than just presenting each stimulus individually, the experimenters also presented the stimuli in pairs. When one of the two stimuli was approached, the other was removed. This method was intended to avoid the limitation in which some individuals consistently approached most or all of the stimuli, causing a possible false impression of the item's preference. In other words, the participant might have approached the stimulus simply because it was available. The forced-choice method required each subject to make a distinction between two possible

stimuli, thus indicating preference. The results of the study were that items identified as highly preferred by the forced-choice assessment were also identified as highly preferred on the stimulus preference assessment in which access to the item was contingent on the emission of a target behavior. Additionally, for all stimuli in which the two assessments disagreed on the strength of the reinforcer, the preference assessment found the item to be highly preferred whereas the forced choice assessment found the item to be in the low to moderate level of preference. These results suggest that the forced choice assessment is the more accurate of the two assessments.

One of the limitations of the aforementioned longer preference assessments (Pace et al., 1985; Fisher et al., 1992) was the time required to conduct them. Windsor, Piche, and Locke (1994) developed a method whereby six stimuli were available simultaneously to the participant on each trial and after the individual chose a stimulus it was then replaced in the array. This new multiple stimulus method greatly reduced the total duration of the preference assessment but proved a less accurate determinant of preference than the methods devised by Fisher et al. (1992).

DeLeon and Iwata (1996) compared the paired stimulus assessment developed by Fisher et al. (1992), the multiple stimulus assessment developed by Windsor et al. (1994), and a multiple stimulus procedure without replacement of selected stimuli (MSWO), which they described as “an attempt to combine the best features of the paired stimulus (PS) format (Fisher et al.) with those of the MS format (Windsor et al.).” Similar to the study conducted by Windsor et al., the participant chose stimuli from an array. As the

name implies, however, once the item was chosen, it was not replaced and therefore not available during the next presentation. This procedure was then repeated until all items had been selected or no more selections could be made, as individuals were constantly required to choose from less preferred items. Results showed that the MSWO procedure identified more reinforcers than the MS (in which the stimuli were returned to the selection field after being chosen). Also, the MSWO procedure provided preference rankings similar to those from the PS method, but in considerably less time.

Roane, Vollmer, Ringdahl, and Marcus (1998) conducted a study that differed markedly from preceding studies. The three critical differences were: (a) it utilized a method that could be used for frequent (weekly or even daily) evaluations of stimulus preferences, (b) preferred stimuli were never withdrawn or withheld during the assessments, and (c) the assessment used a free-operant format in which participants behaved largely independent of any trial-by-trial mechanisms of the experimenters (e.g., only one item available per trial, two stimuli presented at a time). This method addressed the aforementioned limitations of the previous assessments, such as the tendency to produce false-positive measures of preference (Pace et al., 1985), extended duration required for implementation (Fisher et al., 1992), and limited ability to determine preference rankings (Windsor et al., 1994). By discontinuing the removal of highly preferred stimuli, the experimenters also sought to prevent the occurrence of any challenging behaviors associated with lack of access to a preferred reinforcer. During the assessment conditions, 10 or 11 items were placed on a table and participants were free to

approach and manipulate the items of their choice for an interval of 5 min. Percentage of time engaged with the items was recorded using a 10 s partial-interval procedure. Results of the reinforcer assessment were that the free-operant assessment was useful for identifying reinforcing stimuli and that the quickness with which it could be implemented and its potential to assess reinforcers on a consistent basis further enhanced its efficacy. Subsequent studies have used duration-based measurement to reassess items that produced ambiguous results in approach-based preference assessments (DeLeon, Iwata, Conners, & Wallace, 1999) and to evaluate the predictive validity of engagement with a single stimulus (Hagopian, Rush, Lewin, & Long, 2001). A limitation reported in both studies was the possibility that individuals approached items based on availability rather than preference, as seen in the assessment developed by Pace et al. (1985).

Utilizing Preference to Decrease Challenging Behavior

Understanding a student's preference can be beneficial for the process of teaching or changing behavior. To that end, stimuli that are high-preferred have been found to be more effective in reducing destructive behavior maintained by automatic reinforcement than stimuli that are low-preferred (Roane, Lerman, & Vorndran, 2001). In other words, in order for the contingent presentation of the stimuli to change behavior, the stimuli presented must be reinforcing to the individual. However, the status of stimuli as a reinforcer for individuals is not stagnant. In other words the effectiveness of reinforcers for an individual can change over time (Hanley, Iwata, & Roscoe, 2006).

Changes in Preference

Zhou, Iwata, Goff, and Shore (2001) conducted two preference assessments spaced approximately 16 months apart to determine what effects on preference the hiatus might have. Results did not clearly indicate an effective method for predicting whether or not an individual's preference for leisure materials would remain stable or whether more frequent assessments were needed. Preferences have also been changed through manipulation of reinforcing or punishing variables (Hanley et al., 2006). To examine the extent to which preference was malleable, the experimenters first conducted preference assessments for 3 to 6 months of individuals' leisure activities. Results showed that the majority of participants retained their preferences throughout. Hanley et al. (2006) then used techniques to increase or decrease the reinforcing value of the items to determine if they could evoke variability on previously stable preference patterns. The experimenters increased the reinforcing value of lower preferred items by pairing them with social reinforcement and consumable items. To decrease the reinforcing value of higher preferred items, the experimenters provided increased access to the items for the purpose of developing a satiation effect. Results showed that the conditioning and satiation procedures had an effect on the items, with their ranking changing respective to what condition was in place.

Low-Preferred Items in Preference Assessments

Other variables have been examined relating to low-preferred items. Taravella, Lerman, Contrucci, and Roane (2000) conducted two stimulus-choice preference

assessments. Both assessments followed the procedure described by Fisher et al. (1992), but the second assessment dealt with only those items that had been shown to be low-preferred. Results showed that when the low-preferred items were assessed among themselves, at least one item was approached on 80% or more of the trials, and that the highest ranked of these low-preferred items increased behavior. These findings suggest that less preferred stimuli can function as reinforcers.

A study conducted by Roscoe, Iwata, and Kahng (1999) obtained similar results with regard to the reinforcing properties of items that have been found to be lower-preferred. The researchers first replicated the procedures of the single-stimulus preference assessment (Pace et al., 1985) and the paired-stimulus preference assessment (Fisher et al., 1992). Findings of the previous studies were then extended by Roscoe et al. through the introduction of a condition wherein the individuals were presented with a low-preferred stimulus and approach behavior was measured. Of the 7 individuals exposed to this single-schedule arrangement, 6 exhibited rates of responding that were similar to those that had been observed under the paired stimulus, concurrent-schedule condition toward highly-preferred items. The authors asserted that although the lower-preferred items did not compete with the higher-preferred items when offered simultaneously, they had reinforcing qualities when made available in isolation. They concluded that the outcomes of reinforcer identification processes can vary depending on the methods used to identify reinforcing stimuli and the extent of the stimuli reinforcing effects. Paired-stimulus methods might produce false-negative predictions, while single-

stimulus methods may result in false-positive predictions. Ultimately, then, the true measure of the efficacy of the assessment would be the behavior evoked (or not evoked) by the stimuli in question and the selective combination of techniques was encouraged.

Another possible cause of low responding in a preference assessment is the unfamiliarity of the individual with the reinforcement contingencies in place. In other words, some media may not be reinforcing because the individual has no previous reinforcement history with them. Hanley, Iwata, and Lindberg (1999) taught 4 individuals with developmental disabilities to make choices using pictorial representations of various activities. Prior to training, the clients demonstrated no clear preference when using pictures to select an activity. After the selection of pictures had been immediately followed by access to that particular activity, however, clear preferences emerged. Additionally, Hanley et al. (1999) found that differential reinforcement could increase the level of preference for activities that were more socially or practically beneficial to the individual (e.g., choosing the skill of washing dishes over lounging time).

Preference Assessments for the Professional

The information provided by preference assessments can be used by practitioners to teach individuals useful life skills. Just as Roane et al. (2001) found that high-preferred stimuli can reduce challenging behaviors, they also posited that high-preferred stimuli could be used to increase adaptive behaviors. One area of focus is the use of individual preferences to teach vocational skills (e.g., Graff, Gibson, & Galiatsatos, 2006; Lattimore, Parsons, & Reid, 2002; Wordsell, Iwata, & Wallace, 2002). For example,

Lattimore et al. (2002) used preference assessments to determine which workforce tasks an individual was likely to choose. Individuals with disabilities working at a cleaning job were initially given a pre-work assessment during which they chose a task by pointing to or touching the work materials that corresponded with the tasks of dusting, mopping, vacuuming, and cleaning sinks. Upon choice of a task, they performed the task for 3 min, during which time they were observed at 30 s intervals to determine work engagement. Results from the pre-work assessment were supported when supervisors gave the workers choices of tasks (i.e., each individual chose the higher preferred task more frequently).

Preference assessment data are a valuable tool for teaching behaviors. Therefore, teaching professionals how to conduct preference assessments is essential for better outcomes for individuals with disabilities. Lavie and Sturmey (2002) used brief instruction, video modeling, and rehearsals with verbal feedback to train three assistant teachers at a school for children with autism who had reported difficulties determining reinforcing stimuli for their students. Immediately following training, staff quickly learned how to conduct paired-stimulus preference assessments with their students, performing the necessary steps with a mean accuracy of 100%.

Systematic preference assessments have also proven to be a more accurate than opinion-based methods of determining what individuals find reinforcing (Green et al., 1988). When Green et al. conducted a preference assessment with seven individuals with profound disabilities, they found considerable discrepancies between the results they obtained and what staff members had indicated on a Likert-type scale to be reinforcing to

the clients. The results of a second experiment showed that stimuli identified as preferred in the systematic preference assessment functioned as reinforcers when their delivery was contingent on the emission of a behavior. Stimuli identified as preferred by staff opinion, however, only functioned as reinforcers when those same stimuli had also been shown to be preferred in the systematic assessment. Reid, Everson, and Green (1999) compared the accuracy of person-centered planning to systematic preference assessments. Results showed that 100% of items identified by the systematic preference assessments were approached by the two participants. In contrast, just 76% and 60% of items identified as preferred by the person-centered planning were approached by the two individuals, respectively. A systematic replication conducted by Green, Middleton, and Reid (2000) produced similar results and suggested embedded assessment of individual preference as another useful tool for evaluating the results obtained from person-centered planning.

Preference assessments for individuals with multiple disabilities

Scientists have used preference assessments in the years since their inception to determine reinforcers and modify behavior of individuals with disabilities with considerable success. A study conducted by Paclawskyj and Vollmer (1995) compared the Pace et al. (1985) and Fisher et al. (1992) methods of conducting preference assessments with individuals with developmental disabilities and visual impairments. Procedures were identical for each respective procedure (i.e., one stimulus was offered during the Pace et al. procedure and two stimuli were offered during the Fisher et al. procedure) save that the experimenters used physical guidance to help the individuals

explore each item during its initial 3 s of exposure. Results replicated previous findings that the choice procedure (Fisher et al.) was more accurate in identifying reinforcers than the preference procedure (Pace et al.). The authors asserted that this result may be particularly true for individuals with visual impairments, who might be motivated to further explore a single stimulus out of curiosity rather than preference for the item.

Limited research has focused, however, on the use of preference assessments for participants with physical difficulties in addition to severely limited cognitive skills and visual impairments. All three are possible characteristics of individuals with multiple disabilities (Mednick, 2007) and can manifest themselves simultaneously. Previous studies have measured individuals' choices using observable behavior such as moving toward a stimulus (DeLeon & Iwata, 1996; Fisher et al., 1992; Pace et al., 1985).

Individuals with physical difficulties, however, may have repertoires that lack these basic approach skills. Another common choice behavior, reaching for or touching a stimulus, may also pose a problem for individuals with multiple disabilities, particularly cerebral palsy, which significantly impairs functional mobility (Batshaw, Pelligrino, & Rosen, 2007) and causes difficulty with head control, body posture, and balance (Mednick, 2007). In particular, spastic cerebral palsy results in hypertonia, or stiffness of one or more limbs and possibly the entire body (Mednick), and occurs in approximately 50% to 60% of individuals with cerebral palsy (Heward, 2009).

Because individuals with multiple disabilities may exhibit the aforementioned difficulties with movement, they present a considerable challenge to researchers looking

to design methods of assessing preference using skills that are in their repertoire and behavior they can consistently emit. One potential method for determining preference for this population is the measure of a specified duration of eye gaze in the direction of a stimulus.

Purpose

The current study is a replication and extension of previous studies related to preference assessments. The study focused on high school students with multiple disabilities such as cerebral palsy, cortical visual impairment, and seizure disorders. Using duration of eye gaze, researchers measured students' preference in a paired stimulus preference assessment which utilized the same methods as Fisher et al. (1992). Because the students also had cortical visual impairment, stimuli were presented individually before the pairings using procedures similar to those developed by Paclawskyj and Vollmer (1995). Reinforcer assessments were conducted to determine the accuracy of the preference measures.

Research Questions

1. Does measuring the duration of eye gaze in the direction of a stimulus provide a clear indicator of preference?

2. Do the stimuli found to be higher-preferred and lower-preferred by the eye gaze preference assessment evoke more and less target behavior in the reinforcer assessment, respectively?
3. Can a shorter preference assessment with fewer items obtain clear determinants of preference?

CHAPTER 2

METHOD

Participants

Participants attended a Franklin County Board of Developmental Disabilities (DD) high school. The principals were contacted by the experimenters about the study and their support was obtained. This study was part of a larger, previously approved IRB proposal. Participants had severe developmental disabilities and demonstrated inconsistent motor movements (i.e., had physical disabilities) and had communication disabilities (i.e., ineffective vocal communication). Some of the participants also had cortical visual impairment, which is characterized by visual attention that ranges from mildly impaired to absent, although the child does have some vision and has some visual tracking behavior when alert (Batshaw et. al, 2007). Participants had been identified by staff and family as not demonstrating clear preferences of reinforcers. A letter explaining the study and seeking parental permission was sent home with potential participants (see Appendix A). Permission slips were returned for four individuals granting parental permission to participate in the study.

The four students all had medical issues that severely hindered their cognitive and motor abilities. Ashley was a 21-year old female who lived at home with her parents. She was diagnosed with multiple disabilities, an orthopedic impairment, and cortical visual impairment. Ashley consumed meals through a gastric feeding tube. Ashley sometimes emitted groaning sounds indicative of displeasure, possibly to recruit staff attention, or express an unfulfilled need.

Keith was an 18-year-old male who lived at home. He was diagnosed with multiple disabilities, cerebral palsy, cortical visual impairment, and a seizure disorder. Keith used a feeding pump to consume meals, and had medicine administered each day by a nurse. Keith sometimes emitted a groan indicative of distress or displeasure to staff, possibly to communicate currently unmet needs.

Shannon was a 14-year-old female who lived at home. She was diagnosed with multiple disabilities and cerebral palsy. Unlike the other participants, Shannon ate her meals in a typical manner, which is why her choices of stimuli included edible items. Shannon communicated by making facial expressions that demonstrated indices of happiness or unhappiness, looking at items that were reported to be preferred, and opening her mouth to mand for additional food or drink.

Robert was a 19-year-old male who lived in a residential facility. He was diagnosed with multiple disabilities, cerebral palsy, and cortical visual impairment. Robert utilized a gastric feeding tube as well. This was significant because it affected the times that he was available during the day for the study. Of the four students, Robert

possessed the most advanced communication abilities. He actively observed other people in his classroom, made distinct eye contact, smiled and laughed when interacting with others, and emitted vocalizations (e.g., “Hey!”, “Go!”, unintelligible utterances) that consistently resulted in staff attention. His vocalizations often more closely resembled attempts at language than indications of distress or displeasure.

Setting

Sessions for the preference and reinforcer assessment were conducted in the classrooms of two schools that were part of the Franklin County Board of MRDD education system. Research was conducted at school A located in an urban community with Ashley, Robert, and Keith. Shannon attended school B located in a suburban community. The assessments were conducted in classrooms serving 6-8 students with moderate/intense disabilities during typical daytime activities (e.g., positioning, feeding, life skills instruction) Experiments were conducted away from others in the classroom so as to avoid impeding necessary classroom traffic and to prevent distracting variables as much as possible. Midway through the preference assessment, sessions with Robert were moved to an isolated conference room in his school because he looked at the people who were walking around in the classroom rather than the choice items. This room had typical items (e.g., chairs, tables, bookshelves, file cabinets). Assessments were conducted in front of a neutral background in both schools. Items were placed on a music stand that had been bent to a flat position or on an over bed table commonly used in hospitals that

slid directly in front of the participant. The table was acquired during the study and was thus used only with students with whom assessments had not yet begun (i.e., Robert and Keith). A thin black rubber mat (the kind found in cupboards) was placed over the tray/table to prevent items from sliding. The researchers positioned themselves on either side of the participant so that they were out of the participants' line of sight when staring straight ahead but could still see the movement of their eyes.

Experiment I: Preference Assessment

The assessment involved pairing stimuli that were placed in view of the participants for 5 s. The stimuli were placed on a table within the view of the participant and if the stimulus made noise or movement the experimenter caused those movements to occur as the stimulus was presented. See Appendix B for a list of the stimulus pairs.

Target Behavior

In Experiment I data were collected on the emission of choice behaviors.

Choice Behaviors

Choice by the student was defined as looking in the direction of one of the two stimuli for a predetermined duration. For Ashley and Robert, the duration was 3 s (i.e., the experimenter counted silently “one one thousand, two one thousand, three one thousand”). Keith and Shannon's time was 2 s (i.e., “one one thousand, two one thousand”) because during baseline testing, neither student yielded a look that

consistently lasted more than 2 s in any direction. They also tended to dart their eyes back and forth quickly, making a 3 s count too rare to be a sensitive measurement.

Data Collection

The students' choice behavior was recorded using data sheets with a table of randomly paired stimuli (Appendix C). The two stimuli currently being compared were next to one another. Upon observation of a choice, the experimenters circled the stimulus that was chosen. If neither was chosen after two presentations, the experimenters circled NC, for "no choice".

Materials

Materials included a letter to the parents and students (Appendix A), a participant consent form (Appendix A), stimuli being assessed (Appendix B), an observer recording sheet for Experiment I (Appendix C), an observer recording sheet for Experiment II (Appendix E), a procedural integrity checklist for Experiment I (Appendix F), a procedural integrity sheet for Experiment II (Appendix G), a music stand, an over-bed table commonly used in hospitals, and a Big Mac Switch.

Experimental Design

This was a descriptive study. That is, the experimenters simply recorded the participants' response to the stimuli. The experimenters recorded which if any of the two stimuli the participant looked at for 3s (Ashley and Robert) or 2s (Keith and Shannon).

Inter-observer Agreement

All observers were graduate students in a special education program. During 60% of sessions, two observers observed and recorded the behavior of the participant simultaneously. Agreements occurred if the two observers circled the identical stimulus as being selected by the participant during a trial. Disagreements occurred if the two observers circled different stimuli as being selected by the participant. Disagreements also occurred if one observer circled a stimulus and the second observer did not circle either stimulus. At the end of the sessions, the number of agreements and disagreements were counted. The total number of agreements were divided by agreements plus disagreements and multiplied by 100% to determine the percentage of interobserver agreement.

Procedural Integrity

Procedural integrity was defined in Experiment I as the correct execution of the step-by-step procedures of conducting the preference assessment. For each of the required steps of each trial, the experimenter marked a plus or minus in the square corresponding to the required behavior on the checklist (Appendix F). Agreement for the procedural integrity checklist was determined by dividing steps completed accurately by the total steps possible and multiplying by 100%.

Procedures

The stimuli were randomly paired with one another using the methods developed by Fisher et al. (1992) so that the individual would encounter every possible pairing of

stimuli. Please see Appendix B for a list of the stimuli assessed for each participant.

Stimuli were chosen for their abilities to present the participants with a variety of tactile (e.g., squish toy, massager), visual (e.g., light spinner, disco ball), and auditory (e.g., electronic guitar, shaker) sensations. For Shannon, food items (e.g., goldfish crackers, Reese's candy) were used as well. Two durations of the preference assessment were conducted.

Longer Assessment

The longer assessment was the initial choice of the experimenters because it resembled previous preference assessments (e.g., Fisher et al., 1992; Pace et al. 1985) in duration. In the assessment, 14 stimuli were assessed for a total of 182 pairings.

Shorter Assessment

The shorter assessment was implemented because of the time constraints of the study and because its duration made it a method that educators and caretakers would be more likely to use. This assessment used 6 stimuli for a total of 30 pairings.

Toward the end of the assessment, a 7th stimulus, interaction, was added for Shannon as a result of an occurrence whereby the experimenter accidentally dropped an item on the floor, which elicited laughter and higher levels of engagement than had been previously observed with other stimuli. Interaction was represented by a picture of the experimenter affixed to a cup which, through manipulation by experimenters, danced and fell down upon Shannon's choice-making gaze. This stimulus was then tested against the others using identical procedures. Because the measurements were based solely on

direction of eye gaze, each stimulus was randomly paired so that it would be offered on participants' right and left sides. These placements controlled for the eventuality that the participant may favor one direction over another. For the same reason, experimenters positioned themselves on the same side of the client throughout each pairing so that any possible familiarity or favoritism shown to any one individual would not confound the results. Prior to the start of a pairing, researchers positioned themselves on either side of the participant. Two stimuli were then placed on the tray/table that functioned as the display surface for the participant. The primary researcher presented each item to the student for a total of 5 s each. Because of the limited abilities of the individuals to activate or otherwise manipulate the stimuli, the procedures developed by Paclawskyj and Vollmer (1995) were modified in that the experimenter manipulated the items in the manner that showcased their reinforcing qualities (e.g., pre-squeezing a ball that illuminated when squeezed, twisting a dangling disco ball so that it spun in front of the individuals' eyes, activating the music buttons on an electronic guitar, shaking a rattle). Robert exhibited some reaching and grasping behavior but it was inconsistent and limited, therefore procedures for him were identical. Presentation was defined as placing the item on the student's hand (so that they could feel the tactile properties) then directly in front of the student's eyes and slowly retracting it to its original location. After each item had been presented for 5 s, a barrier was placed in front of the items to block the participant's view of them. This barrier was either a black sheet of cardboard or the lid of a brown cardboard box. The experimenter then waited for the participant to reach a

neutral gaze before removing the barrier. A neutral gaze was achieved when the participant's eyes were looking in a direction that was neither left nor right. When the participant had reached the neutral gaze, the experimenter removed the barrier to reveal both items and said, "Pick one." For Shannon, the experimenters said, "Choose one," because she was more familiar with the word, "choose." Once the barrier was removed, the participant was given 5 s to initiate a choice. If the participant made a choice he or she was given access to the item for 5 s in a manner identical to the pre-choice presentation and the other item was removed. If 5 s elapsed without a choice, the items were presented again for 5 s each, the barrier was replaced, and the directive was repeated as the barrier was removed and the items were revealed again. If no choice was made in 5 s during the second presentation, the trial was terminated and the experimenter moved on to the next pairing.

Experiment II: Reinforcer Assessment

The second part of the study consisted of the reinforcer assessment, which determined whether or not the items that had been chosen were in fact reinforcing to the client by making access to them contingent on emission of the target behavior. Of the stimuli previously presented, the highest preferred (i.e., the single stimulus that had been chosen the most by each participant) and the lowest preferred (i.e., the single stimulus that had been chosen the least by each participant) were used in the assessment for a total of two stimuli (Appendix D). When multiple stimuli met the criteria for highest preferred

or lowest preferred, (i.e., chosen the same amount of times), the items that were chosen most or least often (i.e., when the two equally chosen items were in direct competition) were used, respectively.

Participants

The participants were the same as in Experiment I.

Setting

The locations were identical to Experiment I, with the exception of Robert, for whom the last portion (starting with session 13) was conducted in an isolated conference room at the center in which he lived. The room used at the center contained couches, chairs, and a coffee table. Experimenters positioned themselves on either side of each participant in an identical manner to their position in Experiment I.

Independent Variable

The independent variable was the directives given by the experimenters to the individuals to emit the target behavior and the delivery of the high-preferred and low-preferred stimuli contingent upon the emission of the behavior.

Dependent Variables

Data were collected on emissions of the target behavior during Experiment II.

Emission of Target Behavior

Emission of a target behavior was recorded if the individual emitted the behavior within 5 s of the experimenter giving the directive during Experiment II. Behaviors targeted were looking at the experimenter (moving eyes in the direction of the

experimenter) for Ashley, Keith, and Susan on command and pressing a switch on command for Robert.

Data Collection

When the targeted behavior was emitted within the required interval it was scored on the data sheet as a plus. If there was no response or a behavior other than the target behavior occurred, it was scored on the data sheet as a minus for each of 5 trials per session. For an example of a data sheet, see Appendix E.

Experimental Design

A reversal design (ABCABCB) was used for Experiment II. The experimental conditions were Baseline (A), High-preferred (B), and Low-preferred (C). The labels “High-preferred condition” and “Low-preferred condition” refer to what type of reinforcer was contingent on the emission of the target behavior, respectively. Conditions changed when the data demonstrated a stable trend of responding.

Interobserver Agreement

The same observers scored data in Experiment II as Experiment I. During 57% of sessions, two observers observed and recorded the behavior of the students simultaneously. In Experiment II, sessions were scored by circled plusses or minuses for agreement or disagreement. Agreements were the circling of identical indicators of an emission of behavior (plus or minus). Disagreements were any circling of differing rates of behavior emission. Then, agreements were divided by agreements plus disagreements and multiplied by 100% to determine the percentage of agreement.

Procedural Integrity

Procedural integrity was defined in Experiment II as the correct execution of the step-by-step procedures of conducting the reinforcer assessment. For each of the required steps of each trial, the experimenter marked a plus or minus in the square corresponding to the required behavior on the checklist (Appendix G). Agreement for the procedural integrity checklist was determined by dividing steps completed accurately by the total steps possible and multiplying by 100%.

Procedures for Ashley, Keith, and Shannon

For each participant, the stimuli assessed were chosen based on the results of the forced choice pairings. One low-preferred stimulus and one high-preferred stimulus was assessed for each participant and at least two trials were conducted for each condition (See Appendix D). No tray or table was utilized, as the experimenters held the stimuli when presenting them to the participants. The stimuli were placed so that they were out of sight of the participants when the directive (i.e. “look at me” or “hit your switch”) was given, but available to be presented to the participants immediately upon emission of the target behavior.

Baseline

During both the initial and return-to-baseline sessions, the experimenters presented the directives to each participant but did not interact with him or her further. The experimenter first delivered the instruction. For Ashley, Keith, and Shannon, this instruction was, “(name), look at me.” No duration of eye gaze was required for this

phase. If the student's eyes moved in the direction of the experimenter, the behavior was recorded as having been emitted. Prior to the delivery of the instruction, the experimenter waited for the participant to be looking away so that any movement would be as a result of the given instruction. Baseline conditions ended when the participant emitted the behavior at a rate of one or less for two consecutive trials.

High-preferred

During high-preferred conditions, the experimenter first presented the stimulus that the participant had chosen most frequently in Experiment I. The participant was given access to the item for 5 s. After 5 s, the participant's access to the item was terminated. The experimenter then stated, "If you (target behavior) you can have (item)." Next, the experimenter delivered the instruction for the desired behavior. If the participant emitted the required behavior within 5 s, the item was presented to him or her for 5 s. If the participant did not emit the required behavior within 5 s, no consequence was delivered. As in baseline conditions, the experimenter waited for a 5 s interval before delivering the instruction again and the instruction was given to the participant 5 times in a trial and the percentage calculated out of 5. At the end of the trial, the experimenter waited for a 10 s interval before beginning another. The high-preferred conditions ended when the participant emitted the behavior at a rate of 4 or more for two consecutive trials or ended with a rate of 4 with an increasing trend.

Low-preferred

Procedures in the low-preferred conditions were identical to those in the high-preferred condition except that the experimenter presented the participant with the stimulus that had been chosen least frequently in Experiment I upon emission of the required behavior. The low-preferred condition ended when participants emitted the behavior at a rate of 2 or less.

Procedures for Robert

Robert had demonstrated the most consistent reaching motion out of the four in the study, even reaching for some items that he was choosing during Experiment I. Additionally, his apparent social awareness would have likely made preference based on emission of the behavior of looking an inaccurate measurement (i.e., he would likely look at the experimenters regardless of the stimulus contingent upon emission of the behavior, because the social interaction was reinforcing for him). The switch used was one that he had used to access reinforcement in the past. For Robert the instruction was, “Robert, hit your switch,” and the experimenter did not need to wait for his eyes to move away before proceeding with the instruction. For Robert, the switch was affixed to a clipboard and placed in front of him when the direction was given and removed when 5 s had elapsed without a response or upon emission of the behavior. This control was implemented to prevent him from hitting the switch more than once in a 5 s interval. Regardless of the response of the participants within a 5 s interval, no consequence was delivered. The experimenter then waited an additional 5 s before repeating the instruction. Again, no

consequence was delivered, regardless of the behavior emitted by the participant. The experimenter presented the instruction to the participant 5 times for each trial. Responses were recorded out of 5 possible. At the end of the trial, the experimenter waited for a 10 s interval before beginning another. Robert's reversal baseline condition concluded when he reached a rate of 1, but with a steep downward trend. His reversal high-preferred conditions concluded when he reached a rate of 5. His reversal low-preferred conditions ended when he reached a rate of 3 and 2, respectively.

Reassessment for Robert

A reinforcer reassessment was conducted after the 13th trial for Robert due to a rapidly decreasing trend in responding during the high-preferred condition. Because school was no longer in session, the assessment and subsequent trials occurred at the center in which he lived. Sessions took place in an empty meeting room and utilized the same reinforcers and response criteria. The preference reassessment (Exp. 1) was conducted again to determine if a live sneeze, in which the experimenter actually pretended to sneeze, was more reinforcing than the recorded sneeze on the switch. The two sneezes were directly paired against one another for 4 trials, in which the position of the two stimuli were varied. To signal that the live sneeze was a choice and, thus, required the same looking behavior, a picture of the experimenter sneezing was held up at the same time as the live sneeze. Eye gaze was measured and recorded using procedures identical to the earlier preference assessment. Robert chose the live sneeze 4 out of 4 possible opportunities. After the reassessment of the reinforcer had been concluded and

the more reinforcing stimulus (i.e., the live sneeze) determined, the reinforcer assessment continued in the high-preferred condition for the 14th session using the live sneeze and proceeded in the same manner used for the other participants with the exception that the interval was extended to 10 s (for Robert) to allow for more time for him to emit the behavior.

CHAPTER 3

RESULTS

Procedural Integrity for Preference Assessment

Procedural Integrity agreement verified the fidelity with which experimenters performed the preference assessment procedure. Procedural integrity was conducted during 30% of sessions out of a total of 56 sessions. The mean for procedural integrity was 99% and the range across sessions was 99% to 100%.

Procedural Integrity for Reinforcer Assessment

Procedural Integrity agreement verified the fidelity with which experimenters performed the reinforcer assessment procedure. Procedural integrity was conducted during 33% of sessions out of a total of 122 sessions. The mean for procedural integrity was 100%.

Interobserver Agreement for the Preference Assessment

An example of a portion of a preference assessment data sheet is presented in Appendix C. Both the primary and second experimenters recorded a choice made by the individual simultaneously by circling the left stimulus, right stimulus or NC (no choice made). Interobserver agreement was recorded on 60% of the sessions and measured 98%. The mean for IOA was 98% with a range of 94% to 100% across sessions. Please see Table 1 for individual IOA for each participant.

| Participant | Percentage of Sessions | Percentage of Agreement |
|-------------|------------------------|-------------------------|
| Ashley | 57% | 98% |
| Robert | 70% | 100% |
| Keith | 60% | 100% |
| Shannon | 40% | 94% |

Table 1. Interobserver agreement during the preference assessment by individual participant.

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Interobserver Agreement for the Reinforcer Assessment

Both the primary and the reliability experimenters recorded the occurrence or non occurrence of the target behavior by circling the plus or minus signs on the reinforcer assessment data sheet (Appendix E). Interobserver agreement was recorded on 57% of the sessions and measured 99%. The mean for IOA during baseline was 98% with a range of 96% to 100% across sessions. The mean for IOA during the high-preferred condition

was 100%. The mean for IOA during the low-preferred condition was 97% with a range of 90% to 100% across sessions. Please see Tables 2-4 for individual IOA for each participant.

| Participant | Percentage of Sessions | Percentage of Agreement |
|-------------|------------------------|-------------------------|
| Ashley | 100% | 100% |
| Robert | 40% | 97% |
| Keith | 40% | 100% |
| Shannon | 63% | 96% |

Table 2. Interobserver agreement during baseline conditions of the reinforcer assessment by individual participant.

| Participant | Percentage of Sessions | Percentage of Agreement |
|-------------|------------------------|-------------------------|
| Ashley | 64% | 100% |
| Robert | 60% | 100% |
| Keith | 50% | 100% |
| Shannon | 30% | 100% |

Table 3. Interobserver agreement during high-preferred conditions of the reinforcer assessment by individual participant.

| Participant | Percentage of Sessions | Percentage of Agreement |
|-------------|------------------------|-------------------------|
| Ashley | 80% | 90% |
| Robert | 63% | 98% |
| Keith | 50% | 100% |
| Shannon | 57% | 100% |

Table 4. Interobserver agreement during low-preferred conditions of the reinforcer assessment by individual participant.

Duration Comparison

The two types of studies (i.e., longer for Ashley and Robert, shorter for Keith and Shannon) are compared in Table 5 with regards to number of items, trials, and amount of time from the start date to the finish date for each. Results indicate a dramatic difference between the times required to conduct the assessments as a result of the larger amount of stimuli.

| Participant | Number of Items | Number of Sessions |
|-------------|-----------------|--------------------|
| Ashley | 14 | 23 |
| Robert | 14 | 23 |
| Keith | 6 | 4 |
| Shannon | 7 | 5 |

Table 5. Comparison of the two lengths of preference assessments (i.e., longer assessment for Robert and Ashley and shorter assessment for Keith and Shannon).

Preference Assessment

The data from the four students are shown in Figures 1-4. Data presented are from the primary observer. Stimuli are presented from left to right in descending order of preference based on the number of times each was chosen. The data are presented in this manner to clearly indicate which stimuli were the highest-preferred, which were the lowest-preferred, and how the rest of the stimuli fared against one another.

Ashley

Ashley's highest-preferred stimulus was an electronic guitar, chosen on 73% of available opportunities. An electronic singing bear also was chosen 73% of times offered. However, when previous pairings of the two were directly compared to one another, the guitar was selected more frequently. The lowest-preferred stimulus was a rattle, chosen on 12% of available opportunities. A green rubber squish toy referred to as a "sea cucumber" was also chosen on 12% of available opportunities. Again, when the two were

compared, the rattle was lower-preferred. The results demonstrate a hierarchy of preference.

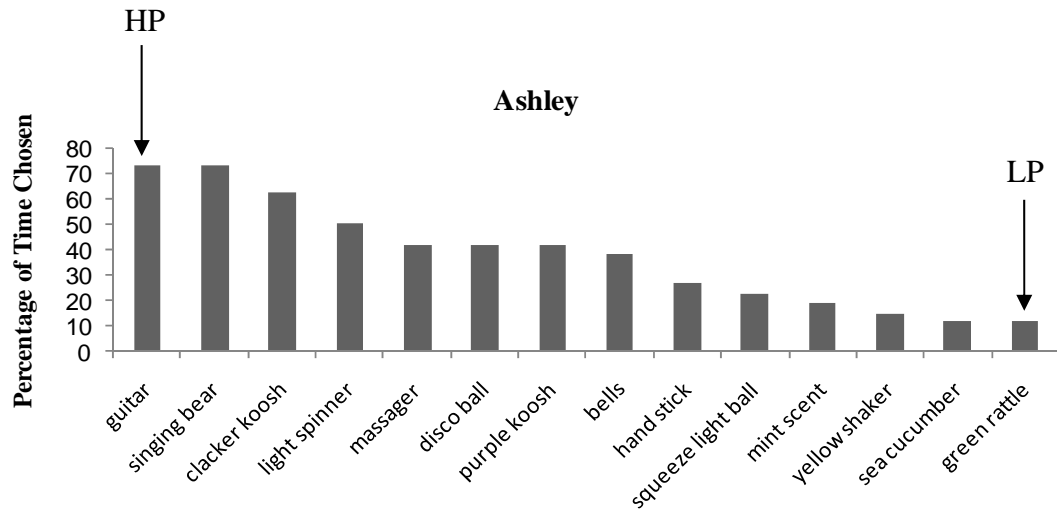


Figure 1. Preference Assessment Results for Ashley

Robert

Robert's highest preferred stimulus was a sneeze, chosen on 81% of available opportunities. The lowest preferred stimulus was a disco ball, chosen on 19% of available opportunities. A mint-scented tube was also chosen 19% of times offered. When the two items were compared, the disco ball was lower-preferred. The results demonstrate a hierarchy of preference.

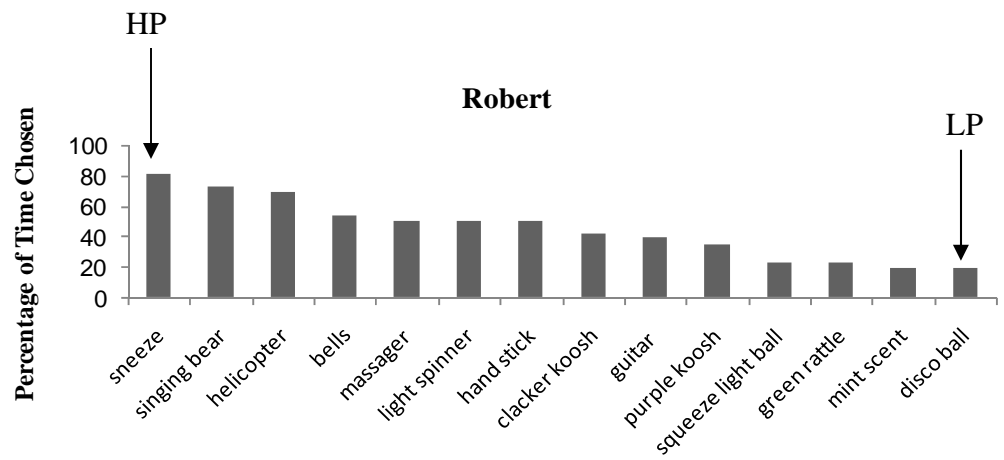


Figure 2. Preference Assessment Results for Robert

Keith

Keith's highest preferred stimulus was an electronic singing dog, chosen on 70% of available opportunities. The lowest preferred stimulus was a coin shaker, chosen on 10% of available opportunities. The results demonstrate a hierarchy of preference.

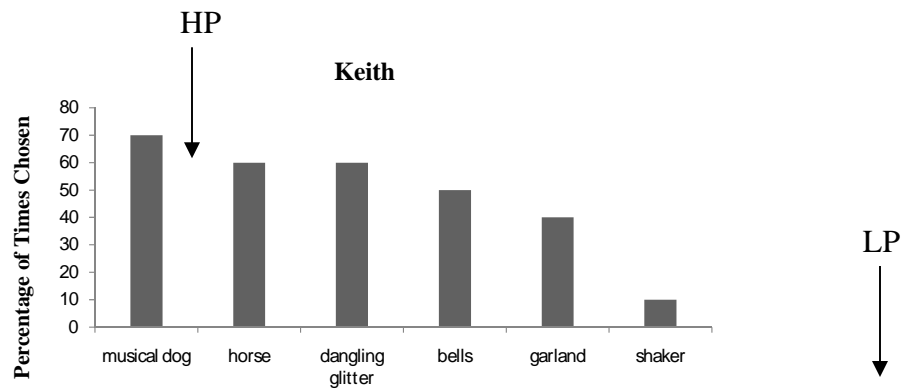


Figure 3. Preference Assessment Results for Keith

Shannon

Shannon's highest preferred stimulus was interaction with the experimenter, represented by a cup with a picture of the experimenter affixed, chosen 80% of available opportunities. The lowest preferred stimuli were blocks, chosen 10% of available opportunities. The results demonstrate a hierarchy of preference.

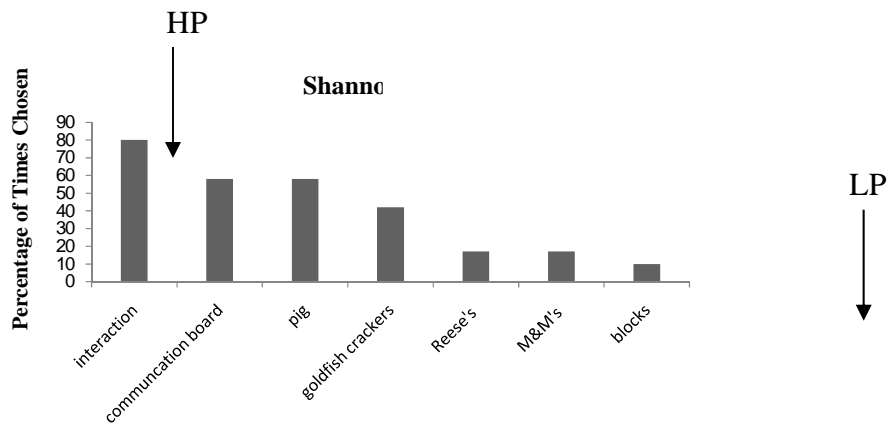


Figure 4. Preference Assessment Results for Shannon

Experiment II Data

Reinforcer Assessment

The data from the four students are shown in Figures 5-8. Data presented are from the primary observer. All recorded emissions of the behavior were out of 5 possible.

Ashley

There was some overlap of data during the initial baseline, high-preferred, and low-preferred conditions, with 2 emissions of the behavior occurring during all three conditions. During baseline, the response rate decreased and never rose above 1. When the high preferred condition was introduced, the response rate remained at 2 at first, then increased to 3 and 5. Upon the start of the low-preferred condition, the responses dropped

to 3, 2, and then to 0. During the reversal, the second baseline's response rates started at 1, dropped to 0 and remained there. During the second high-preferred condition, response rates increased to 4 and then 5. During the second low-preferred condition, response rates dropped to 2 and then 1. In the third and final high-preferred condition, response rates started at 4, dropped to 3, and increased to 4 and 5. The data are significantly more differentiated in later conditions, indicating a stronger functional relation between emitted behavior and contingencies in place.

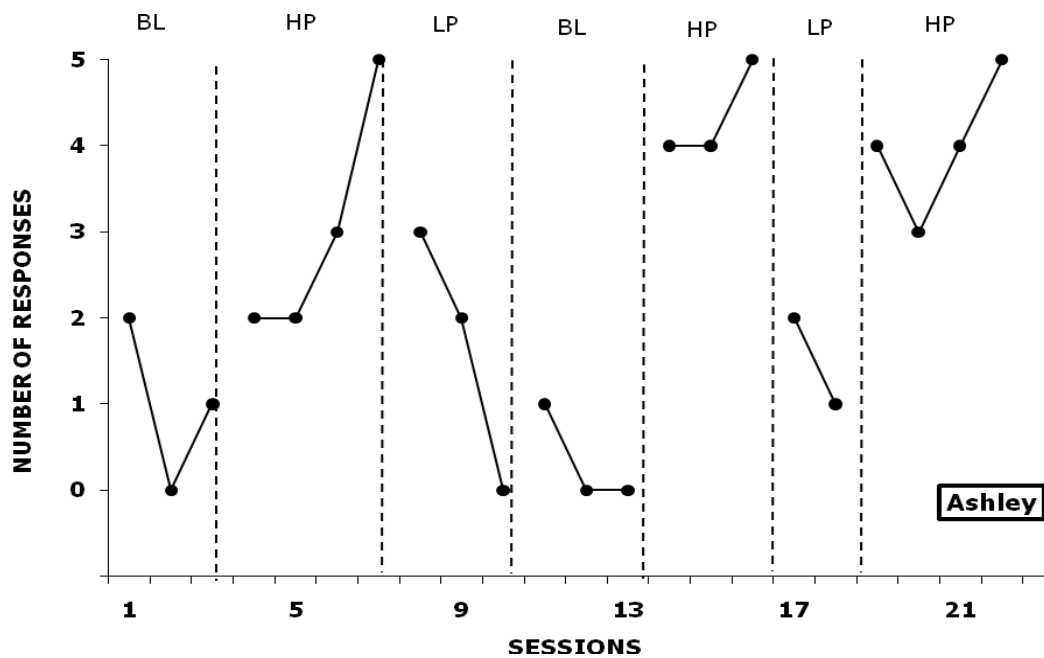


Figure 5. Reinforcer assessment results for Ashley across baseline (BL), high-preferred (HP), and low-preferred (LP) conditions.

Robert

Baseline levels of responding for Robert started at 4, decreased quickly to 1, increased to 3, and finally decreased to 1. Levels of responding during the initial high-preferred condition started at 5 and dropped rapidly to 4, 3, 3, 2, and 1. After the reassessment, levels of responding increased to 5 and 4, finally ending at 5. This portion of data following the reassessment was collected at the center where Robert lived. Rates of responding remained at 3 and 4 in the initial low-preferred condition but did not reach 5 as seen in the high-preferred condition. During the reversal, baseline levels started similarly to the low-preferred condition, at 3's and 4's then decreased to 2 and 1. Rates of responding in the second high-preferred condition started at 5, decreased slightly to 4 and 3, increased to 4, 5, 4 and ended at 5. Rates of responding in the second low-preferred condition started at 5 and remained there for the next 4 sessions. After the primary experimenter left the room (as discussed below) responses dropped to 4, 3, 3, 2, and 2. Upon reintroduction of the high-preferred condition, response was at 5 for 2 consecutive sessions. Results demonstrate a functional relation between emitted behavior and contingencies in place, with some confounding variables.

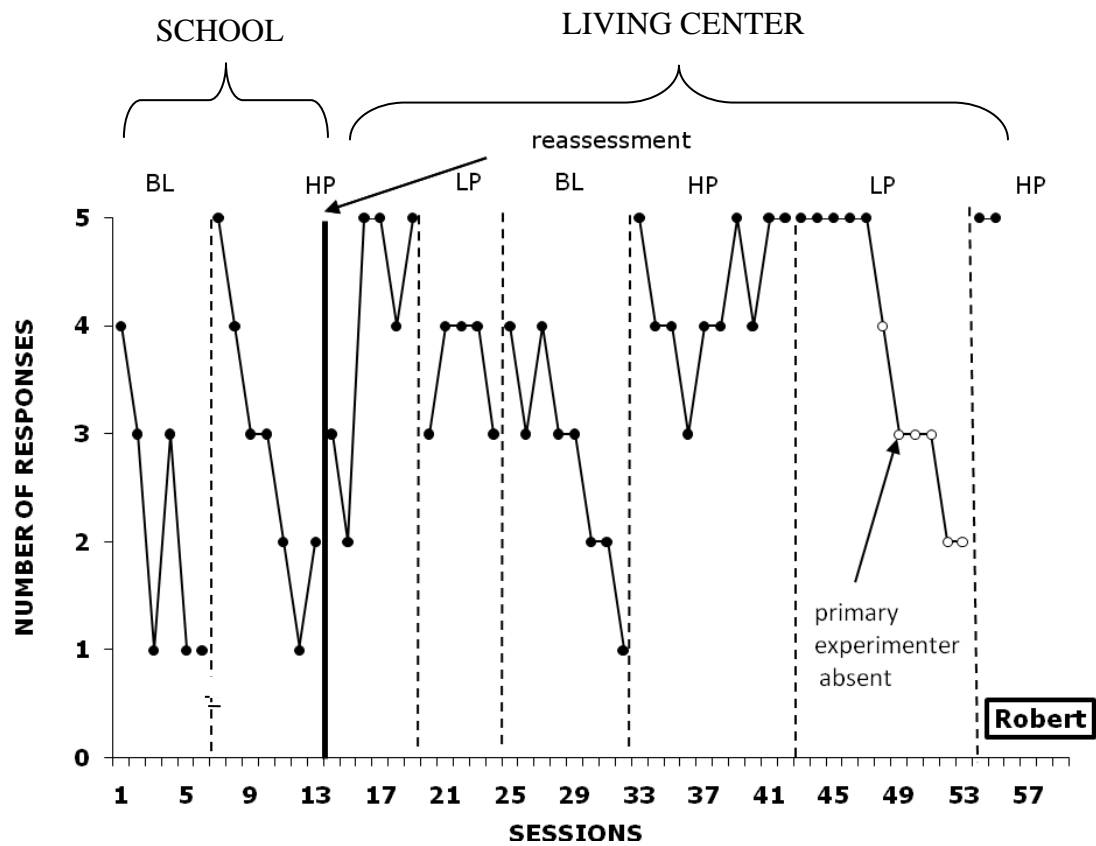


Figure 6. Reinforcer assessment results for Robert across baseline (BL), high-preferred (HP), and low-preferred (LP) conditions in the two assessment environments.

Keith

The differing rates of response were more clearly defined during the initial baseline, high-preferred, and low-preferred conditions than in the reversal. In the initial baseline conditions, responding was at 0 for 2 consecutive sessions. Upon introduction of

the high-preferred condition, response rates increased to 5 for two consecutive conditions. When the low-preferred condition was introduced, response dropped to 3 and then 1. Responding decreased further during baseline, from 1 then 0 and 0. In the second high-preferred condition, responding increased gradually from 1 to 2, 3, then decreased to 2, increased to 5, decreased to 4, and increased to 5 again. In the second low-preferred condition, response rates dropped to 0 for 2 consecutive sessions. Upon reintroduction of the high-preferred condition, responses increased to 3 and 4. These results indicate a functional relation between emitted behavior and the contingencies in place.

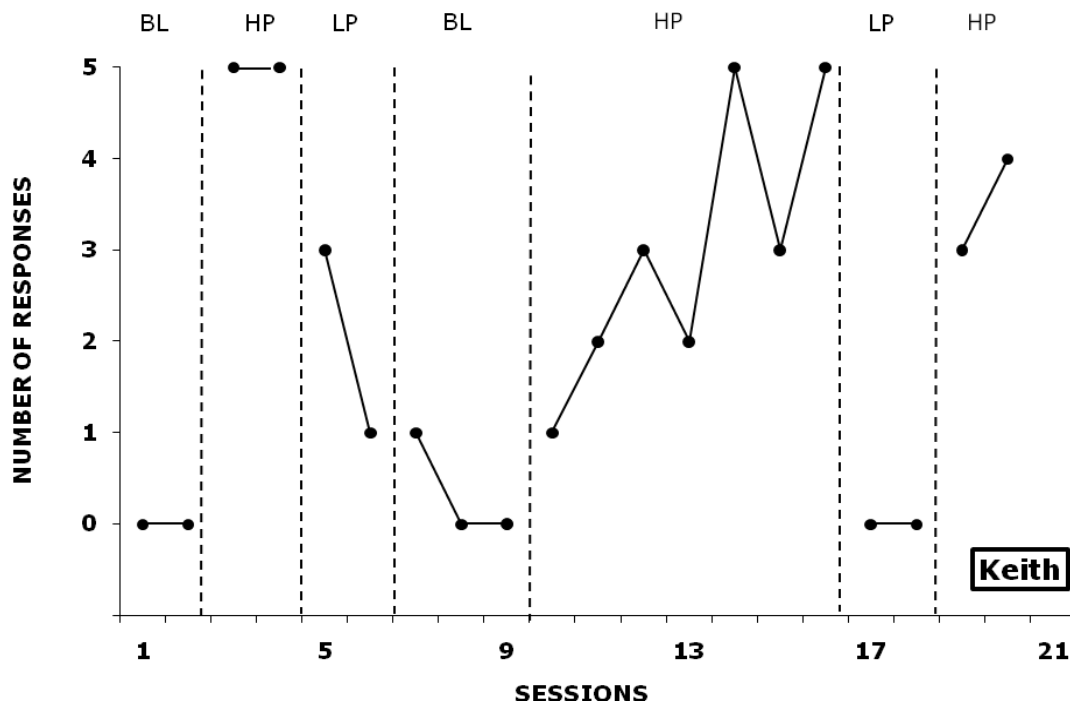


Figure 7. Reinforcer assessment results for Keith across baseline (BL), high-preferred (HP), and low-preferred (LP) conditions.

Shannon

As with Ashley, Shannon's response rates were more clearly differentiated during the reversal conditions. In baseline conditions, response started at 3 and decreased to 0 for 2 consecutive sessions. In the high-preferred condition, response started at 3 and increased to 5 for 2 consecutive sessions. In the low-preferred condition, rates started at 3 and dropped to 1 for 2 consecutive sessions. In the reversal baseline conditions response started at 4 for 2 consecutive sessions, then decreased to 1, 2, and 1. In the second high-

preferred condition, response increased to 4, 5, and 4. In the second low-preferred condition, response decreased to 1, 2, 0, and 2. With the reintroduction of the high-preferred condition, response increased to 5, 4, and 5. With the exception of the first 2 baseline points, there is a significant separation between the high-preferred and other conditions in the reversal. The results indicate an increased functional relation between emitted behavior and the contingencies in place.

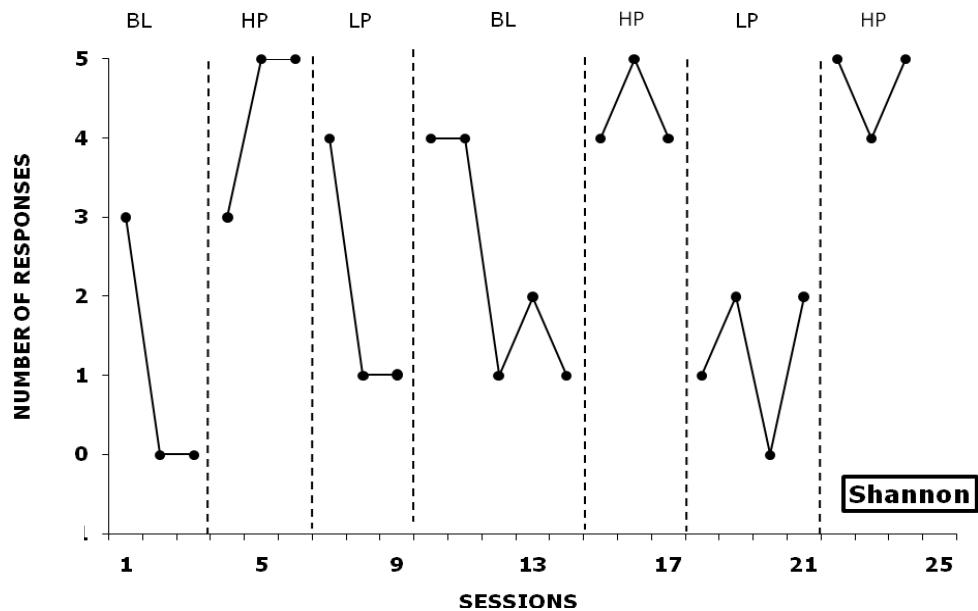


Figure 8. Reinforcer assessment results for Shannon across baseline (BL), high-preferred (HP), and low-preferred (LP) conditions.

CHAPTER 4

DISCUSSION

This chapter will discuss the results of the study in relation to the research questions, the limitations of the current study, classroom and care facility implications relating to the results of this study, and possible future research to extend this study.

Question 1: Does the measure of the duration of eye gaze in the direction of a stimulus provide a clear indicator of preference?

Overall, when choice behavior was measured in terms of duration of eye gaze in the direction of a stimulus, the participants emitted discrete responses and individual preferences were indicated. These results are consistent with other research findings that individuals with disabilities can indicate preferences for stimuli (e.g., DeLeon et al., 2001; DeLeon & Iwata, 1996; Fisher et al., 1992; Green et al., 1988; Lattimore, Parsons, & Reid, 2002; Pace, Ivancic, Edwards, Iwata, & Page, 1985; Paclawskyj & Vollmer, 1995; Roane, Vollmer, Ringdahl, & Marcus, 1998; Taravella, Lerman, Contrucci, & Roane, 2000; Windsor, Piche, & Locke, 1994; Zhou, Iwata, Goff, & Shore, 2001) and suggest that measuring duration of eye gaze is an effective means of determining a preference hierarchy for individuals with severe physical and cognitive disabilities.

All four students demonstrated hierarchical preferences for presented stimuli as measured by duration of eye gaze toward a stimulus. Students also exhibited behavior toward presented stimuli that was differentiated based on previous indicators of preference (e.g. smiling or laughing at stimuli that they had consistently chosen, looking away or putting head down to avoid stimuli that they had consistently ignored).

During the 17th, 19th and 20th trial sessions, Ashley was scored as making no choice between stimuli because her gaze never reached a neutral position for 2 consecutive 30 s intervals. Because no neutral position was reached, no items could be presented, and “no choice” was recorded. It should be noted that both items available in each trial had been indicated as being lower preferred by the low amount of times each had been chosen when presented with other stimuli. Her looking around may have been a result of disinterest in (or avoidance of) the two items offered. Also, other activities taking place in the classroom may have occupied her attention at these times. Still another possibility is that the movement of her head was unrelated to the stimuli and was a result of discomfort or some other neurological event. Other times, Ashley’s behavior during trials where no choice was observed was quite the opposite. She would look at both available stimuli and return her gaze to a neutral, straightforward position. This behavior may have been an indication that neither stimulus was preferred. When presented with stimuli that had been indicated as preferred (i.e. consistently chosen), Ashley sometimes moved her arm up and down. This behavior was topographically similar to her use of a Big Mac Switch to activate reinforcers in the classroom (e.g., a radio, a blinking light), indicating engagement with the stimuli.

Robert also looked around the room at times when stimuli were presented, but his looking behavior appeared to be more socially motivated. He, more than other participants, consistently emitted behavior indicative of social awareness and interest in his surroundings (e.g., smiling and laughing at people, motioning to people, calling out , “Hey!”). He also demonstrated the most control of the movement of his head and one of his arms. Because of his distracted behavior in the classroom, sessions were moved to an isolated conference room where the distracted behavior decreased. When presented with stimuli that had been previously indicated as preferred (i.e., chosen on multiple trials), Robert sometimes emitted behavior consistent with the indices of happiness (e.g., smiling, laughing) described by Green and Reid (1996). This behavior indicates that his choices as measured by eye gaze were likely reinforcing to him.

Keith exhibited the lowest indicators of engagement with his surroundings and chosen stimuli (e.g., no smiling or laughing). Therefore, although he made observable choices based on eye gaze criteria, it was difficult to determine based on the preference assessment alone which items would prove motivating for him to the extent that his behavior might be modified.

When presented with non-preferred stimuli, Shannon sometimes looked away or straight down at the ground. Other times, she put her head down on her tray. In contrast, when presented with stimuli that had been indicated as high-preferred, she sometimes laughed. In fact, experimenters sometimes had to wait for her laughter to subside before the trials could continue. These behaviors were indicative of disinterest and engagement, respectively, and indicated that Shannon demonstrated preferences.

The results of this study indicate differences in the participants' behavior depending on the items presented to them. That is, some items seem to generate interest (i.e., reinforcing qualities) and others a lack of interest. This information could have important value to teachers seeking to motivate students in their classrooms.

Question 2: Do the stimuli found to be higher-preferred and lower-preferred by the eye gaze preference assessment evoke more and less target behavior during the reinforcer assessment, respectively?

Items found to be highly-preferred using the eye gaze preference assessment correlated with higher levels of responding during the reinforcer assessment compared to participants' low preferred items.

Keith demonstrated a rapid response to the contingencies in place. Zero levels of baseline responding were followed by the highest possible levels of responding during high-preferred conditions, and steadily decreasing responses in low-preferred conditions. When the condition shifted from high-preferred to low-preferred, Keith looked at the experimenter for intervals as long as 3 min. The experimenter in turn, was required to wait until he looked away before giving the next directive. Keith had demonstrated a tendency to dart his eyes back and forth, and the effort and concentration required to hold the gaze may have been tiring for him, which is a characteristic sometimes exhibited by individuals with cortical visual impairment (Bishop, 1996). This behavior continued even under baseline conditions when no reinforcement was given. The variability of his data during the reversal high-preferred condition was possibly a result of fatigue during extinction (i.e. baseline), although it still maintained an upward trend. These results show

that although Keith did not exhibit the same characteristics of approval as the other students in the initial preference assessment, he chose items that likely functioned as reinforcers for him.

Both Ashley and Shannon demonstrated differences between levels of responding in initial and reversal conditions that were almost the opposite of results demonstrated by Keith. In other words, the differentiation between their data paths respective to condition was greater in the reversal rather than the initial conditions. This difference suggests that these individuals' behavior changed based on the contingencies in place, and that their awareness of the contingencies (and the discrepancy between the reinforcing values of the high-preferred and low-preferred stimuli) increased during the reversal conditions. Although their rates of responding share data points in common between the phases in the initial conditions, the steep changes in responding with upward and downward trends, respectively, suggest that their responding was based on the current condition and the stimulus being offered. The initial low responding in the high-preferred condition for Ashley, compared to the rapid increase and continued high responding in later high-preferred conditions support the findings of Hanley et al. (1999) in which no clear preference was demonstrated until reinforcement contingencies based on response were developed. In the reversal conditions, the more differentiated responses during baseline, low-preferred, and high-preferred conditions suggest that Ashley and Shannon's levels of responding were based even more directly on the available stimuli. In fact, during the second high-preferred condition, Ashley often looked at the experimenter upon hearing

her name before the complete directive was uttered. No such responsiveness was observed during the low-preferred conditions.

Robert's behavior relative to the conditions in place was by far the most variable. His high levels of responding were a possible result of the experimenter being incorporated in the reinforcing stimulus (i.e., the sneeze) and thus becoming a conditioned reinforcer (Skinner, 1953). The rapidly decreasing trend in the initial high-preferred condition may have been a result of the effort required to access the reinforcer. Robert had been observed in the classroom laughing when someone sneezed or coughed. Once staff noticed Robert's response, a common manner for them to interact with him was through a pretend sneeze or silly sound with no contingent behavior on his part required to access this interaction and social attention. Additionally, Robert developed his own mand for the sneezing behavior (i.e., brushing his index finger under his nose and attempting to reproduce the sound) which further increased the likelihood that staff would respond with sneezing. Compared to the effort required to attain the reinforcer outside of the study, the motor control and concentration involved in the act of repeatedly reaching to press the switch may have had a punishing effect on his switch-hitting.

Another possible factor in the initial path of the high-preferred data is the difference between the sneeze that Robert was accessing in the natural environment and the sneeze that was presented in the study. In order to provide Robert with a tangible object to select when choosing the sneeze, the experimenter recorded 5 s of sneezing on a Big Mack Switch. During Experiment I, the sneeze was presented by pushing the switch, causing it to emit the sneezing sound. Compared to the other stimuli, this sneeze was

higher-preferred. When presented contingent on the emission of the switch-hitting effort, however, the recorded sneeze may have lacked power as a reinforcer. This discrepancy may have been a result of the differing qualities (e.g., clarity of sound) between the recorded sneeze and the live sneeze that Robert encountered in his social interactions. Additionally, the live sneeze may have correlated with other variables that contributed to its strength as a reinforcer (e.g., comical facial expressions, eye contact, and reciprocal interaction). The increasing trend following the second preference assessment (using the live sneeze) suggests that the live sneeze may have functioned as a more powerful reinforcer. These results should be interpreted cautiously, however, due to the differing variables in place after the reassessment (e.g., new location, different social environment) further discussed in the limitations section.

Another factor in the decreasing trend during the initial high-preferred condition may have been the length of the interval in which the switch was available to activate. Often Robert would reach toward the switch, but the 5 s would pass before he was able to depress it. This delay could have been a result of slower cognitive function (i.e., processing time between the antecedent and the behavior) or motor impairment (i.e., slow movement, weakened limb control). The effort required to reach toward the switch, when combined with the denial of the reinforcer as a result of latency between the directive and the response, may have had a negatively punishing effect on Robert's switch hitting behavior. When given 10 s to press the switch, Robert accessed the reinforcer at a greater rate.

Robert's high levels of responding in the first low-preferred condition can be interpreted in various ways. First, the increased responding may have been intended as an attempt to continue to access the high-preferred reinforcer as a result of the contingencies not being clear to him. In other words, he may have distinguished that the switch could be used to access reinforcers, but not discriminated which were available at what times. Another possibility is that the low-preferred item (i.e., the disco ball) functioned as a reinforcer for Robert's behavior as was found by Taravella et al. (2000). Robert's behavior toward the presentation of the disco ball (e.g., smiling, touching it with his finger) indicated that although it was low-preferred when compared to other stimuli, some qualities of it were engaging to him. The switch itself may have even had reinforcing qualities such as attention by the experimenter in form of instruction when presented. There is also the possibility that the behavior was sustained through automaticity of reinforcement (Skinner, 1953). In other words, after a number of trials of hitting the switch, something favorable always happened (e.g., he was pushed in his chair to return to his room, the experimenters talked to him on the way back to his room). The switch may have acquired reinforcing value regardless of experimental condition. Decreasing levels during baseline, however, indicate that the switch lost reinforcing value when presented with no reinforcer contingent on its activation. The extended high-response levels during the second high-preferred condition, coupled with Robert's behavior during the trials (e.g., agitated vocals, straining in his seat, emitting the mand for "sneeze") suggest an extinction burst. In this case, although the low-preferred conditions had been conducted by the other experimenter (in the event that the primary

experimenter's voice had become a conditioned reinforcer), the continued presence of the primary experimenter in the room may have functioned as a discriminative stimulus (Skinner, 1953) that the high-preferred reinforcer (i.e., sneeze) was still available. When the primary experimenter left the room and observed from the hallway, the behavior decreased. Subsequent sessions with the primary experimenter absent evoked continued decreases in responding in the low-preferred condition. Although the switch hitting behavior decreased, Robert's manding behavior increased, possibly indicating that he was beginning to distinguish between the contingencies of the high and low preferred conditions. This behavior also suggests that although Robert desired to access the higher preferred reinforcer (i.e., the sneeze), the contingent delivery of the lower-preferred stimulus punished his switch hitting behavior. The possibility exists, however, that the behavior extinguished as a result of having been repeatedly denied the high-preferred reinforcer and that its correlation with the removal of the preferred experimenter is coincidental. When the high-preferred condition (and the primary experimenter) returned, Robert immediately responded at maximum levels for two consecutive sessions for the first time in the study. The continued decrease in target behavior in the absence of the primary experimenter, and the immediate increase in response upon reintroduction of the high-preferred condition suggest that Robert's continued emission of the switch hitting behavior during low preferred conditions was intended to access the high-preferred reinforcer and that he never clearly discriminated between high-preferred and low-preferred conditions until the primary experimenter was removed.

Overall, high preferred stimuli evoked more instances of the targeted behavior for all four participants. Low preferred stimuli evoked less instances of the targeted behavior for all four participants. Results indicate that individuals with multiple disabilities are capable of selecting stimuli that are individually reinforcing to them.

Question 3: Can a shorter preference assessment that measures duration of eye gaze toward a stimulus with fewer items obtain clear determinants of preference?

The results of the two studies indicate that a shorter eye gaze preference assessment can be used with similar accuracy and greater efficacy than a longer preference assessment. Where the longer preference assessments required months to complete, the shorter assessments were completed in a matter of days. For instance, the preference assessments for Ashley and Robert required 23 sessions to complete. On the other hand, the preference assessments for Keith and Shannon required only 4 and 5 sessions, respectively. The shorter preference assessments also produced indicators of preference which were largely supported by the results of the reinforcer assessments, suggesting that preference assessments can be conducted in significantly less time and retain their accuracy in determining reinforcers. This is particularly useful for staff seeking to conduct preference assessments in the classroom environment, because the shorter assessment requires considerably less time to be diverted from instruction and other classroom activities, which likely increases the chances of such assessments being conducted. The shorter duration required is even more important for staff who care for individuals with severe cognitive and physical impairments, as their needs such as

positioning, feeding, and toileting present more potentially challenging time constraints than for learners needing typical classroom instruction only.

Another advantage of the shorter assessment is the ease with which other items may be added and subsequently compared to current items mid-study if necessary. This strength is illustrated by the addition of interaction as a choice for Shannon toward the end of the study. Also notable is that interaction received the highest amount of choices during Experiment I and her responses during Experiment II indicate that it proved to be a powerful reinforcer. Such an adjustment, while possible in the longer study, would have taken considerably longer to test and would have added to what was already a significantly more laborious process.

Because the two durations of preference assessments did not take place with the same individuals, however, experimenters should be cautioned that the results may be attributed at least in part to the individuals participating in the study. In other words, different results may have been obtained had the individuals in the shorter study participated in the longer study and vice versa. An option for future experimenters seeking to explore which size and duration produces the most reliable determinants of preference is to conduct a study similar to DeLeon et al. (2001) but that examines size (i.e., number of items) and duration (i.e., length of study) using the same individuals for both styles of paired choice preference assessments.

Overall, the shorter preference assessment produced clear determinants of preference for the two students. These results were then supported by the behavior evoked by the preferred (and nonpreferred stimuli) during the reinforcer assessment.

Limitations

There were several limitations to this study. First, the required behavior during the preference and reinforcer assessments of looking was one that the participants were accustomed to emitting freely. Unlike the behavior of reaching or pressing a switch, it can be reasonably assumed that the participants all used looking behavior to observe and interact with their surroundings to some degree even when no specific experimental contingencies were in place. It can also be assumed that this looking behavior often resulted in some type of pleasurable consequence (e.g., sight of a stimulating image, contact and social interaction from others) that reinforced it. In other words, the act of looking had likely already been reinforced through operant conditioning (Skinner, 1953) long before it was utilized as a required behavior in this study. Although the measured looking behavior significantly increased in the presence of the high-preferred stimuli, there is no way to determine that the participant was looking solely as a result of the experimental conditions. The study was conducted in a classroom during normal school hours. At any time during the trials, teachers were moving around the room, talking to one another, or working with other students. Although the teachers did not approach the student directly while trials were conducted, some of the daily classroom activities that occurred in the background may have garnered the students' attention at any given time, producing a directional look that was incorrectly attributed to the pairing or trial being conducted. Robert in particular exhibited behavior indicating that he was reinforced considerably by social interaction with other individuals. The distracting nature of this social motivation resulted in the complications that were previously discussed.

Another limitation of using eye gaze as the required behavior was that unlike the pressing of a switch, the behavior of looking was not one that could be controlled. For example, the removal of the switch made it impossible for Robert to emit the behavior required to attain the desired stimulus outside of experimental conditions (although he tried unsuccessfully to access it in other ways). The behavior of looking was not completely controllable by the experimenters. In other words, there was no way of removing anything to prevent it from occurring or to control its duration. For example, if the switch was only available to Robert for 5 or 10 s, he would only have the chance to emit the behavior during that interval. Also, when he did press the switch, it was immediately removed while the reinforcer was delivered. This prevented the behavior from occurring more than once in the determined interval or when no experimental conditions were in place. No such control could be exerted over the behavior of looking for Ashley, Keith, or Shannon and the experimental conditions required that the experimenter wait until the participant had looked away from him or her to deliver the instruction again. This combination of factors resulted in instances when the participants continued to stare at the experimenter for extended periods of time (sometimes as long as 3 min) but received no reinforcement for their efforts. That is, the behavior was potentially on extinction. For Keith in particular, this phenomenon appeared to affect response as a result of possible frustration or fatigue. The extended looking occurred primarily during the high-preferred condition, in the phase change from the high-preferred condition to the low-preferred condition and from the low-preferred condition to a baseline reversal condition. Once a low-preferred response and extinction effect

developed, Keith demonstrated an understandable hesitation to emit the looking response when the high-preferred condition was reintroduced, although he grew gradually more responsive. When the low-preferred condition was reintroduced, Keith stopped responding all-together. Once, he even looked in the direction *opposite* the experimenter. With the reintroduction of the high-preferred reinforcer, the looking behavior increased again steadily.

The use of eye gaze to measure preference presented another dilemma in that the topography of what constituted the different types of “looking” behavior differed for the participants. For example, Ashley demonstrated the ability to hold her head in a position where she was facing directly forward. For this reason, a neutral, left, and right gaze could be clearly determined. Keith, however, typically turned his head to one side and demonstrated very little tendency or ability to hold his head upright. For him, a neutral gaze was determined as one in which he was looking in the downward direction to which he was accustomed, and left and right gazes were any movement of his eyes past that neutral point, respectively. These distinctions were made for each client and discussed extensively by the experimenters prior to data collection. In order to measure all looking behavior equally, a directional look (right or left) was counted if the eyes moved past the neutral position to that side. This more flexible interpretation of looking behavior was necessary in order to encompass the topographies of all participants under a universal definition of the behavior. However, this definition resulted in some instances when the participant was scored as looking “at” a stimulus when he or she was likely looking at something or someone past it to that corresponding side. This limitation may have been

most confounding for Robert, who was the most socially observant and demonstrated the highest amount of interest in his surroundings.

Robert had previously used the switch with teachers in the classroom to access reinforcers. As such, he had a reinforcement history in which any emission of the switch-hitting behavior immediately met with praise or some other type of rewarding stimulus. This history, coupled with the social nature of his requesting, is one likely reason why levels of responding when the experimenter delivered the directive were so high during baseline and low-preferred conditions. Future researchers may want to use stimuli with which the individual has no known reinforcement history but that are still topographically similar (i.e., a different sized or shaped switch). Another option would be to use a behavior that had not been emitted previously by the individual. Using a novel behavior would free the responses of the individual from any previous reinforcement history. Similarly, the researchers could be reasonably certain that any emission of the previously unseen behavior was as a result of the value of the reinforcer. Unfortunately, such new behaviors would require a training process which would add to the time required to conduct the assessment. Additionally, the relation between the reinforcer and the behavior might weaken as a result of the delay between the preference assessment and reinforcer assessment as the new skill was acquired.

The length required to conduct the longer preference assessment was another limitation of the study. This issue was exacerbated by the medical challenges inherent in the lives of students with multiple disabilities (Borgioli & Kennedy, 2003; Mednick, 2007). Robert in particular was absent from school for weeks at a time due to health-

related issues. Such interruptions may have resulted in confounding variables such as shifting preference or having to readjust to the experimental conditions and contingencies in place. Because of these delays, the study had to be concluded in Robert's center of residence (as school was no longer in session) which introduced other possible confounds (e.g., different location, peculiarity of interacting with experimenters in the home environment, different social atmosphere) that were unavoidable.

A further limitation of the study in relation to Robert is that the combination of the new social environment (i.e., his living center) and the introduction of the higher preferred live sneeze occurred simultaneously. This concomitant adjustment of two variables makes it difficult to determine exactly what (e.g., the stronger reinforcer, the new environment, an unrelated factor) was primarily responsible for his increased responding following the reassessment. For example, the social atmosphere in his living center differed from his living environment in that he appeared to receive less social interaction and attention. This was likely the result of staff in the center being required to attend to the needs of considerably more individuals simultaneously than the staff in the classroom. This decrease in attention may have had an evocative effect on any behavior which had previously resulted in attention for Robert. Conversely, the attention he was receiving in the classroom (e.g., talking, silly noises, getting taken for rides on a mat with wheels) may have had an abative effect on his initial switch hitting behavior because he was contacting the social attention elsewhere and with little to no contingent requirements. The possibility exists that the electronic sneeze may have been more reinforcing in this new environment and that the reassessment may have been

unnecessary. A more effective course of action may have been to conduct more trials with the initial electronic sneeze in the new environment before performing the reassessment. Then, if levels of responding had remained low (i.e., using the electronic sneeze) in the high-preferred condition, the increased responding after the reassessment (i.e., using the live sneeze) might have been more clearly attributable to the adjustment of the reinforcer.

The final “limitation” of the study, the factor of pre-existing relationships between the experimenters and participants, may be more accurately described as an idiosyncrasy of the participants. The experiments’ pre-study interactions with participants could have caused the experimenters to acquire reinforcing or punishing qualities for the participants. This complication is likely to occur often, as the people for whom the information provided by a preference assessment would be most convenient are those that care for the individuals on a nearly constant basis. These relationships were likely what caused the extraordinarily high level of response during initial baseline conditions for Robert and Shannon. Both participants had previously exhibited behavior that indicated their social awareness of the people around them. Shannon’s high rates of emitted response in both baseline conditions may have been a result of the reinforcing qualities of the experimenter. Shannon had demonstrated a previous enjoyment of “stapstick” humor, such as when someone pretended to fall down. For this reason, one of her stimuli was a picture of the experimenter attached to a paper cup that would dance and then “fall.” Her initial level of response may have been higher because the person giving the direction in the low-preferred and baseline conditions was the same person that was pictured on her

highest reinforcer. In these instances the voice of the experimenter may have become a conditioned reinforcer (Skinner, 1953). Her continued high level of response in the first low-preferred condition was likely a result of this reinforcement as well.

Classroom Implications

Behavior observed during the study indicates that items identified as reinforcing through the preference assessment may be used to train new behaviors. Robert in particular demonstrated a tendency to reach for items on the table as the first phase of the study (i.e., the preference assessment) progressed. He also developed his own mand for the sneeze (i.e., brushing his nose with the finger of his more dominant hand and attempting to reproduce the sound). Because the measured response was duration of eye gaze, the reaching and manding behavior unfortunately did not elicit any direct consequences. In other words, he might reach for a stimulus, but if he was looking away a choice was not counted and no item was received. However, the reaching behavior often correlated with the direction of eye gaze. Also, on a handful of occasions, he was able to grip an item (such as the massager) with such force that the experimenter was required to pry his fingers from the item before presenting the other choice, which elicited laughter. In another instance, he reached out and grabbed the mat on which the items were resting and pulled, causing the items to roll off the table, resulting in more laughter. This behavior suggests that the act of reaching, although not before seen to such a degree and not directly targeted, acquired more reinforcing characteristics through repetition. This increased interest in reaching might be another factor in the slow extinction of the switch pressing behavior as well. Future experimenters and caregivers

can use results gleaned from the assessments to challenge their clients and expand their repertoires. In particular, the emission of the discrete manding behavior was considerably more topographically complex than the looking required in the preference assessment or the reaching required in the reinforcer assessment, and suggests that Robert may be able to learn other simple requesting motions as well provided the items he was taught to mand for were high reinforcers. These motions would likely have to be adapted from the typical signs because of the stiffness in his hands caused by cerebral palsy.

The instructional potential of strengthening reaching behavior is significant. High preferred items could be used to develop a consistent reaching motion (i.e., placing preferred stimuli progressively further from reach). With less tangible reinforcers such as a sneeze, a picture similar to the one of the primary experimenter in this study could be used to represent the reinforcer, and moved around to the same effect (i.e., when he touched the picture, the person sneezed). This method could be used to train directional arm movement as well. Once the behavior had been trained to criterion, Robert would have an invaluable method of independently manipulating the stimuli in his immediate environment.

Ashley's behavior changed over the course of the study as well. Initially, she positioned her head at an upward angle when engaged in her day to day behavior. Because experimenters were concerned that she would be unable to see the stimuli, they waited until she lowered her head to remove the barrier. As Experiment I continued, she began to lower her head into an ideal position to see the stimuli with considerably less waiting required on the part of the experimenters. The experimenters continued to

remove the barrier immediately upon her emission of the head lowering behavior and a chain appeared to emerge between the behavior and the consequence. That this behavior was not discretely targeted further supports the assertion that the reinforcing values of preferred items can motivate individuals with severe cognitive and physical difficulties to acquire new skills.

Another example of the ability of preferred stimuli to influence behavior is the extended looking of Keith toward the experimenter during the reinforcer assessment. Keith had previously exhibited a tendency to “look over” items and people as described by Batshaw et al. (2007) as a challenge for individuals with cortical visual impairment. This constant movement of the eyes was the reason he was selected for the 2 s consecutive duration during the preference assessment rather than the 3 s count. His concentration (i.e., staring directly at the experimenter) during the reinforcer assessment following the introduction of the high-preferred reinforcer was considerable (as long as 3 min in one instance) and suggests that reinforcing items can be used to develop and strengthen behavior that a condition or impairment makes difficult to emit for individuals with multiple disabilities.

A further issue of importance, particularly to teachers or anyone else conducting the preference assessments in a classroom, is how often preference needs to be reevaluated. Zhou et al. (2001) found no predictable indicator of whether or not an individual’s preference may change or under what circumstances the change would occur. In a situation where periodic reevaluation of preference was required, the shorter preference assessments would likely be preferable, provided that further studies had

proven them to be accurate. Another option for professionals is the free-operant procedure described by Roane et al. (1998) which can be performed weekly or even daily. However the technology needed to conduct such an assessment for individuals with severe cognitive and physical difficulties is potentially expensive. In order to observe the true duration of interactions with stimuli, the experimenters would have to provide a means for the individuals to activate and deactivate all electronic stimuli independently (e.g., separate switches corresponding to each stimulus). For non-electronic items such as rattles or shakers, the same manipulative control may be realized by suspending the stimuli near the participants in a manner that the stimuli were accessible to their hands. Experimenters should be cautioned, however, of the limitations of the accuracy of duration-based measurement (i.e. individuals' tendency to approach items because they are available rather than preferred, difficulty in determining a preference hierarchy) reported by DeLeon et al. (1999) and Hagopian et al. (2001).

Future Research

Future researchers may want to continue to examine whether a lower preferred reinforcer can be made stronger for individuals with severe cognitive and physical impairments by adding reinforcing values (e.g., social) to its overall presentation in the manner of Hanley et al. (2006). These questions are especially intriguing for students or individuals who have exhibited previous indices that social attention may prove reinforcing (e.g., following with their eyes as others walk past, smiling or laughing when someone enters the room).

Another possible direction for future research with individuals with severe cognitive and physical impairments is to conduct preference assessments using only the items that have been found to be low-preferred. In this study, two lower-preferred reinforcers were compared solely in the context of determining the lowest-preferred item in the preference assessment. A follow-up study for a similar population of individuals using items that had been previously found less reinforcing might yield interesting results. Of particular interest would be the question of whether lower-preferred items could be used to affect behavior as was reported by Taravella et al (2000). In this study, Robert's behavior toward lower-preferred stimuli strongly supports their findings. Additionally, an assessment of the remaining stimuli (i.e., the remaining 12 in the long assessment and the remaining 4 in the short assessment) that were not assessed under any reinforcement contingencies might be informative for the same reason. The preference and reinforcer assessments could be directly compared to see if a similar hierarchy (i.e., level of responding in the reinforcer assessment corresponding to amount of times the stimulus was chosen in the preference assessment) emerged.

Conclusion

A common characteristic of the participants in this study was that staff and family members felt that they did not consistently demonstrate preferences for particular stimuli. The results of the eye gaze preference assessment, however, indicate that these individuals exhibited choice-making behavior. These choices were then largely corroborated by the reinforcer assessment in which the stimuli that had been found to be high-preferred (i.e., chosen most often) evoked higher levels of responding in the

reinforcer assessment than their low-preferred counterparts. The lack of previously observed choice behavior, then, may be a result of measurements not being sensitive enough to track the choice behaviors of these individuals. Cortical visual impairment, for instance, may result in a situation where an individual tends to “look over” items but not directly at them (Batshaw et al., 2007). In the natural environment, this behavior may lead parents or caregivers to believe that the individual does not have preference for one item over another. If in fact the individual is attempting to indicate a choice, the subsequent lack of reinforcement for his or her efforts can potentially move the behavior toward extinction. An important feature of the eye gaze preference assessment, then, was the presentation of the stimuli in an isolated visual environment (i.e., during the initial presentation and in the choice assessment) as recommended by Bishop (1996) for individuals with cortical visual impairment. All four participants indicated their desires for reinforcing stimuli using eye gaze and, in Robert’s case, mands as well. The challenge (and responsibility) for educators and other care professionals is to give the individuals under their care and guidance the opportunities to make choices in a manner that appropriately utilizes whatever abilities they have. Simply assuming that the individuals have no preference, or do not know what they want, is unacceptable, as it diminishes the teachers’ ability to provide appropriate instruction.

The ability to formulate and indicate a choice is crucial for an individual to manipulate his or her surroundings, attain happiness, and maintain a high quality of life. To that end, research has shown that individuals with disabilities have demonstrated the capability to indicate preferences and emit choice-making behavior. Additionally,

knowledge of such preferences has been used to expand the repertoires of these individuals and teach them novel skills. Precious few variables in the lives of individuals with cognitive and physical disabilities are under their control. Many are significantly, if not completely, dependent on the care of others for their sustenance. Every opportunity, then, must be afforded these individuals to make choices that affect their immediate environment and give them access to desired and motivating stimuli.

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APPENDIX A

LETTER OF EXPLANATION AND PARENTAL CONSENT

Dear Parents,

We would like to include your child in a study that will examine methods to assess your child's preferences. The purpose of this project is to determine whether eye gaze can be used to systematically assess preference.

If your child participates in this study, sessions will be conducted 4-5 times weekly for twenty to thirty minutes. Two assessments will be conducted with your child. First, we will conduct a preference assessment in which a series of items will be paired and your child given the opportunity to choose one of the items. A choice will be defined as your child looking at a particular item for 3 seconds. Once we have identified those items that are preferred based on the results of the first assessment, we will assess whether or not those items are reinforcing to your child. In other words, can we use those items to increase skills in your child. This will be done by asking your child to do a task, such as making eye contact when they hear their name, and providing access to the preferred item. If that behavior increases, it would suggest that the items are indeed preferred and reinforcing.

If this study is successful, your child's teacher will have a way to systematically determine what your child does and does not like. They can then use these items to reinforce and teach new skills.

I will be leading this project with the assistance of OSU graduate students. If you would like more information, please feel free to contact me at the phone number or email address below. If you would like for your child to participate in this study, please sign the attached consent form and return it to your child's teacher. Please know that your consent for your child's participation is voluntary, you can refuse to answer questions that you do not wish to answer, and you can refuse your child's participation or withdraw your child at any time without penalty or repercussion.

Thank you for your time and attention.

Helen I. Malone, Ph.D.
Assistant Professor

The Ohio State University Parental Permission For Child's Participation in Research

Study Title: Assessing preference in students with severe to profound intellectual
and physical impairments

Researcher: *Helen I Malone*

Sponsor: *FCBMRDD*

This is a parental permission form for research participation. It contains important information about this study and what to expect if you permit your child to participate.

Your child's participation is voluntary.

Please consider the information carefully. Feel free to discuss the study with your friends and family and to ask questions before making your decision whether or not to permit your child to participate. If you permit your child to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose:

The purpose of this study is to determine if eye gaze can be used to systematically assess preference in students with severe intellectual and physical disabilities.

Procedures/Tasks:

If you allow your child to participate in this study, s/he will participate in two different phases. In the first phase, we will do a preference assessment in which two items we think your child likes will be placed in their eye sight (approximately 2 feet apart). We will then get your child's attention and tell them to "choose one". If they look at one of the two objects for at least three seconds, we will consider this a choice. We will repeat this process with numerous items. Doing this several times will allow us to determine which items are more preferred. For example, if your child always looks at one particular item each time it is presented and never looks at another item, we would think that they liked the one they looked at more than the one they didn't look at.

In the second phase of the study, we will test whether or not the items identified as preferred in the above phase will act as reinforcers for your child. To do this, we will ask your child to do something they know how to do (such as make eye contact when they

hear their name). When they do the behavior, we will give them access to the preferred item. If the behavior increases, this would support the finding that the item is preferred. We will repeat both phases three times over the next six months to determine if preference remains constant over time.

In addition to participating in these two phases, we will collect information from your child's educational file that is not publically available, including your child's disability and standardized assessment scores (where available).

Duration:

This study will last approximately 6 months (until the end of this school year). During this study, we expect to work with each student four to five days per week for twenty to thirty minutes per day.

Your child may leave the study at any time. If you or your child decides to stop participation in the study, there will be no penalty and neither you nor your child will lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with The Ohio State University.

Risks and Benefits:

We do not anticipate any risks as a result of participating in this study. Participants will be working with OSU students they are familiar with, so they should be comfortable in the study sessions. One potential risk is that the study is not successful in systematically identifying preferred items for individuals with significant intellectual and physical disabilities.

The main anticipated benefit of this study is that we will identify a means of systematically identifying preference for individuals with severe to profound developmental disabilities. Knowing whether the identified items are actually preferred and whether or not they can act as reinforcers for this sample of students would be extremely beneficial. If we are successful, we will be able to provide systematic instruction AND be able to reinforce the new behaviors with things that are actually reinforcing to the student, rather than using something that we think might be something the student likes.

Confidentiality:

Efforts will be made to keep your child's study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your child's participation in this study may be disclosed if required by state law. Also, your child's records may be reviewed by the following groups (as applicable to the research):

- Office for Human Research Protections or other federal, state, or international regulatory agencies;
- The Ohio State University Institutional Review Board or Office of Responsible Research Practices;

- The sponsor, if any, or agency (including the Food and Drug Administration for FDA-regulated research) supporting the study.

Incentives:

There are no incentives for participating in this study.

Participant Rights:

You or your child may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you or your child is a student or employee at Ohio State, your decision will not affect your grades or employment status.

If you and your child choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights your child may have as a participant in this study.

An Institutional Review Board responsible for human subjects research at The Ohio State University reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and University policies designed to protect the rights and welfare of participants in research.

Contacts and Questions:

For questions, concerns, or complaints about the study you may contact **Helen Malone** at XXXXXXXX

For questions about your child's rights as a participant in this study or to discuss other study-related concerns or complaints with someone who is not part of the research team, you may contact Ms. Sandra Meadows in the Office of Responsible Research Practices at XXXXXXXX

If your child is injured as a result of participating in this study or for questions about a study-related injury, you may contact **Helen Malone** at XXXXXXXXX

Signing the parental permission form

I have read (or someone has read to me) this form and I am aware that I am being asked to provide permission for my child to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to permit my child to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form.

Printed name of subject

Printed name of person authorized to provide permission
for subject

Signature of person authorized to provide permission for
subject

Relationship to the subject

Date and time

AM/PM

Investigator/Research Staff

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

Printed name of person obtaining consent

Signature of person obtaining consent

AAM/PM

Date and time

APPENDIX B

LIST OF STIMULI ASSESSED IN EXPERIMENT I

Ashley

- 1) massager
- 2) rubber toy (sea cucumber)
- 3) clacker koosh
- 4) squeeze light ball
- 5) big purple koosh
- 6) disco ball
- 7) coin shaker
- 8) hand stick
- 9) mint scent
- 10) musical bear
- 11) light spinner
- 12) rattle
- 13) bells
- 14) electronic guitar

Keith

- 1) garland
- 2) coin shaker
- 3) musical dog
- 4) horse
- 5) glitter
- 6) bells

Robert

- 1) massager
- 2) sneeze
- 3) clacker koosh
- 4) squeeze light ball
- 5) big purple koosh
- 6) disco ball
- 7) helicopter
- 8) hand stick
- 9) mint scent
- 10) musical bear
- 11) light spinner
- 12) rattle
- 13) bells
- 14) electronic guitar

Shannon

- 1) M & M's
- 2) interaction
- 3) Reese's candy
- 4) blocks
- 5) goldfish crackers
- 6) pig
- 7) communication board

APPENDIX C

PREFERENCE ASSESSMENT OBSERVER RECORDING SHEET

Initials_____

IOA? Y/N

Date_____

Primary/Reliability

LEFT

RIGHT

| | | |
|--|--|----|
| | | NC |
| | | NC |
| | | NC |
| | | NC |
| | | NC |
| | | NC |
| | | NC |
| | | NC |

APPENDIX D

STIMULI TESTED IN EXPERIMENT II

| Student | High-preferred stimulus | Low-preferred stimulus |
|----------------|--------------------------------|-------------------------------|
| Ashley | electronic guitar | rattle |
| Robert | Sneeze | disco ball |
| Keith | musical dog | coin shaker |
| Shannon | Interaction | blocks |

APPENDIX E

REINFORCER ASSESSMENT OBSERVER RECORDING SHEET

Behavior: _____ Student: _____

Data Collector: _____ IOA: Y / N

High-preferred: _____ Low-preferred: _____

Condition: **Baseline** **High-preferred** **Low-preferred**

1. + -

2. + -

3. + -

Session Total: ____/5= _____%

4. + -

5. + -

APPENDIX F

PREFERENCE ASSESSMENT PROCEDURAL INTEGRITY CHECKLIST

Initials_____ Student_____

Date_____

Trials

1 2 3 4 5 6 7 8

| | | | | | | | | |
|--|--|--|--|--|--|--|--|--|
| 1. Places both items on tray | | | | | | | | |
| 2. Presents left item for 5s | | | | | | | | |
| 3. Presents right item for 5s | | | | | | | | |
| 4. Places screen in front of items | | | | | | | | |
| 5. Removes screen and states “pick one” | | | | | | | | |
| | | | | | | | | |
| 6. Upon a 3s directional gaze beginning within 5s, selected item given to student for 5s | | | | | | | | |

| | | | | | | | | |
|---|--|--|--|--|--|--|--|--|
| 7. If no 3s directional gaze begins within 5s, steps 2-5 are repeated | | | | | | | | |
| 8. If no choice is made during second presentation, trial is terminated | | | | | | | | |

APPENDIX G

REINFORCER ASSESSMENT PROCEDURAL INTEGRITY CHECKLISTS:

BASELINE, HIGH-PREFERRED, LOW PREFERRED

Initials _____ Student _____ Date _____

Condition: **Baseline**

| | Trials | | | | |
|--|--------|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 |
| 1. experimenter delivers instruction | | | | | |
| 2. if student responds w/i 5s, no consequence is delivered | | | | | |
| 3. if student does not respond w/i 5s, no consequence is delivered | | | | | |
| 4. experimenter waits additional 5s (10s ITI) | | | | | |

Initials _____ Student _____ Date _____

Condition: **High-preferred**

Trials

1 2 3 4 5

| | | | | | |
|--|--|--|--|--|--|
| 1. experimenter presents high-preferred item for 5s | | | | | |
| 2. states, “if you (target behavior) you can have (item)” | | | | | |
| 3. experimenter delivers instruction | | | | | |
| 4. if student responds w/i 5s, item is presented | | | | | |
| 5. if student does not respond w/i 5s, no consequence is delivered | | | | | |
| 6. experimenter waits additional 5s (10s ITI) | | | | | |

Initials _____

Student _____

Date _____

Condition: **Low-preferred**

Trials

1 2 3 4 5

| | | | | | |
|--|--|--|--|--|--|
| 1. experimenter presents low-preferred item for 5s | | | | | |
| 2. states, "if you (target behavior) you can have (item)" | | | | | |
| 3. experimenter delivers instruction | | | | | |
| 4. if student responds w/i 5s, item is presented | | | | | |
| 5. if student does not respond w/i 5s, no consequence is delivered | | | | | |
| 6. experimenter waits additional 5s (10s ITI) | | | | | |

APPENDIX H

LETTER SENT HOME AT THE END OF THE STUDY

To the family of XXXXXXXX

As the school year comes to a close, I would like to share with you some of the progress made in XXXXXXXX classroom this year. As a graduate student in special education at The Ohio State University, I've been working with XXXXXXXX classroom team at West Central School. Through this experience I have had the unique opportunity to share with members of the school community knowledge gained at the university. As a classroom team, we began the year by discussing common goals, some of which included:

Increasing ...

- * learning opportunities throughout the day

- * communication

In order to increase learning opportunities throughout the day, we added more interactions into existing activities, such as morning group meeting.

In order to increase communication, XXXXXXXX expressed choices throughout his day by way of selecting preferred activities or items.

XXXXXXX participation in the preference assessment project was very exciting and I am happy to share with you information about how to use this tool to assess his preference from a variety of options. But before discussing the results, I would like to tell you a little about the assessment itself.

Before beginning the preference assessment, we discussed with the classroom team what items in the classroom they believed XXXXXXXX enjoyed. Using these six toys, we paired

them up so that each item was matched with the other two times. We were then able to determine a relatively 'high preferred' and a 'low preferred' toy, by observing which he chose most frequently when two were simultaneously available.

Here is how we set up each choice making opportunity – both toys were set on a tray about 1 ft in front of XXXXXXXX, with one object to the his and the other to his right. XXXXXXXX chose one of the two items by looking in the direction of the object. For the purpose of the preference assessment, 'choice' was defined as a shift in eye gaze towards an item, that was held for 2 seconds. Both items were presented at the same time, and we observed to see which item he would glance at, and then rest his gaze upon for 2 seconds.

We looked at six items: a rain-stick type of coin shaker toy, shiny garland, bells, a musical dog, a stuffed horse, and a red glitter ornament. Of these six items, XXXXXXXX most frequently chose the dog (selected 70% of time it was presented), and the least chosen item was the coin shaker (selected 10% of time it was presented).

Next, we assessed whether or not those items were reinforcing to XXXXXXXX. In other words, can we use those items to increase skills? This was done by asking XXXXXXXX to do a task, which was looking towards me after I stated "XXXXXXX look at me", and then providing access to the preferred item if he followed the instruction. If that behavior increases, it would suggest that the items are indeed preferred and reinforcing. And what we found for XXXXXXXX was that he did tend to follow the instruction "look at me" when his 'looking' resulted in access to the high preferred item (e.g., the musical dog). His looking occurred much less consistently and frequently when his 'looking' resulted in access to the low-preferred item (e.g., the coin shaker).

Here's hoping the summer months are enjoyable for you and your family. I have appreciated the opportunity to work with XXXXXXXX, and be a part of his learning experience this year. My goal here was to provide you with a clear and concise description of our preference assessment so that you may use this tool in your daily life to help XXXXXXXX express preferences through choice making. If you do have any questions, feel free to contact me.

Sincerely,

XXXXXXXXXXXX