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The Origins, Evolution, and Future of Preference Assessments in Applied Behavior Analysis

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THE ORIGINS, EVOLUTION, AND FUTURE OF PREFERENCE ASSESSMENTS IN APPLIED BEHAVIOR ANALYSIS

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For nearly thirty years, preference assessments have been utilized in determining items of interest for individuals afflicted with developmental disabilities. Originally, preference assessments were conducted on individuals with severe and profound disabilities, however over time, preference assessments have been adapted to suit individuals with various levels of functioning, as well as those with physical disabilities. Five primary methodologies have become widely accepted for conducting such assessments, and as new techniques have emerged, researchers have conducted a wide range of comparative studies, in hopes of sorting out each respective assessment's strengths and weaknesses, as well as identify which specific populations for which each is best-suited. To this point, the strengths and weaknesses of each assessment have largely been isolated, however the picture is somewhat more cloudy when attempting to match the ideal assessment to a particular subpopulation. Future research may continue to work to clarify this issue, and in addition may utilize new innovations in technology to determine preference in populations previously inaccessible to traditional methods.

Keywords: preference assessment, single-stimulus, paired-stimulus, multiple-stimulus, free operant, developmental disabilities, reinforcement, literature review.

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CHAPTER 1

INTRODUCTION

Throughout history, individuals with severe disabilities have often been placed in institutional settings in cases where their families are unable or unwilling to meet their complex care needs. Historically, the quality of care in such institutional settings has been notoriously poor, and while there are undoubtedly facilities with a similarly poor quality of care in existence to this day, vast improvements have been made in recent years in the effective treatment of institutionalized individuals. This can partially be attributed to the attention drawn to problems in institutional care in the media, and subsequent changes in legislation and regulation. However, while this may eliminate gross negligence on the part of institutional staff, such regulation is unable to account for certain facets of providing the most effective possible treatment for individuals in institutional settings. Two interrelated factors that, due to their complexity, require a focus that goes beyond simple legal regulation, are the development of life skills and, in a broader sense, the maximum attainable quality of life among the institutionalized population. The proper use of tangible items and stimuli can aid in the development of both of these factors. First, the availability of tangible items that are genuinely desired by the institutionalized individuals will have a direct effect on the quality of their leisure time. In addition, desirable tangible items, when used as incentives, have long been shown to have a positive effect on the development of skills in individuals with intellectual disabilities, both in the institutional setting and otherwise, whether in group homes, nursing homes, workshops, or special education classrooms (Feliciano, Steers, Elite-Marcandonatou, McLane, & Areán, 2009; Fisher, Piazza, Bowman, Hagopian, Owens, & Slevin, 1992; Horrocks & Morgan, 2009).

Unfortunately, it is not always as simple as merely asking disabled individuals what their preferences are. Individuals with severe and profound intellectual disabilities represent the lowest-functioning segment of the population diagnosed with mental retardation/intellectual disability, together comprising approximately 4-6% of the diagnosed population. This subpopulation is typically afflicted with major or total inability to effectively communicate, and as a result they may not be able to express preference to caregivers, or even be able to comprehend conversationally what the caregivers are trying to determine. In addition, individuals with severe and profound disabilities are far more prone to significant medical issues than those with mild or moderate disabilities. These issues include, but are not limited to, seizure disorders, cardiovascular and neuromuscular conditions, and visual and auditory impairments (Diagnostic and Statistical Manual of Mental Disorders, 2000, 4th ed., text rev.). The development of preference assessments began as an attempt to determine the preferences of individuals with communication deficits associated with severe and profound disabilities, and these assessments have been crucial in improving the overall quality of life for these individuals, particularly outside of the familial environment, situations in which caregivers often do not have the experience with a particular disabled individual to have the slightest clue what their specific preferences are. From the original populations assessed with these methodologies, preference assessments have been adapted to address the needs of individuals with less-severe disabilities, and even those with no disabilities at all. In addition, recent technological developments have opened the door for researchers to assess the preferences of individuals with profound physical disabilities that would have been impossible to determine at the time that the original preference assessment studies were pioneered.

Four different assessment structures have been developed and subsequently widely accepted in empirically determining the preferences of individuals with intellectual disabilities. All of these consist of presenting a sequence of potentially preferred items to an individual; the methodologies vary primarily in the manner of item presentation, and each method carries its own set of strengths and limitations in terms of validity, accuracy, and utility among different population groups within the subpopulation afflicted with intellectual disabilities. In addition, a fifth technique was later developed; this assessment differs from the previous four in that it is more observational in nature, with less structure and minimal experimenter involvement. The following section will review the pilot studies that established the methodologies for each of the five broadly-accepted preference assessment procedures.

CHAPTER 2

THE HISTORY OF PREFERENCE ASSESSMENT METHODOLOGY

The first empirical preference assessment developed was the single-stimulus assessment, developed by Pace, Ivancic, Edwards, Iwata, and Page (1985). In this procedure, stimuli were presented one at a time to individual participants between the ages of 3 and 18 with profound intellectual disabilities. Participants were exposed to 16 different stimuli across eight sessions; within each session, four different items were presented for five trials each, for a total of 20 trials per session. Preference was determined on the basis of a participant's "approach" or "non-occurrence" to the presented items, with "approach" defined as moving towards the presented stimulus with body or hand within 5 seconds of the first or second stimulus probe. If no approach was made on the first presentation, the item was removed and re-presented along with a prompt to sample the stimulus. Upon approach in either the first or second probe, the participant was rewarded with an additional 5 seconds of access to the stimulus; if no differential response occurred in either probe, the presentation was scored as a non-occurrence.

Pace et al. (1985) then implemented a second procedure with the same participants based on the results of the first experiment, in which participants' completion of arbitrarily selected responses were differentially reinforced with items scored as "preferred" (selected at least 80% of the time in experiment 1) and "non-preferred" (selected less than 50% of the time). Preferred and non-preferred conditions were alternated with baseline in a reversal design.

The strengths of the single-stimulus assessment are its brevity and ease of administration in terms of teaching staff. Additionally, due to the fact that participants only contact one stimulus at a time, in assessing the preferences of individuals with profound disabilities it may be more useful than assessments that require more complex choice-making in participants. Conversely,

this assessment's primary limitation also pertains to its simplicity. Comparative studies suggest that when participants' functioning level allows them to discriminate between multiple stimuli delivered simultaneously, presenting them as such is more representative of a participant's preference than is the single-stimulus presentation (Fisher et al., 1992).

Fisher et al. (1992) developed the second empirical preference assessment, the paired-stimulus procedure, and directly compared it with the single-stimulus procedure. The participant pool included four children between the ages of 2 and 10, all of whom had severe or profound intellectual disabilities. The first phase in the study was a direct replication of the Pace et al. (1985) single-stimulus procedure. After the replication, a forced-choice procedure was implemented with the same set of stimuli; participants were presented with items two at a time, and were required to select one of the two stimuli presented. A participant's approach toward one of the stimuli resulted in 5 seconds of access to the chosen stimulus. If both stimuli were approached, the response was blocked. If the participant responded to neither of the presented stimuli, he/she was given 5 seconds access to each stimulus individually, and then the trial was re-presented. The trials were counterbalanced so each of the 16 stimuli was presented in combination with every other stimulus in a randomized order, for a total of 120 trials per participant.

Phase two of this study consisted of a comparison of items selected at a high percentage in both the forced-choice and single-stimulus presentations ("high-high") to items selected at a high percentage in the single-stimulus only ("SP-high"). Participants were trained on certain responses and then tested on these responses using the selected high-high and SP-high items as reinforcers for performing the trained responses.

The strength of the forced-choice assessment can be seen in its concurrent validity: in phase one, for all disagreements in high-P/low-P outcomes, the forced-choice resulted in a low-P, while the single-stimulus assessment resulted in a high-P. Subsequently, in phase two, all participants displayed higher durations of in-seat behavior when compliance led to reinforcement with the items identifies as preferred in both the single-stimulus and forced choice assessments than when the items identified as "preferred" in the single-stimulus assessment alone were provided as reinforcers. This suggests that the forced-choice assessment is better-suited to differentiate between the relative strengths of reinforcers. The limitations of this assessment are that it is more complex and time-consuming to administer than the single-stimulus assessment, and it may not be suitable for extremely low-functioning individuals.

The third and fourth preference assessments developed were the multiple stimulus assessments, with and without replacement. The pilot study for the multiple stimulus without replacement assessment (Deleon & Iwata, 1996) involved a direct comparison of the multiple stimulus without replacement method with a variation of the paired stimulus assessment derived from Fisher et al. (1992) and the multiple stimulus with replacement assessment (Windsor, Piche, & Locke, 1994). The multiple stimulus without replacement layout consisted of a spread of 6 items placed in a line in a random order across a table. Participants were prompted to select one item from the table; once an item was selected, it was removed from the spread and the items were re-ordered to control for presentation effects by moving the item on the left end over to the right end, and shifting all remaining items to the left. Participants were then instructed to pick one of the remaining items; these trials continued until either all items were selected, or no items were selected for an interval of 30 seconds within a trial. Each participant was exposed to five

trials of each procedure (multiple stimulus with and without replacement, and paired-choice), with the order of procedures varying across participants.

The procedure for the multiple stimulus with replacement assessment was identical to the multiple stimulus without replacement, except that the items were not removed from the array after being selected.

After all assessments were concluded, a second experiment was conducted in which a schedule of contingent delivery was arranged for 4 stimuli to determine if they could support levels of responding above baseline. These items were never selected in MSW, but were selected at some point in both PS and MSWO (if this did not work, it would support the conclusion that PS and MSWO are more prone to false positives than MSW—however, the selected items were supported through contingent delivery for 3 out of 4 participants).

The strengths of the multiple-stimulus assessments, both with and without replacement, are their relative brevity (they take significantly less time to administer than the forced-choice assessment) and their ability to compare a wide range of items that may be reinforcing all at once. The multiple stimulus without replacement assessment may be better suited to identify a broad range of reinforcers, while the multiple stimulus with replacement assessment is likely more effective in identifying a narrow range of high-potency reinforcers. The primary drawback of these assessments is that unlike the single-stimulus and forced-choice methods, it is difficult to set a selection percentage in determining what is “preferred” and “not preferred”; it is much easier to simply rank and order presented items in terms of one another, which may reduce the predictive validity of the multiple-stimulus techniques.

The fifth preference assessment procedure, the minimally-structured free operant assessment, was developed by Roane, Vollmer, Ringdahl, and Marcus (1998), as an attempt to

produce an effective procedure that was less time-consuming than those previously developed. The study consisted of two experiments. The first experiment involved implementing the procedure and then testing the reinforcing efficacy of the items selected by participants as "highly preferred" using two different task-oriented reinforcer assessments. The free operant procedure consisted of an initial walkthrough wherein the experimenter took a participant around the testing room so that the participant contacted each of ten items that were placed throughout the room, followed by a five-minute session where, in the absence of the experimenter, participants were allowed to contact the items around the room at their own leisure. Selected items were recorded by observers outside the testing room using partial-interval recording; during testing, participants were alone in the room at all times unless the experimenter entered to replenish an edible reinforcer that had been consumed. The procedure was able to differentially identify preferred items for all 10 participants.

Following the free-operant preference assessments, subjects participated in one of two reinforcer assessments. The first consisted of two squares, one containing an item identified by the free operant procedure as "highly preferred", and the other (control square) containing nothing. Participants received constant access to the highly-preferred item contingent on remaining in the corresponding square. Five out of six participants in the first reinforcer assessment approached the highly-preferred item square for access, while the sixth approached neither square. The second reinforcer assessment involved two work stations, one containing an item identified as "highly preferred" and the other a non-preferred item (one that was rarely or never selected during the free operant procedure). Participants could approach either station and complete a simple task (the same task at both stations) to receive access to the item. Three out of

four participants exclusively completed tasks for the item in the highly-preferred square, while the fourth shifted back and forth between the highly-preferred and non-preferred stations.

The second experiment involved a comparison between the free operant procedure and the paired-stimulus procedure developed by Fisher et al. (1992). Seventeen subjects participated in both assessments; the two assessments identified the same highly-preferred items for 8 out of 17 participants. A reinforcer assessment comparing the highly-preferred items for reinforcing efficacy was not conducted, however the results of significance from the second experiment were twofold: the free operant procedure was both more quickly implemented and evoked substantially less problem behavior than the paired-stimulus assessment.

In addition to the aforementioned strengths of brevity and relative lack of resulting problem behaviors, the free operant procedure also seemed to be effective across a range of disabled individuals: participants in both studies varied widely in age (3 to 37 years old) and level of intellectual disability (moderate to profound), yet the results were fairly consistent across the full range of participants. One limitation of the free operant procedure is that it is difficult to directly compare its effectiveness to that of other preference assessments due to differences in data recording (partial-interval versus percentage of trials). The free operant procedure also does not identify a distinct hierarchy of preference, as do the paired-stimulus and multiple stimulus assessments.

Over time, many researchers have utilized the frameworks of these pilot studies and methodologically tweaked them to validate and improve their effectiveness in general, as well as within specific populations. The following section will discuss studies involving methodological and participant adjustments to the original single-stimulus, paired-stimulus, and multiple-stimulus assessments. Studies that have been conducted in which the utility of the different

assessments have been directly compared with one another, as well as with the unstructured free operant procedure, will be discussed at the end of the section.

CHAPTER 3

VARIATIONS IN PREFERENCE ASSESSMENT METHODOLOGY

Variations on Single-Stimulus Preference Assessments

Green, Reid, White, Halford, Brittain, and Gardner (1988) conducted two experiments in an attempt to identify reinforcers for profoundly disabled individuals, and compared their results to caregiver reports on the participants' preferences. In the first experiment, stimuli were selected based on availability and ease of presentation; the experimenters also made sure that the stimuli represented a variety of sensory inputs. Stimuli were arranged in four groups of three, and similar stimuli were not grouped together. Presentation was in a single-stimulus format, with three of the 12 selected stimuli presented in each session. Experimenters were able to establish preference of one or more items at an 80% approach criteria for five out of seven participants. Staff opinions on the preference of the selected stimuli were collected using surveys in which each stimulus was rated by staff on a five-point Likert scale; large discrepancies were seen between the staff reports and the results of the preference assessment. The second experiment included the five participants from the first experiment for whom the researchers were able to definitively establish preferences. In this experiment, stimuli were grouped into four categories based on the results of the first experiment, as well as staff reports conducted prior to experiment 1. The categories were high systematic/high opinion; high systematic/low opinion; low systematic/high opinion; and low systematic/low opinion. A reinforcer assessment was conducted with these stimuli, with the dependent variable of interest being the level of independence in which participants were able to complete tasks, with the selected stimuli serving as reinforcers. Responses were scored on a four- or five-point scale (depending on the specific participants' training programs), with 1 being the lowest level of independence and 4 or 5 being

the highest. All participants showed positive behavior change when target behaviors were reinforced with at least one of the items identified as preferred in the single-stimulus assessment; in four of the five cases, the item that evoked positive behavior change was also ranked as preferred in staff surveys. None of the participants showed any behavior change when provided with stimuli that the systematic assessment identified as not-preferred. This is evidence for the utility of the single stimulus preference assessment for individuals with extremely profound disabilities.

Logan, Jacobs, Gast, Smith, Daniel, and Rawls (2001) conducted two experiments in an attempt to identify reinforcers for people with multiple profound disabilities. In the first experiment, they modified the single-stimulus assessment by providing 30 seconds of access to stimuli in the preference assessment phase, instead of the 5 seconds of access given in the original Pace study. They also used a spaced-trial format instead of massed-trial, in which stimuli were presented throughout the day in the context of different activities, until each stimulus had been presented 10 times. The experimenters identified individual lists of stimuli for each participant, instead of a generalized list, and used "approach-based" criteria to determine preference: if an item was approached (looking, smiling, reaching for, vocalizing, etc.) on 80% of trials it was considered "preferred". In the second study, five stimuli were selected from each of seven sensory domains (auditory, gustatory, olfactory, tactile, thermal, visual, vestibular), as well as social stimuli, for a total of 40 stimuli. Each was presented for 30 seconds, with a 30-second intertrial interval. Sessions were videotaped and later analyzed to determine what constituted "approach", how long stimuli were approached for. All approached stimuli were given in a second session, and the 10 that were approached for the longest were subsequently given in a third and fourth session. In contrast to the Green et al. (1988) study, the results were

inconclusive or negative for all participants, suggesting that this methodology is not effective for participants with multiple profound disabilities.

Table 1

Single-Stimulus Studies

Study	Participants	Age	MR Level	Comorbid Disorders
Green et al. (1988) [exp.1]	7	12 to 34	Profound	Various
Green et al. (1988) [exp.2]	5	12 to 34	Profound	Various
Logan et al. (2001) [exp. 1]	6	5 to 12	Profound	Various/Multiple
Logan et al. (2001) [exp. 2]	5	5 to 8	Profound	Various/Multiple

Single-stimulus assessments have been primarily conducted on individuals with severe or profound intellectual disabilities, as can be seen in Table 1. Generally, they have been successful, whether using tangible or sensory stimuli, in situations where delivery was contingent on behavior. Significantly, the Green et al. (1988) study showed a greater utility in the single-stimulus assessment than in staff surveys in determining reinforcers that were capable of evoking behavior change.

Variations on Paired-Stimulus Preference Assessments

Patel, Carr, and Dozier (1998) conducted 2 different standard forced-choice assessments, one with stereotypic stimuli and one with stimuli not associated with self-stimulation, in a single-case study. Following the assessments, a reinforcer assessment was conducted under 3 conditions: baseline (brief praise only, no tangibles), highest-preferred self-stimulatory item, and

highest-preferred non-associated item. During these sessions, prompt fading was used (physical to gestural to verbal) over time on the target behavior being performed. There was no discernible difference in the reinforcer assessment in the participant's responding when contingent on self-stimulatory versus standard reinforcers.

Gottschalk, Libby, and Graff (2000) evaluated the effects of establishing operations on preference assessment results using a paired-stimulus procedure. Participants were presented with four different edibles two at a time in the typical paired-stimulus format; the same four edibles were presented in three different conditions: deprivation, satiation, and control. The results for all participants were as-expected for each condition (lower percentage of approach in the satiation condition and higher percentage of approach in the deprivation condition) for at least three out of four of the edibles presented.

Haynes, Derby, McLaughlin, and Weber (2002) examined the utility of preference assessments with typically developing children with behavioral disorders. Their procedure was based on the forced-choice procedure developed by Fisher et al. (1992). In phase one of this study, they compared assessment administration by the participants' parents with administration by a novel therapist, and also compared pictures of reinforcers with actual items. The pictures were representative of delayed reinforcers; in trials when pictures were used, the reinforcer would be delivered at a later time. In the second phase immediate and delayed reinforcers were delivered contingently on work completion in a reversal (with parent delivery representing baseline); results showed that immediate reinforcers were more preferred with parent delivery, and delayed were more preferred with therapist delivery.

Wilder, Wilson, Ellsworth, and Heering (2003) compared verbal preference assessments in which the items were not visible with tangible assessments with the items present. Both

assessments were administered in a paired-stimulus format. They used both edible and nonedible reinforcers, but controlled for motivating operations for edibles by conducting trials at the same time of day in relation to regular meals. In the verbal assessment, participant was asked "Do you want X or Y?"; the items were hidden under the desk, and the selected one given to the participant upon response. Both assessments indicated the same highest-preferred item for three out of four participants, and the same lowest-preferred item for all four.

Didden and DeMoor (2004) conducted a comparison of a forced choice preference assessment with children afflicted by mild physical and developmental disabilities and a control group of nondisabled children. Toys assessed in the study were classified as "dynamic" or "non-dynamic", with "dynamic" defined as "…moving or transporting itself on its own strength after it is set in motion". The researchers found that dynamic toys were preferred by the disabled children, but not the typically developing ones; that a more significant rank-ordering of preference was seen in the disabled children than the typically developing ones; and that, for both groups of children, the findings of the assessment did not correlate with parent or teacher reports of the participants' preferences. This last finding supports the notion that a forced-choice preference assessment is superior in determining childrens' preferences than parent or teacher reports.

Horrocks and Higbee (2006) modified the paired-stimulus procedure to assess purely auditory stimuli. Because the stimuli were auditory, they were not truly presented simultaneously; they were presented in a sequence of two, with the left-side stimulus activated first. The researchers assessed the results of the preference assessment by assessment requiring task completion. Results indicated that participants completed tasks at a higher rate when the auditory reinforcers identified as "preferred" were used than those identified as "not preferred".

Kuhn, DeLeon, Terlonge, and Goysovich (2006) compared the effectiveness of paired-stimulus preference assessments conducted in the presence and absence of the actual objects to be given as reinforcers. In the first condition, the stimuli were "presented" verbally without the presence of the actual tangible item (and without subsequent access to the item). In the second, the same verbal presentation was given, but with the item also present, and subsequent access to the item after the choice. Following the preference assessments, the researchers attempted to validate the results using a reinforcer assessment in which participants were instructed to complete their choice of a red, blue, or white worksheet, with the red and blue worksheets corresponding to different reinforcers determined by the preference assessments, and the white worksheet present as a control worksheet with no reward for completion. Analysis of the results showed a moderate-to-high positive correlation with researcher predictions.

Wilder, Schadler, Higbee, Haymes, Bajagic, and Register (2008) modified the forced-choice procedure to include only olfactory stimuli. In this procedure, a therapist presented each individual odor prior to assessment. During the assessment, the experimenters implemented a forced-choice procedure with the different olfactory stimuli presented one right after the other, holding each of the odors under the participants' noses for 3s and asking which one they like the most. Choice was indicated by the participant touching the air freshener he/she preferred. A reinforcer assessment was subsequently conducted using a high, medium, and low preference smell for each participant as a reinforcer for completing a card-sorting task. Increased responding was noted for all participants relative to baseline when responding was rewarded with the olfactory stimuli identified as preferred.

Feliciano et al. (2009) attempted to extend the findings of the paired-stimulus procedure developed by Fisher et al. (1992) to older adults with dementia. In this study, prior to

assessments, participants were given tests to determine level of functioning, frequency of agitation, possible behavior function, and potential preferred reinforcers. In the assessment phase, eight preferred reinforcers suggested by the Reinforcer Assessment for Individuals with Severe Disabilities (RAIS-D) were then presented using a paired-stimulus procedure. Assessments were conducted in a multiple baseline across participants, with the target being frequency of agitated behaviors. Results from the preference assessments for each participant were then incorporated into their respective treatment plans, and follow-up data was taken to assess the effectiveness of the program changes. Results indicated that agitation was reduced in eight out of 11 participants following the paired-stimulus assessment and subsequent treatment plan changes; two out of three participants that failed to show improvement were unable to complete the preference assessment.

Table 2

Paired-Stimulus Studies

Study	Participants	Age	MR Level	Comorbid Disorders
Patel et al. (1998)	1	6	Unknown	Autism (all)
Gottschalk et al. (1988)	4	6 to 11	Unknown	Autism (all)
Haynes et al. (2002)	6	5 to 12	None	ODD, ADHD
Wilder et al. (2003)	4	36 to 47	IQ: 71-90	Schizophrenia
Didden & DeMoor (2004)	20	2 to 4	Mild/None	Various
Horrocks & Higbee (2006)	6	13 to 15	Unknown	Autism (1)
Kuhn et al. (2006)	3	10 to 12	Mild	Autism (1)
Wilder et al. (2008)	3	13 to 38	Profound (2)	Autism (all)
Feliciano et al. (2009)	11	Mean: 85.6	None	Dementia

Paired-stimulus assessments have shown great flexibility, as shown in Table 2, in terms of the levels of functioning and specific disabilities of the individuals it is useful for assessing.

They have been effective in assessing a great range of stimuli (visual, auditory, stereotypic, in addition to the usual tangibles and edibles). Additionally, they have been successful in establishing preference even in the absence of the items assessed. Like the single-stimulus assessment, paired-stimulus assessments have been shown to be more effective in determining preference than staff reports, however the paired-stimulus goes a step further in that it has demonstrated its superiority across a broader set of subpopulations, including individuals with mild disabilities and those with no disabilities at all, as well as with older adults suffering from dementia. Indeed, the paired-stimulus assessment may have the broadest utility of all the preference assessments, and is inhibited primarily by its inherent duration and complexity of administration.

Variations on Multiple-Stimulus Preference Assessments

DeLeon, Iwata, and Roscoe (1997) examined whether edible reinforcers "displaced" non-edibles when presented simultaneously. In this study, edibles and leisure items were presented in separate preference assessments; subsequently, the top selections from each were combined into a third assessment to see if food reinforcers were preferred over leisure reinforcers in preference assessment settings. A standard multiple stimulus without replacement assessment was used in all three assessments. Twelve of 14 participants showed a preference for edibles over leisure items in the combined arrays, suggesting that leisure items are in fact displaced by edibles in multiple stimulus preference assessments.

Waldvogel and Dixon (1998) examined the application of preference assessments in an organizational behavior management setting with typically developing participants. In this study, the experimenters tested the utility of a multiple stimulus without replacement assessment

against that of a self-report on preferences. In the trials, the items to be selected were presented written on index cards in a manner identical to that of the self-report survey. 10 stimuli were ranked on the self-report; six (the chosen top three and bottom three) were presented in the multiple stimulus assessment. After removal of items, cards were shuffled randomly (instead of uniformly redistributed) before re-presentation. The procedure was performed three times per participant to demonstrate stability in selections. Identical preference hierarchies were seen in four of seven participants.

Ciccone, Graff, and Ahearn (2006) conducted three different multiple stimulus without replacement assessments: one standard, and two more comprised specifically of the medium- and low-preference items determined from the first one. Additional reinforcers included to fill out the array of 7 in medium/low preference conditions were randomly selected from available edibles in the residential facility. The latter two assessments were conducted to test whether additional high-preference items could be identified among those initially selected as moderately-preferred; results indicated that high-preference items could be found in the moderate category for five out of seven participants.

Resetar and Noell (2008) conducted a multiple stimulus without replacement reinforcer assessment among a general education population and compared the results to teacher assessments of childrens' preferences. The initial preference assessment used an array of 20 items (selected by teacher surveys), as opposed to the six used in the pilot study. After selection, instead of a period of immediate access, the child placed the item in a sandwich bag and was told he/she could bring it back to class after the assessment. Next, the experimenters used an alternating treatments design in comparing students' compliance to completion of math problems under 3 different reward conditions: no reward, teacher selected reward, multiple stimulus

selected reward. The researchers did not find a difference in math problem completion in the teacher-selected reward condition versus the rewards identified in the preference assessment, although two of four children did show higher rates of problem completion in both conditions than in the no-reward condition.

Horrocks and Morgan (2009) used a multiple stimulus without replacement assessment to determine job preference (instead of reinforcer preference) with moderately disabled teenagers in a special education program. They used an array of 16, as opposed to six in the original assessments, and presented them in a video format, with four screens depicting four icons each from which the participants could choose. Following selection of preferred jobs, the process was conducted in reverse, with participants identifying jobs that they would not want to do. The researchers then analyzed on-task behavior in job performance on jobs selected as high-preference and low-preference. Results indicated that the participants tended to stay on-task a higher percentage of the time in the high-preference jobs.

Table 3

Multiple-Stimulus Studies

Study	Participants	Age	MR Level	Comorbid Disorders
DeLeon et al. (1997)	14	Not stated	Profound (13) Moderate (1)	Not stated
Waldvogel & Dixon (1998)	4	22 to 30	None	None
Ciccone et al. (2006)	7	15 to 21	Various	Autism (Some)
Resetar & Noell (2008)	4	1st/2nd grade	None	None
Horrocks & Morgan (2008)	3	19 to 20	Moderate	Cerebral Palsy (1)

Notably, among studies surveyed, the multiple-stimulus assessments did not show the same superiority to staff report that the single- and paired-stimulus procedures demonstrated. It is possible that this was due to participant groups that were higher-functioning or typically-functioning among the multiple stimulus assessments that made this comparison, or simply because of the small sample size of such studies in this review. Regardless, multiple-stimulus assessments have proven highly useful among individuals with mild and moderate intellectual disabilities, and can be easily modified to suit the attention span and functioning level of a particular client by increasing or reducing the number of items in the array. In addition, multiple-stimulus procedures have been shown to have a degree of effectiveness among some individuals with more severe disabilities, although at times they are too complex for these individuals; in such cases, paired-stimulus assessments may be more appropriate (Reid, Parsons, Towery, Lattimore, Green, & Brackett, 2007).

CHAPTER 4

COMPARATIVE STUDIES ON PREFERENCE ASSESSMENTS

Hagopian, Long, and Rush (2004) conducted a literature review of preference assessment studies; this review was focused on comparing, first, direct and indirect methods of assessing preference, and second, engagement and approach-based assessments. They suggest that indirect methods have not yet established predictive validity, and thus they recommend the use of direct assessments or a combination of both. In addition, they suggest that engagement-based procedures may identify preferences more accurately than approach-based procedures.

Kodak, Fisher, Kelley, and Kisamore (2009) compared the multiple stimulus with replacement assessment with the free operant assessment developed by Roane et al. (1998) in which items were distributed around a room and participants were instructed to play with any items of their choosing. The two assessments were conducted separately, and then the most-preferred items from each were compared using images of the items presented to the participants in a concurrent-operants format. Pointing to one of the two images resulted in access to the item for 30s on an FR1 schedule. Results for two out of four participants indicated that when presented concurrently, the highest-preferred item from the multiple stimulus assessment was the strongest reinforcer; the other two participants showed similar rates of selection for both reinforcers.

Roscoe, Iwata, and Kahng (1999) combined the methodologies from the pilot studies on single-stimulus and paired-stimulus assessments. In the first phase, the single-stimulus and paired-stimulus assessments were conducted back-to-back, with the single-stimulus always conducted first, using the same 10 edible stimuli in both assessments. Results showed greater differentiation in the paired-stimulus format for all participants. In the second phase of the study,

a reinforcer assessment was conducted using a concurrent schedule, in which participants were instructed to press their choice of two buttons. In the concurrent-schedule baseline, pressing either button did not result in any consequences, whereas in the experimental phase, pressing one button led to access to a preferred reinforcer, while the other led to a non-preferred reinforcer. Following the concurrent-schedule, a single-schedule baseline was conducted which was identical to the concurrent baseline except there was only one button present. Finally, a single-schedule reinforcement condition was conducted, in which responding on the one available button resulted in access to a non-preferred reinforcer. High rates of responding on the button corresponding to a preferred item were observed in the concurrent-schedule reinforcement condition for all participants, and similarly high rates were noted in the single-schedule reinforcement condition were observed in three out of four participants.

DeLeon, Fisher, Catter, Maglieri, Herman, and Marhefka (2001) analyzed the effectiveness of brief daily preference assessments and compared the results over time to those of longer, more traditional preference assessments conducted earlier in the study. The initial assessments were paired-choice. Subsequently, brief daily multiple stimulus without replacement assessments were conducted prior to work tasks. This multiple stimulus assessment differed from the standard one in that the array was only presented once. On days when the top items on the daily assessment differed from the original paired-choice assessment, the experimenters used the most-preferred items from each in a concurrent-schedule during work tasks. Results showed a higher response to assigned tasks when participants received items from daily preference assessments than when they received items from the longer initial paired-choice assessment.

Hagopian, Rush, Lewin, and Long (2001) evaluated the predictive validity of a single-stimulus assessment in comparison to a paired-stimulus assessment. They modified the original

single-stimulus preference assessment by measuring the duration of engagement, rather than recording an “approach” or “non-approach”, while the paired-stimulus trials were evaluated based on whether or not a participant approached an item. Following administration of the assessment, a reinforcer assessment was conducted with three squares that participants could stand in. A control square contained nothing, while the other two contained items identified in the preference assessment as “preferred” and “non-preferred” respectively. The results showed that the single-stimulus assessment was quicker and easier to administer, but also that the results lacked the stability of those in the paired-choice assessment.

Reid et al. (2007) used preference assessments in assessing employment preference, comparing the relative efficiency of paired-stimulus and multiple stimulus without replacement assessment in determining supported work preferences. As shown in Tables 3 and 4, the participants’ disabilities were more severe than those in Horrocks and Morgan (2009). They targeted secondary “work behavior” as measure of validity, defined as manipulation of work materials in a manner necessary to complete a specific job task OR any action necessary to complete a task that did not involve the work materials. They also targeted problem behavior during work tasks as a secondary measure of validity. Results indicated that preferred jobs were identified for 11 of 12 participants; due to the severe nature of their disabilities, however, the multiple stimulus procedure proved to be too complicated for five of the 12 participants.

Thomson, Czarnecki, Martin, Yu, and Martin (2007) compared single-stimulus and paired-stimulus preference assessments with severely and profoundly disabled individuals, using edible and inedible items separately. The paired-stimulus assessment was not forced-choice; if participant did not engage either item within 5 seconds (edible) or 30 seconds (inedible), trial was scored as “no selection”. Some non-food items, when selected, were engaged through

cooperative interaction with experimenter. Verbal praise was given whenever selections were made. The results indicated that the two assessment types were roughly equal in their effectiveness, but also that the paired-stimulus assessment resulted in a better-defined hierarchy of preference. This is contrary to the belief that the single-stimulus method is better suited for individuals with severe and profound disabilities than the paired-stimulus method.

Reed, Luiselli, Magnuson, Fillers, Vieira, and Rue (2009) conducted a single-case study comparing a combination of multiple stimulus without replacement, paired-stimulus and free-operant procedures with a progressive-ratio demand task to assess reinforcers. The multiple stimulus and paired-stimulus procedures followed the procedures from the pilot studies, however they used only edible reinforcers. Following the preference assessments, they used the items from those assessments in a reinforcer assessment with a progressive-ratio schedule to determine the strengths of the items as reinforcers. They used economic analyses to contrast the relative preference of items in the initial assessments with the actual reinforcing values of the items in a task-presentation scenario. They found the accuracy across all three preference assessments to be 67%, however they do not compare the preference assessments with one another. They suggest that progressive-ratio reinforcer assessments may be more effective than traditional preference assessments.

Table 4

Comparative Studies

Study	Participants	Age	MR Level	Comorbid Disorders	Assessment Type
Kodak et al. (2009)	4	2 to 10	Unknown	Autism (all)	MSW, FO
Roscoe et al. (1999)	8 (phase 1) 4 (phase 2)	25 to 63	Mild-Profound	Autism (3)	SS, PS
Deleon et al. (2001)	5	8 to 25	None-Severe	Autism (2) Prader-Willi (1)	PS, MSWO

Hagopian et al. (2001)	4	7 to 20	Moderate (1) Severe (2)	Autism (all)	SS, PS
Reid et al. (2007)	12	29 to 76	Severe-Profound	Autism (4)	PS, MSWO
Thomson et al. (2007)	14	26 to 65	Severe-Profound	Not stated	SS, PS
Reed et al. (2009)	1	19	Not stated	PDD-NOS	PS, MSWO, FO

Comparative analyses of preference assessments have produced mixed results in general. The effectiveness of the paired-stimulus procedure was once again evident in comparisons with the single-stimulus procedure in Roscoe et al. (1999), wherein an approach-based paired-stimulus assessment produced stronger results than an engagement-based single-stimulus procedure. If Hagopian et al. (2004) are correct in their assessment that engagement-based procedures are generally superior to approach-based ones, then this bodes well for the utility of the paired-stimulus assessment; it is important to note that in the Roscoe et al. (1999) study, the results of both assessments stood up to the administration of subsequent reinforcer assessments. In addition, the direct comparison of single- and paired-stimulus assessments conducted by Thomson et al. (2007) suggested that, contrary to some prior research, the paired-stimulus procedure may be equally effective to the single-stimulus procedure when assessing individuals with severe and profound disabilities, while maintaining the superior hierarchy definition that was also demonstrated in the paired-stimulus pilot study (Fisher et al., 1992).

However, one of the primary downsides of the paired-stimulus procedure, as previously noted, is the extended duration of time required to administer it fully. DeLeon et al. (2001) demonstrated that, in contrast to the massive paired-stimulus undertaking, very brief multiple-stimulus assessments administered on a daily basis proved even more effective when the assessments' respective preferred reinforcers were evaluated in a contingent-reinforcement setting. While the original multiple-stimulus procedures' aforementioned issues with determining

selection percentage are a hindrance, this study suggests that a truncated version that produces a simple hierarchy may effectively determine an individual's short-term preferences at a given moment.

Kodak et al. (2009) built on this suggestion in comparing the full multiple stimulus with replacement procedure, the similar but slightly more open-ended version of the multiple stimulus without replacement assessment, with the ultimate "heat of the moment" preference assessment, the largely unstructured free-operant procedure developed by Roane et al. (1998). The results were similar for both assessments—the multiple-stimulus assessment may have even been slightly more effective—further suggesting the utility of multiple-stimulus procedures in making quick determinations of items carrying immediate reinforcing value.

CHAPTER 5

SUMMARY

The administration, study, and evolution of preference assessment procedures over time has demonstrated that, while imperfect, these assessments are tremendously useful across a huge range of populations and settings. Determining preferred items, activities, foods, and even jobs leads to an inherent improvement in quality of life, and in many cases, it may lead to improved productivity as well (Reid et al., 2007; Feliciano et al., 2009). While these assessments have shown a degree of utility within the typically-developing population, their true strength lies with the developmentally disabled: those who are not so readily able to express their preferences. These procedures, in many cases, may allow a practitioner to determine a severely or profoundly disabled client's preferences without ever having met the individual in question (Fisher et al., 1992). And while in some cases a caregiver may be so familiar with a developmentally disabled individual that procedures such as these may not seem to be worth the time, even the briefest assessments have been shown to accurately determine preferences and have a positive influence on behavior (DeLeon et al., 2001). And while preference assessments have been developed to address the needs of an extremely broad range of disabled individuals, the list is not yet comprehensive; there remain subpopulations within the disability community for whom the issue of determining preference has not yet been thoroughly assessed. One future direction in preference assessment research that is beginning to gain ground involves the use of computers and sensors to analyze a patient's eye gaze as a means of determining preference (Fleming, Wheeler, Cannella-Malone, Basbagill, Chung, & Day, 2010). These procedures open the door for preference determination for quadriplegic patients and others with extremely severe movement restrictions. Though the research itself is in the early stages at this point, the technology has

advanced far enough to where eye gaze can be detected across multiple stimulus arrays containing a minimum of fourteen possible selections. (Fleming et al., 2010). Research in general on assessing leisure preference in individuals with multiple profound disabilities, including the aforementioned movement restrictions, visual and auditory impairments, and a variety of others still leaves something to be desired. Logan and Gast (2001) provide a thorough analysis of the literature to that point; a fair amount of studies have been conducted with that subpopulation, however the results of those studies, according to Logan and Gast, provided little evidence of procedural effectiveness. The population suffering from multiple profound disabilities is one that remains incredibly difficult to assess, and future developments that improve researchers' and practitioners' abilities to do so would constitute a significant breakthrough. Another future avenue for the study of preference can be seen in the use of multiple-stimulus-type concurrent chains to analyze an individual's preference in types of interventions (Hanley, 2010). This is a truly exciting development, because the value inherent in allowing individuals to dictate their preferred personal styles of learning cannot be understated. First, as Horrocks and Morgan (2009) demonstrated, an individual working at a preferred job is likely to perform at a higher level than a non-preferred job; it is not a huge stretch to imagine that an individual's ability to select a preferred method of intervention may well perform at a higher relative level, or provide a more accurate series of data, depending on the nature of the intervention. This line of research could potentially also be adapted to develop improved methods of functional behavioral assessment, or more efficient functional analyses. Second, information on a client's preferred learning style gleaned from such an assessment could prove extremely valuable to practitioners in the development of treatment plans; by reducing a degree

of the initial trial-and-error that is often involved in these processes, an increase may well be seen in both the effectiveness and efficiency of the plans subsequently developed.

A final consideration in the future progress of preference assessment research is rooted in the Reed et al. (2009) single-case study, the results of which suggested that in some cases, the use of progressive-ratio reinforcement assessments may be more effective than traditional preference assessments. The expanse of studies providing positive results from the use of preference assessments is evidence enough that these assessments have established their place in the broad scheme of effective treatment, however if scientists and practitioners hope to apply the *most* effective treatment, then the utility of progressive-ratio reinforcer assessments is important to explore in future research.

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