Web-Based Stimulus Preference Assessment and Reinforcer Assessments for Videos

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WEB-BASED STIMULUS PREFERENCE ASSESSMENT AND REINFORCER ASSESSMENTS FOR VIDEOS

by

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A dissertation submitted to the Graduate College in partial fulfillment of the requirements for the degree of Doctor of Philosophy Psychology Western Michigan University April 2018

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WEB-BASED STIMULUS PREFERENCE ASSESSMENT AND REINFORCER ASSESSMENTS FOR VIDEOS

Hugo Curiel, Ph.D.
Western Michigan University, 2018

Stimulus preference assessments and reinforcer assessments are integral components of positive reinforcement-based interventions. Web-based brief multiple-stimulus without replacement (MSWO) preference assessments have recently been shown to be effective in identifying preference hierarchies for videos (Curiel, Curiel, Li, Deochand, & Poling, 2018). The purpose of the current studies was to replicate Curiel et al.’s web-based MSWO assessment and assess the reinforcing function of the highest and lowest identified stimuli using novel web-based reinforcer assessments. Study 1 employed single-operant arrangements (SOAs) and Study 2 employed concurrent-operants arrangements (COAs) to assess the absolute and relative reinforcing function of the identified stimuli, respectively. The web-based MSWO was effective in identifying stimulus preferences hierarchies in both studies. Furthermore, the highest-preferred stimuli functioned as reinforcers in both arrangements. The findings, limitations, and areas of future research are discussed.
ACKNOWLEDGEMENTS

I write this acknowledgement with great pleasure and gratitude. This accomplishment has been the result of collective efforts. I would like to thank those who made it a success. I would like to thank my doctoral advisor, Dr. Alan Poling, for his mentorship and support throughout this endeavor. Dr. Alan Poling has taught me how to approach issues with great scientific rigor. Dr. Steven Ragotzy was a great contributor throughout this project. I am very appreciative for his collaboration and thoughtful commentary. My wife, Dr. Emily Curiel, was such a vital partner. I am forever indebted to her for her personal and academic support. She truly made this an enjoyable process. Along this journey, I was also very fortunate to meet and work with my lab mate, Anita Li, who I now consider a lifelong friend. Her work ethic has been admirable. Along with these acknowledgments, I dedicate this dissertation to my wonderful parents, Everardo and Carlota Curiel, who made many, many sacrifices to afford me the opportunity to obtain a doctoral degree.

Hugo Curiel
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INTRODUCTION

General Background

The importance of technology in science, applied disciplines, and society in general is gargantuan and growing. For example, more than 90% of all adults in the United States of America have a cellular phone (Pew Research Center, 2013), and iPads are widely used in educational systems at all levels (Donohue, 2015; Miller & Doering, 2014). Unsurprisingly, as emphasized in a recent literature review (Cohen & Rozenblat, 2015), technology has long benefitted behavior analysts as demonstrated in several 1960’s studies that addressed various behaviors such as cigarette smoking (Powell & Azrin, 1968), postural control (Azrin, Rubin, Ayllon, & Roll, 1968), stuttering (Azrin, Jones, & Flye, 1968), and on-task behavior (Tate, 1968). Many other applications arose as the years passed and powerful computerized devices became widely available, assisting behavior analysts in “…collecting and analyzing data, as well as implementing interventions using technologies” (Cohen & Rozenblat, p. 184).

Two areas within the field of applied behavior analysis that have embraced technology are stimulus preference assessments and reinforcer assessments. Continued efforts to incorporate technology into these assessments, making them easier and quicker to use, are imperative because “positive reinforcement is the most important and most widely applied principle of behavior analysis” (Cooper, Heron, & Heward, 2007, p. 257). The effective use of positive reinforcement requires the identification, followed by the manipulation, of reinforcing stimuli. The identification of reinforcing stimuli often follows a two-step process that entails stimulus preference assessments and reinforcer assessments (Cooper et al., 2007; Fisher et al., 1992; Hagopian, Long, & Rush, 2004; Kang et al., 2013). For this reason, these assessments are important. Three valuable applications of computerized devices is using such tools 1) to deliver
stimuli that are potentially reinforcing, 2) to assess preference among such stimuli, and 3) to
determine whether highly-preferred stimuli actually function as reinforcers. These applications
lend themselves to empirical investigations, such as those reported here. The sections that follow
review literature pertinent to the current studies.

**Stimulus Preference Assessments**

Stimulus preference assessments, by definition, are “a variety of procedures used to
determine the stimuli that a person prefers, the relative preference values (high versus low) of
those stimuli, the conditions under which those preference values remain in effect, and their
presumed value as reinforcers” (Cooper, Heron, & Heward, 2007, p. 705). Several specific
procedures are currently used for the aforementioned purposes: single-stimulus (Pace, Ivancic,
Edwards, Iwata, & Page, 1985), paired-stimulus (Fisher et al., 1992), multiple-stimulus
(Windsor, Piche, & Locke, 1994), multiple-stimulus without replacement (MSWO; DeLeon &
Iwata, 1996), free-operant (Roane, Vollmer, Ringdahl, & Marcus, 1998), and the brief MSWO
preference assessment (Carr, Nicolson, & Higbee, 2000). The vast majority of stimulus
preference assessments have been implemented and systematically assessed among individuals
with severe and profound disabilities (see Kang et al., 2013; Tullis et al., 2011).

Research on stimulus preference assessments has evolved in ways that have increased the
effectiveness of preference identification and decreased the overall assessment time. Three
examples can provide support for these two claims. First, the paired-stimulus preference
assessment addressed the identification of false positive stimuli within the single-stimulus
preference assessment (see Fisher et al., 1992). Second, the MSWO assessment has proved to be
efficient in regard to its total duration of implementation, as compared to the paired-stimulus
preference assessment (see DeLeon & Iwata, 1996; Kang et al., 2013). Third, the brief MSWO
has further decreased the total assessment duration when compared to a full MSWO preference assessment (see Carr, Nicolson, & Higbee, 2000).

**Staff- and Self-Nominated Preferences**

The identification of preferred stimuli for clients, students, or participants obtained via vocal reports from staff members (e.g., caregivers, teachers, clinicians, researchers) or via self-report—for individuals without communication impairments—appear to be reasonable and convenient. However, the data supporting these methods are mixed. Several researchers have specifically assessed the predictive value of staff- and self-nominated preferences. These studies will be reviewed and summarized in the following paragraphs, in order of publication year.

In the early stages of identifying preferred stimuli for individuals, staff and other personnel that have an extended rapport with the target individuals may play a crucial role, particularly for individuals who have language impairments or limited communication repertoires. Green et al. (1988) compared staff-nominated rankings of preferred stimuli to the results of single-stimulus assessments for participants between the ages of 12 and 34 years; the seven participants were reported to have profound impairments. As part of the procedure, the staff ranked the participants’ preferences for 12 preselected stimuli (e.g., verbal interactions, mechanical toy, music). Single-stimulus assessments were completed after the staff rankings. The comparisons between the staff-nominated stimuli and the stimuli identified via the single-stimulus assessment resulted in overall poor correspondence. The authors stated, “The results also indicate that preference rankings based on caregiver opinion do not consistently coincide with the results of a systematic, observational approach to preference assessment” (p. 41).

Piazza, Fisher, Hagopian, Bowman, and Toole (1996) conducted paired-choice preference assessments with four individuals with mental retardation and other comorbidities,
who were between the ages of 7 and 19 years. Prior to conducting the paired-choice assessment, the participants’ caregivers completed a structured interview (i.e., Reinforcer Assessment for Individuals with Severe Disabilities), in which the caregivers identified stimuli across various sensory modalities (e.g., visual, olfactory, edible) that were presumed to have reinforcing functions. The high-ranked stimuli identified via the structured interview were then incorporated in paired-stimulus preference assessment. “Stimuli categorized as high preference by the choice assessment consistently functioned as reinforcers across all clients and all relevant phases” (Piazza et al., p. 6).

In a recent study, Brodhead, Abston, Mates, and Abel (2017) compared three preference assessment procedures: brief MSWOs followed by access to the selected stimuli, brief MSWOs not followed by access to the selected stimuli, and staff-nominated stimuli. The participants were four children (4 to 7 years old), who had a diagnosis of autism. The staff nominated and ranked five activities (e.g., playing on the trampoline, basketball, playground) that were available in the participants’ environment and were presumed to be preferred. Following the staff rankings, the brief MSWO procedures were conducted. The comparisons between the assessments, based on statistical analyses, resulted in moderate correlations. The staff-ranking of stimuli did not correspond with the results of the either brief MSWO procedure. That is, when given the task of rank ordering (from highest-to-lowest-preferred) activities, the staff could not accurately predict the order in which the participants selected the activities. However, it should be noted that correspondence for the highest-preferred activity was apparent for the staff-ranked assessment and the brief MSWO followed with immediate access for two of the four participants. Additionally, correspondence for the highest-preferred activity was apparent for the staff-ranked
assessment and the brief MSWO not followed by access to the selected stimuli for one of the four participants.

Self-nominated preferences by individuals without communication impairments have also been subjected to empirical investigation. Northup, George, Jones, Broussard, and Vollmer (1996) assessed self-nominated preferences in children (6 to 9 years old) diagnosed with attention deficit hyperactivity disorder (ADHD). Four participants completed three types of preferences assessments: survey, verbal stimulus choice, and pictorial stimulus choice. The participants’ preferences were assessed across categories (i.e., edibles, tangibles, activities, attention, or escape). Participants selected one category when presented with two simultaneous categorical options. During the survey format, the participants vocally rated each category. That is, the participants were asked if they liked a particular category (e.g., tangibles) and responded with one of three vocal responses (i.e., not at all, a little, or a lot). The vocal rankings occurred for all categories. During the verbal stimulus choice, the categories were vocally presented in pairs (e.g., “Would you rather get things to eat or do things?”). The pictorial stimulus choice was similar to the verbal stimulus choice but differed in that the categories were presented on cards—in which each card represented a category—and the participants were provided opportunities to physically select the category (as opposed to engaging in vocal selections). The outcomes for each assessment were compared to subsequent reinforcer assessments. The authors concluded that the survey format resulted in the identification of false positives more often than the verbal stimulus choice or pictorial stimulus choice procedure.

As evidenced by the previous studies, indirect methods (i.e., staff- and self-nominated procedures) may or may not yield preferences that correspond with direct assessment procedures (e.g., paired-choice, brief MSWOs). Therefore, as standalone procedures, indirect methods may
prove to be ineffective in identifying accurate preferences; however, nominated stimuli may serve as a beneficial starting point for direct measures, as demonstrated by Piazza et al. (1996).

MSWO

The MSWO is a direct assessment procedure, which differs from staff- and self-nominated procedures in that the participants are afforded opportunities to make selections from arrays of preselected stimuli. First, a subset of stimuli which are presumed to be preferred are identified. The methods in which the initial stimuli are selected have been mixed: some researchers have incorporated arbitrary stimuli (see DeLeon & Iwata, 1996) and others have incorporated staff- or caregiver-nominated stimuli (see Daly et al., 2009; DeLeon et al., 2001; Ortiz & Carr, 2000). Once a subset of stimuli are identified, the following procedural steps are followed: (a) each stimulus is sampled for a predetermined duration; (b) the stimuli are simultaneously presented to the participant; (c) the participant is provided with opportunities to select and access one stimulus at a time; (d) the selected stimulus is removed from the stimulus array; (e) and the remaining unselected stimuli are represented. This process recurs until the participant has selected and accessed all the stimuli, or until the participant ceases engagement in selections (DeLeon & Iwata). The steps previously described constitute one stimulus-presentation. DeLeon and Iwata’s first MSWO demonstration consisted of five stimulus-presentations. The dependent measure of interest was the order in which the stimuli were selected. The selections were quantified as the number of times a stimulus was selected divided by the number of times it was presented and multiplied by 100 (to yield a percentage; DeLeon & Iwata). Therefore, if five stimuli were assessed and all were selected, the first, second, third, fourth, and fifth stimulus would be assigned percentage values of 100%, 50%, 33%, 25%, and 20%, respectively. The stimuli are then averaged across the number of stimulus-presentations,
revealing a range of percentages. This range is translated as a preference hierarchy, in which the stimulus with the highest percentage value is typically labeled as the high-preferred stimulus and the lowest percentage value is labeled as the low-preferred stimulus. This procedure has proven to be effective and efficient in identifying participant preferences (see Daly et al.; DeLeon & Iwata; DeLeon, Iwata, Conners, & Wallace, 1999; Kang et al., 2013; Ortiz & Carr).

**Brief MSWO and Daily MSWO**

In continued efforts to enhance the efficiency of the MSWO, truncated MSWO assessments have been evaluated. For example, Carr et al. (2000) extended the traditional MSWO assessment by decreasing its implementation time. The brief MSWO, as it was called by the authors, was initially evaluated with children (2 to 7 years old) diagnosed with autism. The procedural arrangements were similar to those put forth by DeLeon and Iwata (1996). The distinguishing feature of the brief MSWO, however, was the reduction of stimulus presentations. Three stimulus presentations were conducted as part of the brief MSWO compared to the traditional five stimulus presentations. Based on their results, the authors concluded that the brief procedure was effective in identifying stimulus preference hierarchy for all three participants.

Another procedural arrangement that was based on the initial MSWO was DeLeon et al.’s (2001) daily MSWO. The daily MSWO consisted of one stimulus presentation per assessment. Results of the daily MSWO outcomes for the highest-preferred stimuli were compared to the results of an initial paired-stimulus preference assessment. On sessions in which the highest-preferred stimuli failed to correspond with those revealed by the paired-stimulus preference assessment, the authors conducted concurrent-operants (COA) reinforcer assessments to ascertain which assessment was most predictive in identifying a reinforcing stimulus. Based on their results, the authors concluded that discrepancies between the paired-stimulus preference
assessment and the daily MSWO assessments occurred often; correspondence only occurred for 30% of presentations. On days in which discrepancies occurred, the daily MSWO proved to be the most effective in identifying stimuli that subsequently functioned as reinforcers.

Findings regarding the brief and daily MSWOs are significance in at least two ways. First, and most important, the truncated procedures proved to be effective in the identification of preferences. Second, their briefness is of real practical importance for those who implement such procedures.

**Technology and Stimulus Preference Assessments**

Behavior analysts have long used technological devices to address behaviors of social significance; a perusal of the archives of the *Journal of Applied Behavior Analysis* firmly supports this contention (Cohen & Rozenblat, 2015). In Cohen and Rozenblat’s review, the authors state that technology is readily incorporated for the purposes of data collection and data analysis and as a medium to deliver treatment. Researchers interested in stimulus preference assessments have recently incorporated emerging technology in their area of study. Technology has been used to assess stimulus preferences for tangibles, activities, and videos (e.g., cartoons, movies, television shows) via the presentation of electronic pictures and videos.

To assess preferences among tangible items, Snyder, Higbee, and Dayton (2012) compared two paired-stimulus preference assessments; tangible-based assessments were compared to video-based assessment depicting tangible stimuli, in which the stimuli (e.g., toys) in both assessments were identical. The purpose of the assessment was to assess whether video-based assessments would yield similar results to a tangible-based assessment. The authors reported correspondences between the assessments in the identification of the highest-preferred stimuli for five of the six participants. In a subsequent evaluation, Brodhead et al. (2016)
compared an electronic pictorial MSWO, presented via an electronic tablet, to a tangible-based MSWO assessment. The findings were similar to those of Snyder et al., in that the highest-preferred stimuli in the tangible-based assessment corresponded with the electronic pictorial MSWO assessment for four of the five participants.

Technology has also been used to assess participants’ preferences for activities. In one demonstration, Mechling and Moser (2010) used videos that depicted the participants, an adult, or a peer engaging in preferred tasks (e.g., completing puzzles, playing with a favorite toy). The results did not reveal differentiated preferences among the stimuli. In a second demonstration, Brodhead et al. (2017) compared two video-based MSWOs and a staff-nominated preference assessment for videos. One video-based MSWO was followed by brief access to the activity (e.g., train table, swing, wagon ride) immediately after it was selected, while the other video-based MSWO was not followed with access to the selected activity. Both assessments produced stimulus preference hierarchies; however, the outcomes did not correspond across participants.

To assess preferences for videos (e.g., movies, cartoons, television shows, music videos), an automated web-based preference assessment was evaluated by Curiel, Curiel, Li, Deochand, and Poling (2018). The web-based assessment arranged a brief MSWO procedure. The assessment depicted five still images of the videos that were assessed. When the participants selected a particular image, the corresponding video was displayed for a predetermined time. The assessment was evaluated with five participants diagnosed with autism, other health impairment, or emotional impairment. The program and procedures resulted in clear stimulus preference hierarchies for all participants.
Reinforcer Assessments

As noted previously, the identification of stimuli which function as reinforcers often follow a two-step process (Cooper et al., 2007; Fisher et al., 1992; Hagopian et al., 2004; Kang et al., 2013). The first step is the identification of stimulus preferences and the second is the verification of their effect on responses other than simple choice responses, commonly termed reinforcer assessments. Reinforcer assessments, by definition, are “…a variety of direct, data-based methods used to present one or more stimuli contingent on a target response and then measuring the future effects on the rate of responding” (Cooper et al., p. 280). Reinforcer assessments are assumed by some behavior analysts to play a key role in differentiating preferred stimuli from reinforcing stimuli. This differentiation is important not only for technical purposes but for behavior-change purposes. Preferred stimuli serve as reinforcers for the choice responses, and the purpose of reinforcer assessments is to provide more information about this function.

As with stimulus preference assessments, reinforcer assessments also have a variety of procedural arrangements, such as COA (Cote, Thompson, Hanley, & McKerchar, 2007; DeLeon et al., 2001; DeLeon, Iwata, Goh, & Worsdell, 1997; Francisco, Borrero, & Sy, 2008; Fisher et al., 1992; Roscoe, Iwata, & Kahng, 1999; Tustin, 1994) and single-operant arrangement (SOA; Carr et al., 2000; Daly et al., 2000; Francisco et al., 2008; Glover, Roane, Kadey, & Grow, 2008; Northup et al., 1996; Roscoe et al., 1999). Each of the aforementioned arrangements is important in its own right and can be used to provide information about the reinforcing function of particular stimuli.

For example, the COA has often used to assess the relative reinforcing function of stimuli (Fisher & Mazur, 1997). Concurrent schedules simultaneously arrange reinforcement independently for two or more responses and the relative allocation of time or behavior among
the alternative schedules is taken as a measure of the *relative* reinforcing value of the consequences arranged by those schedules (Davison & McCarthy, 1988). In contrast, the SOA (which arranges a single schedule) typically has been used to identify the *absolute* reinforcing function of stimuli (Carr et al., 2000; Daly et al., 2000; Francisco et al., 2008; Glover et al., 2008; Northup et al., 1996; Roscoe et al., 1999). The SOA provides one stimulus option per session; the comparisons among stimuli, if any, are over stimuli across sessions. The COA, in contrast, makes two or more stimuli available each session. With either of these arrangements, researchers manipulate the schedule of reinforcement depending on the target response and participant characteristics.

**Purpose of Current Studies**

Overall, it appears that video presentation of stimuli via a computerized device is a convenient, versatile, and valid technique for assessing preference. Such devices seemingly also offer a convenient platform for assessing whether stimuli actually function as reinforcers for more than simple choice responses. Given the potential value of technology in conducting preference and reinforcer assessments, the present project, which comprised two studies, extended research in these areas. The purpose of the current studies was threefold. First, both studies replicated Curiel et al.’s (2018) web-based brief MSWO preference assessment procedure. Second, Study 1 assesses the reinforcing functions of the high-preferred (HP) and low-preferred (LP) stimuli using a web-based SOA reinforcer assessment. Third, Study 2 assesses the reinforcing functions of the HP and LP stimuli using a web-based COA reinforcer assessment.
STUDY 1: WEB-BASED STIMULUS PREFERENCE ASSESSMENT AND SINGLE-OPERANT REINFORCER ASSESSMENT FOR VIDEOS

Method

Participants

Five adults participated in the study. To be recruited for the study, the individuals had to be 18 through 26 years age, have a diagnosis of ASD or another developmental disability, or be eligible for educational services under the category of autism. Additionally, the participants had to demonstrate—as reported by their classroom teacher—the following skills: (a) sit or stand within the confines of a work area for up to 20 min, (b) make a selection when presented with two or more items, (c) have the physical capability to touch an electronic screen with their fingers, and (d) have a preference, or show an interest in, electronic media (e.g., cartoons, movies, music videos, television shows, YouTube videos). Participants were not considered if they were reported to engage in challenging behaviors (e.g., physical aggression, property destruction) that would prevent them from engaging in watching videos, making video selections, or transitioning the electronic device to and from the researcher.

The participants were recruited from a public school in the midwestern United States (US). The participants attended a postsecondary program specializing in providing transition services to individuals with disabilities. All participants met the educational category of autism, and thus were eligible for such services. The participants were fluent in using and navigating a 32 GB Apple iPad Air 2 (hereafter, iPad; Apple Inc., Cupertino, CA). That is, they were able to independently type the names of their preferred videos and make selections by clicking images and icons on the electronic screen.

The participants characteristics (i.e., age, sex, diagnosis, ethnicity, and language characteristics) are presented in Table 1. Marcus was a 23-year-old man. His vocal
communication skills were limited; he spoke in single words and short phrases. Andy was a 25-year-old man. He vocally communicated using complete sentences. Charles was an 18-year-old man. He did not engage in vocal communication. He communicated via gestures (e.g., pointing to stimuli and nodding his head in response to questions) and by making physical selections (i.e., selecting items within an array). Carla was a 20-year-old woman. She vocally communicated using full sentences. She initiated conversations and answering questions. Carl was a 19-year-old man. He vocally communicated using single words and short phrases.

The study was approved by the Western Michigan University Human Subjects Institutional Review Board (see Appendix A) and was conducted in accordance with the Helsinki Declaration of 1975. Informed consents (see Appendix B, C) and Assent (see Appendix D) were obtained for all participants.

Table 1
*Participant Characteristics for Study 1*

<table>
<thead>
<tr>
<th></th>
<th>Age (years)</th>
<th>Sex</th>
<th>Diagnosis</th>
<th>Racial/Ethnic Identity</th>
<th>Language</th>
</tr>
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<tbody>
<tr>
<td>Charles</td>
<td>18</td>
<td>Male</td>
<td>Autism</td>
<td>African American</td>
<td>No vocal language</td>
</tr>
<tr>
<td>Carl</td>
<td>19</td>
<td>Male</td>
<td>Autism</td>
<td>Caucasian</td>
<td>Single word, short phrases</td>
</tr>
<tr>
<td>Carla</td>
<td>20</td>
<td>Female</td>
<td>Autism</td>
<td>Caucasian</td>
<td>Full sentences</td>
</tr>
<tr>
<td>Marcus</td>
<td>23</td>
<td>Male</td>
<td>Autism</td>
<td>African American</td>
<td>Single word, short phrases</td>
</tr>
<tr>
<td>Andy</td>
<td>25</td>
<td>Male</td>
<td>Autism</td>
<td>Caucasian</td>
<td>Full sentences</td>
</tr>
</tbody>
</table>

**Setting**

The sessions were completed at the participants’ school. The sessions were conducted in a private room that was designed for occupational therapy. The room was equipped with two
adult-size chairs and a table. The participant sat adjacent to the researcher (a second-year doctoral student). A second data collector (Board Certified Behavior Analyst [BCBA] or undergraduate psychology student) sat or stood behind the participant and researcher.

**Materials**

The materials used for the study were a Fintie (Dublin, OH) iPad stand and an iPad. The iPad stand was used to support the iPad—in landscape position—and thus did not require the participants to hold the device. The iPad was used to conduct the web-based assessments (i.e., brief MSWO and MSWO) and web-based reinforcer assessments (i.e., SOA). The dimensions of the web-based programs are described below.

**MSWO Program**

The program dimensions were the same as those reported in Curiel et al.’s (2018) study. The functions of this program phase were to display and play video options following specific duration parameters. The program had a preference display screen and video play screen (see Figure 1a and 1b, respectively).

The preference display screen displayed five video options at the beginning of each session (see Figure 1a). The video options were displayed via still images. The video options were arranged in two rows. Three video options were arranged in the top row and the remaining were arranged in the bottom row. The dimensions of each video option were 3.81 × 2.84 cm. The video options on the top row were separated by 1.91 cm. The video options on the bottom row were separated by 3.81 cm. The top row and the bottom row were separated by 0.64 cm.

The video play screen played the videos as they were selected. The program only allowed one selection to be made at a time, therefore, when a selection was made, one video played at a time. The video play screen was 13.97 × 7.62 cm.
The program automatically transitioned between the preference display screen and the video display screen. When a video option was selected on the preference display screen, the program automatically displayed the video on the video display screen for preprogramed durations. When the play time duration was met, the program automatically switched to the preference display screen. The preprogrammed durations are discussed in the procedure section.

**SOA Program**

The function of this program phase was to play the video options for preprogrammed durations. This program had an SOA display screen and an SOA video play screen (see Figure 1c and 1d, respectively). The SOA display screen depicted a $4.45 \times 3.81$ cm play button. The SOA video play screen played the target video option being assessed. The dimensions of the video play screen were $13.97 \times 7.62$ cm.

The program automatically transitioned between the SOA display screen and the SOA video play screen. Depending on the assessment phase, the researcher had the capabilities of programming a specified response requirement that would allow the program to display the SOA video play screen when the requirement was met. The preprogrammed response requirements and video play durations are discussed in the procedure section.
Figure 1. The Web-Based Program Displays. (a) MSWO preference display screen, (b) MSWO video play screen, (c) SOA display screen, (d) SOA video play screen, (e) MSWO analytic display screen, and (f) SOA analytic display screen.
Procedure

Selection of Videos

In order to narrow the selection of stimuli to assess, the researchers conducted open-ended interviews (see Appendix E) with each participant. The participants were asked to identify their favorite movies, music videos, television shows, cartoons, and YouTube videos. The participants had the option of vocally reporting or typing their video selections on a computer keyboard. The classroom teacher assisted three of five participants (Charles, Carl, and Marcus) in identifying their preferred videos or video themes (e.g., cartoon series, television series), due to the participants’ limited vocal language repertoires and rapport with the researchers. The participants were asked to report at least five videos or video themes. When five selections were made, each video or video theme was searched on YouTube and the participants were allowed to select a specific episode. For example, if a participant reported liking *SpongeBob SquarePants*, this video theme was searched on YouTube, and the participant was allowed to select a specific episode. This procedure was repeated for each video and video theme until five videos were selected per participant.

MSWO

When the target video stimuli were identified, the web-based preference assessment procedure was introduced. The web-based procedure employed in this study was the same procedure developed and described by Curiel et al. (2018) and followed a methodology similar to DeLeon and Iwata’s (1996) initial MSWO demonstration.

Each participant completed the assessment individually. Each session began with a sampling phase, in which the researcher randomly selected a video from the preference display screen. When a selection was made, the video played in the video play screen for 30 s. When the
duration criterion was met, the program automatically transitioned to the preference display screen and displayed the four unselected video options. This procedure was repeated until all the video options were sampled.

Following the sampling phase, each participant was allowed to select the sequence in which the videos were presented. The researcher provided an instruction (i.e., “Which one do you want to watch.”), while the MSWO preference display screen was presented. The participant was then allowed to make a selection. The participant made a selection by touching a video image with his/her finger. The video automatically played for 30 s on the video play screen. When the 30 s elapsed, the screen automatically transitioned to the preference display screen; at that point, only the unselected video options were displayed. This procedure was repeated until all the video options were selected or until the session was terminated. Data were collected on the MSWO data sheets (see Appendix F).

The sessions were terminated if the participant engaged in the following behaviors: (a) vocally stated that he/she was done, (b) touched researcher’s arm or hand and indicated that he/she was done, (c) turned the iPad towards the researcher and indicated that he/she was done, (d) pressed a button on the iPad (i.e., home button, power button) or screen (i.e., Uniform Resources Locator [URL] pane) that exited or stopped the program, or (e) left the work area. For options b and c, if the participant touched or turned the iPad towards the researcher, the researcher provided a question (i.e., “Are you done?”), if the participant nodded his/her head or repeated the word “done,” the session was terminated. For option e, the session was terminated if the participant moved away from the work area, in excess of 9.8 m. Additionally, when the participant was allowed to make selections, the researcher would repeat the instruction a maximum of three times if a selection was not made within 5 s. If the instruction was repeated
three times and the participant did not make a selection, the session was terminated. This, however, did not occur.

**SOA Reinforcer Assessment**

The SOA consisted of two distinct phases: baseline and contingent. The purpose of the baseline phase was to assess the number of responses (i.e., play button) with no programmed consequences. The purpose of the contingent phase was to assess the number of responses to the same stimulus when videos were presented following the target responses.

During the baseline sessions, the participant was provided with a model of button pressing and then allowed to engage in the behavior. The researcher presented the participant with the SOA display screen, provided the statement (i.e., “I’m going to press the button.”), and pressed the play button two times. No display changes occurred in response to the button presses. The researcher then provided the instruction, “You can press the button as many times as you want or tell me when you are done.” The participant was then provided with the opportunity to press the button as many times as he/she wanted. Data were collected on the SOA baseline data sheet (see Appendix G). No display changes occurred in response to the button presses.

The maximum duration of each baseline session was 13 min; however, the total duration per session was dependent on the participant’s responses. This phase incorporated the same termination criteria as the MSWO phase. Additionally, the sessions also had a timeout period of 1 min. That is, if one minute elapsed without any responses made to the play button, the program automatically terminated the session.

The contingent sessions differed from the baseline sessions in that a video played after the predetermined criteria were met. Each session began when the researcher presented the participant with the SOA display screen and provided the statement “I’m going to press the
button,” and pressed the play button two times. When two responses were made, the program automatically transitioned to the SOA play screen and played the video for 10 s. When the duration criterion was met, the program automatically transitioned to the SOA display screen. The researcher provided the instruction, “You can press the button as many times as you want or tell me when you are done.” The sessions were the same duration and followed the same termination parameters as those described for the baseline sessions. Data were collected on the SOA data sheet (see Appendix H). This phase implemented a progressive-ratio (PR) schedule of reinforcement. A reduced sequence of responses preceded the PR 10 schedule of reinforcement. The initial four responses were: 2, 2, 2, and 5. After the fourth requirement was met (i.e., 5 responses), the PR 10 was initiated (i.e., 10, 20, 30). The response requirement increased by 10 responses after each criterion was met.

**Interobserver Agreement**

Interobserver agreement (IOA) measures were calculated for all phases of the study: brief MSWO or MSWO, SOA baseline, and SOA contingent. The purpose of the IOA measures was to calculate the agreement of the data that were collected between the researcher and a second data collector (see Cooper et al., 2007). During the MSWO sessions, the researcher and second data collector independently recorded the participant’s video selections as they occurred. During the SOA baseline and SOA contingent phases, the total number of responses for Marcus and Andy were counted and recorded by the researcher and the second data collector. After Marcus and Andy completed all phases of the study, an automated data function was added to the program. The automated data function recorded all responses per session and displayed them in the analytic display screen. Therefore, the researcher and second data collector independently recorded the total number of responses produced by the program at the end of each session.
Trial-by-trial IOA measures for the MSWO phases were collected and analyzed for 11 sessions across (58%) all participants. The number of agreements per video selection were divided by the total number of selections and multiplied by 100. The mean trial-by-trial IOA was 100%. Total count IOA measures for the SOA baseline phases were analyzed for 11 (65%) sessions across all participants. The lower count of responses was divided by the larger count of responses and multiplied by 100. The mean total count IOA was 97% (range, 86–100%). Total count IOA measures for the SOA contingent phases were analyzed for 19 (76%) sessions across all participants. The mean total count IOA was 99% (range, 97–100%).

**Procedural Integrity**

Procedural integrity (PI) measures were calculated for all phases of the study. The purpose of the PI measures was to calculate the percentage of steps completed correctly by the researcher (see Cooper et al., 2007). The second data collector independently recorded whether each step in the protocol was presented as outlined. The brief MSWO and MSWO consisted of 20 steps. The SOA baseline and SOA contingent phases consisted of four and five steps, respectively. PI measures were calculated as the number of steps completed according to the protocol divided by the total number of steps and multiplied by 100.

PI for the brief MSWO and MSWO phases were analyzed for 11 (61%) sessions across all participants. The mean PI was 99% (95–100%). PI for the SOA baseline phases were analyzed for 11 (65%) sessions across all participants. The mean PI was 100%. PI for the SOA contingent phases were analyzed for 18 (72%) sessions across all participants. The mean PI was 100%.
Experimental Design

The SOA was evaluated using an alternating treatment design with an initial baseline phase (Cooper et al., 2007; Roane, Lerman, & Vondran, 2001). The initial baseline measures allowed the researchers to assess the overall responding to the target stimulus (i.e., play button) before the contingent phase was in effect. The baseline phase was in effect until the participant’s responding demonstrated a steady state. The contingent phases allowed the researchers to assess the effects of each video; the video stimuli were alternated across sessions.

Results

Four of the five participants (Marcus, Andy, Carla, and Charles) demonstrated differentiated preference hierarchies during the web-based MSWO procedure. The dependent variable was the percentage of selection per video. The total percentage of selections per video was calculated by obtaining the number of times each video was selected and then divided by the total number of trials the video was available (see DeLeon & Iwata, 1996). That is, the first, second, third, fourth, and fifth video selections received a percentage value of 100%, 50%, 33%, 25%, and 20%, respectively, per session. The percentages per session were then averaged across the total number of stimulus presentations conducted (e.g., three or five stimulus presentations).

Following the web-based MSWO procedure, the participants completed the SOA reinforcer assessment. The responses that occurred during the SOA baseline and SOA contingent phases were reported as total number of responses per session. Overall, the participants responded at higher levels to access the HP video options. The participants’ results are displayed in Figure 2.
Marcus

Marcus was accompanied by his classroom teacher during the open-ended interview. The teacher provided the researchers with information regarding videos and video themes that Marcus had shown an interest in. The stimulus array was narrowed to the following video stimuli: Need for Speed, Dragon Ball Z, Jodeci, Rush Hour, and Blackstreet. The video selections varied in category. That is, Need for Speed was a video that depicted a racing video game. Dragon Ball Z was a cartoon series. Rush Hour was a movie. Jodeci and Blackstreet were music videos.

Marcus completed a full web-based MSWO, which consisted of five stimulus assessment presentations. He selected the video options in the following order: Need for Speed, Dragon Ball Z, Jodeci, Rush Hour, and Blackstreet. The percentage of selections per video option was 100%, 50%, 33%, 25%, and 20%, respectively. The web-based SOA was implemented following the web-based MSWO. During the baseline phase, Marcus completed a total of three sessions. His total number of responses across sessions were 25, 14, and 2. The SOA contingent phase was introduced during the fourth session. The LP and HP videos were assessed in an alternating manner; one video option was assessed per session. The total number of responses across sessions for the LP video were 65, 779, and 1,234. The total number of responses across sessions for the HP video were 588, 1,278, and 1,352. The break points for the LP video were 30, 120, and 150. The break points for the HP video were 100, 150, and 150.

Andy

Andy communicated in full sentences and independently completed the interview. He vocally reported the videos that he liked. The videos that were selected for the assessment Curious George, Madeline, Frank Sinatra, The Huggabug Club, and J. Geils Band. Curious
George, Madeline, and The Huggabug Club were television series. Frank Sinatra and J. Geils Band were music videos.

Andy completed a brief web-based MSWO. The brief procedure only required three stimulus assessment presentations. His preferences, in descending order, were: Curious George, Madeline, Frank Sinatra, The Huggabug Club, and J. Geils Band. The percentage of selection per video option was 83%, 61%, 30%, 29%, and 25%, respectively. He completed three baseline sessions during the web-based SOA. The total number of responses across sessions were 5, 9, and 8. During the SOA contingent phase, the total number of responses across sessions for the LP video were 108, 19, and 44. The total number of responses across sessions for the HP video were 101, 106, and 289. The break points for the LP video were 30, 10, and 20. The break points for the HP video were 30, 30, and 70.

Charles

Charles was accompanied by his classroom teacher during the interview. Charles did not engage in vocal responses, so his teacher provided information regarding videos and themes that Charles had shown an interest in. The stimulus arrays that Charles selected were the following: SpongeBob SquarePants, Looney Tunes, Spider-Man, Cars, and Space Jam. SpongeBob SquarePants and Looney Tunes were cartoon series. Spider-Man, Cars, and Space Jam were movies.

Charles completed a brief web-based MSWO, requiring three stimulus-presentations. From HP to LP videos, he selected SpongeBob SquarePants, Looney Tunes, Spider-Man, Cars, and Space Jam. The average percentage of selection across sessions per video were 75%, 50%, 44%, 39%, and 20%, respectively. Following the preference assessment, Charles completed the web-based SOA reinforcer assessment. He completed five baseline sessions. The total number of
responses across sessions were 1, 198, 11, 0, and 0. During the SOA contingent phase, the total number of responses across sessions for the LP video were 356, 671, and 833. The total number of responses across sessions for the HP video were 677, 910, and 957. The break points across sessions for the LP video were 70, 110, and 120. The break points across sessions for the HP video were 100, 120, and 130.

**Carla**

Carla vocally communicated in full sentences; she independently completed the interview. The stimulus array that she selected were the following: *Blue’s Clues*, *SpongeBob SquarePants*, *Marmaduke*, *Secretariat*, and buses. *Blue’s Clues* and *SpongeBob SquarePants* were television series. *Marmaduke* and *Secretariat* were movies. The last selection, buses, depicted home footage of buses.

Carla completed a brief web-based MSWO. From highest to lowest-preferred videos, she selected *Blue’s Clues*, *SpongeBob SquarePants*, *Marmaduke*, *Secretariat*, and buses. The average percentage of selection across sessions per video were 73%, 55%, 46%, 28%, and 26%, respectively. She subsequently completed the web-based SOA reinforcer assessment. She completed six baseline sessions. The total number of responses across sessions were 0, 7, 18, 29, 8, and 6. For the web-based SOA reinforcer assessment, she completed a total seven sessions. The total number of responses across sessions for the LP video were 9, 4, and 9. The total number of responses across sessions for the HP video were 369, 258, 219, and 277. The total break points across sessions for the LP video were 5, 2, 5. The total break points across sessions for the HP video were 80, 60, 60, and 60.
Carl was accompanied by his classroom teacher during the open-ended interview. The teacher provided Carl with assistance in identifying video stimuli. Carl selected the following stimulus array: Katy Perry, Adele, Vanilla Ice, *Full House*, and *Diary of a Wimpy Kid*. Katy Perry, Adele, and Vanilla Ice were music videos. *Full House* and *Diary of a Wimpy Kid* were television series. Carl completed four stimulus-presentation sessions during the web-based MSWO. It was observed that Carl had a apposition preference. He selected videos that appeared on the top right corner. Due to the bias selections, Carl did not complete the remaining preference assessment sessions or the web-based SOA reinforcer assessment.
Figure 2. MSWO and SOA. Left panel: The percentage of trials on which videos were selected for the web-based MSWO, where the HP indicate high-preferred and LP indicate low-preferred (LP). Right panel: The number of responses in the single-operant arrangement (SOA), where BL indicate baseline, HP indicate high-preferred, and LP indicate low-preferred.
**Discussion**

The web-based MSWO was effective and efficient in determining preference hierarchies in four of the five participants. The results were similar to those reported by Curiel et al. (2018). Three participants (Andy, Charles, and Carla) demonstrated clear preference hierarchies with three stimulus-presentations. Marcus demonstrated such a hierarchy following five stimulus-presentations. The assessment, however, was not effective in identifying the preferences of one participant, due to a persistent side preference. Following the identification of the preferred videos, SOAs with programmed PR 10 schedules of reinforcement were implemented to further assess if, and to what degree, the HP and LP videos would maintain target responses (i.e., button presses) across sessions. The HP videos maintained a higher number of responses, as compared to the LP videos during the contingent phases. Interestingly, but not unusual for SOAs, two participants (Marcus and Charles) engaged in high levels of responding to access the LP videos. The highest number of responses for the LP videos did not exceed the highest number of responses for the HP videos; both videos functioned as reinforcers and their effectiveness appeared to be similar. These findings provide valuable information but should be interpreted with caution.

One potential limitation was that the program did include a randomization feature in which the placements of the still images were randomized after each selection; however, this feature may not be sufficient in addressing position preference selections. For example, Carl selected video options that appeared in one location irrespective of the video options displayed. Future research should investigate modifications to address such biases; this may be achieved via interactive program modifications.
In terms of the reinforcer assessments, SOAs have been used to assess the absolute reinforcing function of stimuli (see Roscoe et al., 1999). That is, it provides information related to the total number of responses that occur within a session, when one consequence is made available. This arrangement then allows the comparison of responses across stimuli and sessions. Although the findings in this study, and others that have employed SOAs, provide valuable information, another commonly used arrangement used to assess choice responding is the COA (see Fisher & Mazur, 1997; Fisher et al. 1992; Glover et al., 2008). Thus, COAs should be implemented to assess the relative reinforcing functions of stimuli identified via web-based MSWOs. That was the purpose of Study 2.
STUDY 2: WEB-BASED STIMULUS PREFERENCE ASSESSMENT AND CONCURRENT-OPERANTS REINFORCER ASSESSMENT FOR VIDEOS

Method

Participants

A total of five participants were recruited for the study. The inclusion criteria were similar to the previous study, with the exception of including children. All participants were recruited from public schools in the Midwestern United States. Louie, Eric, and Rene, all four-year-old boys diagnosed with autism, attended a preschool for children with early childhood developmental delays. Each of them reliably echoed two-word statements, answered simple questions (e.g., “What is your name?” “How old are you?”), and further communicated with icon-exchange systems.

Jon and Joel attended a postsecondary transitional program. Both participants had a diagnosis of autism. Jon was a 20-year-old with man with limited vocal language. Jon did not engage in any vocal initiations or responses throughout the course of the study. When he was asked a question, he responded by nodding his head. Joel was a 26-year-old man who spoke in full sentences. The participants’ characteristics are displayed in Table 2.
Table 2  
*Participant Characteristics for Study 2*

<table>
<thead>
<tr>
<th></th>
<th>Age (years)</th>
<th>Sex</th>
<th>Diagnosis</th>
<th>Racial/Ethnic Identity</th>
<th>Language</th>
</tr>
</thead>
<tbody>
<tr>
<td>Louie</td>
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<td>Male</td>
<td>Autism</td>
<td>Caucasian</td>
<td>Two-word phrases, responded to simple questions</td>
</tr>
<tr>
<td>Eric</td>
<td>4</td>
<td>Male</td>
<td>Autism</td>
<td>Caucasian</td>
<td>Two-word phrases, responded to simple questions</td>
</tr>
<tr>
<td>Rene</td>
<td>4</td>
<td>Male</td>
<td>Autism</td>
<td>Caucasian</td>
<td>Two-word phrases, responded to simple questions</td>
</tr>
<tr>
<td>Jon</td>
<td>20</td>
<td>Male</td>
<td>Autism</td>
<td>Caucasian/African American</td>
<td>No vocal language</td>
</tr>
<tr>
<td>Joel</td>
<td>26</td>
<td>Male</td>
<td>Autism</td>
<td>Caucasian</td>
<td>Full sentences</td>
</tr>
</tbody>
</table>

The study was approved by the Western Michigan University Human Subjects Institutional Review Board (see Appendix A) and was conducted in accordance with the Helsinki Declaration of 1975. Informed consents (see Appendix B, C) and Assent (see Appendix D) were obtained for all participants.

**Settings**

Louie, Eric, and Rene’s sessions were conducted in an enclosed hallway near their classrooms. A small table was placed against the hallway wall; the participant, researcher (a third-year behavior analysis doctoral student who was a BCBA), and data collector (also an advanced behavior analysis graduate student who was a BCBA) sat in child-size chairs oriented towards the wall. The participant sat between the data collector and the researcher, facing the table. The data collector sat slightly behind the participant and did not interact with the participant during the sessions.
Sessions for Jon were conducted in a hallway outside his classroom. It contained an adult-size table and three chairs. Sessions for Joel were conducted in a common area, outside of his classroom, equipped with two adult-size tables and three chairs. The seating arrangements for Jon and Joel were similar to those of the other participants. Sessions for Louie, Eric, and Rene were conducted once per day. Joel and Jon completed two sessions per day.

Materials

The materials used in this study were the same as those used in the previous study.

MSWO Program

The web-based MSWO program was the same as Curiel et al. (2018). The MSWO preference display screen and MSWO video play screen are depicted in Figure 3 a, b, respectively. For a full description of the program dimensions, see the MSWO program section of the previous study.

COA Program

The COA program arranged a COA preference display screen (see Figure 3 c) and a COA video play screen (see Figure 3 d). The COA preference display screen simultaneously displayed three 5.71 × 4.44 cm still video images. Two videos images were displayed on the top row and one on the bottom row. The spacing between the images on the top and bottom row was 2.54 cm. The spacing between the two images on the top row was 0.63 cm.

During initial exposure to the COA program, the location of particular images (stills and videos) was fixed. Subsequently, when the COA-Randomized (COA-R) program was in effect, locations were randomized across trials. The COA-R program arranged screens that had the same dimensions and functions as those of the COA program. After a video was selected and played, the location of the three video images was randomized. For example, the video on the top left
position might shift to the top right or bottom position, or remain where it was, with equal probability.

Figure 3. The Web-Based Program Displays. (a) MSWO preference display screen, (b) MSWO video play screen, (c) COA preference display screen, and (d) COA video play screen.

Procedure

Selection of Videos

The selection of videos followed the same procedure as the previous study.

MSWO

The web-based MSWO followed the same procedure as Curiel et al. (2018) and those as the previous study, with the exception of the instructions. One of two instructions (i.e., “Which
one do you want to watch.” or “Pick the one you want.”) were provided. Jon and Joel were provided the first instruction; Louie, Eric, and Rene were provided the second.

**COA Reinforcer Assessment**

The purpose of the web-based COA reinforcer assessment was to assess the reinforcing functions of the HP and LP videos identified via the web-based MSWO. As in prior studies, a control video also was available to give participants the opportunity to emit a response with no prior consequence (see Brodhead et al., 2016; Karsten, Carr, & Lepper, 2011; Piazza et al., 1996). The control video displayed a black screen when it was selected. The COA preference display screen displayed the HP, LP, and control videos on the top left, top right, and bottom center positions of the screen, respectively.

The COA reinforcer assessment sessions began with the COA preference display screen and the instruction (i.e., “Which one do you want to watch.” or “Pick the one you want.”). When a response was made to one of the options, the corresponding video played in the COA video play screen for 10 s. When the 10 s elapsed, the COA video play screen transitioned to the COA preference display screen. The participant then had the opportunity to emit a response that accessed any of the video options. The termination criteria and session duration were equivalent to those of the MSWO phase. Data were collected on the COA data sheets (see Appendix I).

At the start of each session, the verbal instruction was presented prior to the first response. Thereafter, the instruction was only re-presented if the participant did not emit a response within 5 s of the COA preference display screen being displayed. The instruction was re-presented a maximum of three times per video selection opportunity. A selection, however, was always made within the three repetitions of the instruction. The instructions were repeated a total of 8, 1, 2, and 2 times for Eric, Rene, Jon, and Joel, respectively.
**COA-R**

The COA-R phase was comparable to the COA phase, with the exception of one function. After a selection was made, the positions of video icons were randomized. This phase was implemented with Rene, Joel, and Jon, who appeared to simply alternate between touching the top right and top left panels.

**Progressive-Ratio**

The HP and LP stimuli did not generate clearly different levels of responding for Jon and Joel during either the COA or COA-R phase. Prior studies have shown that stimuli that generate similar rates of responding when response requirements are low often generate dissimilar rates when response requirements are increased, with HP stimuli engendering higher rates than LP stimuli (e.g., Bernstein & Sturmey, 2008; DeLeon et al., 1997; Mace, McCurdy, & Quigley, 1990). To determine whether this would occur under the conditions of the present study, for three consecutive sessions Joel and Jon were exposed to a PR 10 schedule (see Hodos, 1961). Independent schedules were arranged for each video option. Each PR 10 schedule began with two ratio requirements of five responses, after which the ratio increased by ten when the video ended (i.e., PR 5, 5, 10, 20). After a selection was made, the positions of video icons were randomized. The termination criteria and session duration were the same as in previous phases. For each session, the total number of responses that produced each of the three videos and the largest ratio completed to produce each video were recorded.

**Interobserver Agreement**

IOA was collected for 12 (71%) of the MSWO sessions across the participants. A trial-by-trial IOA measure was calculated in order to assess the correspondence in which the videos were selected. The number of agreements were divided by the total number of selections and
multiplied by 100 to yield a percentage. The trial-by-trial IOA was 100%. IOA was collected for 18 (90%) of the COA and COA-R sessions across the participants. Total count IOA was calculated per video. The smaller total count was divided by the larger total count and multiplied by 100 to yield a percentage. The mean IOA for the LP video was 99% (range, 89–100%). The mean IOA for the HP video was 99% (range, 88–100%). The mean for the Control video was 97% (range, 50–100%). IOA was collected for 1 (17%) PR session. Due to the high rate of responding, the data collectors recorded the output (i.e., total number of responses) provided by the program at the end of each session. The data collectors independently recorded the program’s output and correspondence was calculated for correspondence. The mean IOA for the LP, HP, and Control video was 100%.

**Procedural Integrity**

Procedural integrity (PI) was determined for 12 (71%) of the MSWO sessions across the participants. A second independent data collector collected data on the number of steps the primary implementer completed as outlined in the protocol. The number of correct steps were divided by the total number of steps (i.e., 20) and multiplied by 100. Overall, it was 99.5% (range across sessions 94–100%). PI for COA, COA-R, and PR schedule phases was assessed by having the observer record whether the researcher correctly provided the initial instruction that started the session and terminated the sessions in accordance with the specified criteria. PI was collected for 17 (65%) COA, COA-R, and PR sessions across the participants. It was 100% in all cases.

**Results**

The five participants demonstrated differentiated preferences during the web-based MSWO phase. Four of the five participants (Louie, Eric, Rene, and Joel) demonstrated a robust
differentiation after three stimulus-presentations, brief MSWO, while Jon required five stimulus-presentations, full MSWO. Preference assessment, COA, and COA-R data for all participants are presented in Figure 1. Percentage values reported for the preference assessment data were calculated as described by DeLeon and Iwata (1996) and sum to more than 100% because stimuli were presented without replacement. Hence, multiple comparisons, with different stimuli (i.e., 5 on the first trial, 4 of them on the second trial, 3 of them on the third etc.) were conducted and percentages reflect all comparisons that involved the designated video. The participants’ results are displayed in Figure 4.

During the COA phase, Louie and Eric responded more often to access their HP videos than to access their LP and control videos. Rene, Joel, and Jon did not demonstrate such differentiated responding, and emitted a similar number of responses to access their HP and LP videos. These participants typically alternated their responses between the HP and LP video options throughout the sessions. Therefore, the COA-R phase was implemented. This phase randomized the video images after each video was selected and played. Rene demonstrated a differentiated preference for the HP video after completing this phase. Joel and Jon continued to engage in a switching-response.
Figure 4. MSWO and COA. Column graphs: The percentage of trials on which videos were selected for the web-based MSWO. Line graphs: The number of responses for the concurrent-operants arrangement (COA) FR 1 schedules, where COA-R indicate the randomized phase, HP indicate high-preferred, LP indicate low-preferred, and C indicate control.

To further assess the effects of response requirements on selection, a symmetrical COA PR 10 was implemented with Joel and Jon. Both participants regularly responded to produce both the LP video and HP video under this arrangement, and there was no compelling evidence
that either video was a more effective reinforcer. Relevant data for these participants are depicted in Figure 5.

**Figure 5.** COA and PR. The total number of responses during the concurrent-operants arrangement PR 10 schedules, where HP indicate high-preferred, LP indicate low-preferred, and C indicate control.

**Louie**

*Old McDonald, Wheels on the Bus, Five Monkeys, Sailor to Sea, and Five Ducks* were the videos assessed for preference. After the brief MSWO, the percentage of selections were 83%, 55%, 42%, 26%, and 22%, respectively. Across three COA sessions, Louie emitted 8, 24, and 18 responses that produced access to the HP video and 4, 1, and 3 responses that accessed the LP video. He allocated 1, 0, and 3 responses to the control video. There was a clear differentiation in responding. That is, the HP video functioned as a reinforcer for button pressing. The first COA session had an overall lower number of responses because the participant pressed the URL pane, resulting in the termination of the session after the thirteenth response.

**Eric**

*Thomas & Friends, Thomas & Friends* toy video, *Learn Letters, Shark* toy video, and *Baby Shark* were the videos assessed for preference. Eric had a pronounced preference hierarchy, in which he responded in the same order across the three stimulus-presentations. His percentage
of selections were 100%, 50%, 33%, 25%, and 20%, for the videos listed above, respectively. Eric completed a total of four COA sessions, in which he emitted 2, 22, 33, and 32 responses that accessed the HP video. The number of responses that accessed the LP video were 0, 2, 0, and 0, while the control video resulted in 0, 3, 0, and 0 responses across sessions. The HP video identified in the web-based MSWO functioned as a reinforcer for button pressing during the COA phase. The first COA session had an overall lower number of responses because the participant requested to terminate the session (i.e., “All done”) after the second response.

**Rene**

*Thomas & Friends, Puppy Pals, PJ Masks, Five Ducks, and Moana* were the videos assessed for preference. The percentages of selection across these respective videos were 83%, 61%, 39%, 25%, and 20%. Rene had three COA sessions. He engaged in 13, 15, and 16 responses that accessed the HP video. Similarly, however, he engaged in 13, 14, and 14 responses that accessed the LP video. The control video received 2, 0, and 0 responses across sessions. Rene regularly switched between responding that produced the HP video and responding that produced the LP videos across all the COA sessions. During the COA-R phase, Rene allocated more responses (22, 28, and 17 across sessions) that accessed the HP video than responses that accessed the LP video (9, 2, and 3 responses). The control video received 0, 1, and 1 responses across sessions. The HP video functioned as a reinforcer for button pressing.

**Joel**

*The Avengers, Transformers, Spider-Man, Teen Titans, and The Lion King* were assessed for preference. The percentages of selections across these respective videos were 83%, 47%, 44%, 28%, and 26%. Joel had three COA sessions. He emitted 16, 8, and 17 responses that accessed the HP video and 16, 8, and 17 responses that accessed the LP video. Across sessions,
he made 2, 7, and 0 responses that accessed the control video. Joel regularly switched between the two schedules during the COA sessions. As with Rene, a COA-R phase was implemented. During this condition Joel emitted 17 responses that accessed the HP video and the same number that accessed the LP video. Switching continued during this phase.

During the three sessions in which the COA PR was in effect, Joel emitted 370, 370, and 454 responses that accessed the HP video and 460, 460, and 370 responses that accessed the LP video. No responses were made that accessed the control video. The largest ratios completed to assess the HP video were 80, 80, and 80. For the LP video, they were 90, 90, and 80 (see Figure 5). Although there were differences in the number of responses that produced the HP and LP videos, the switching-response occurred throughout all the sessions; therefore, the higher number of responses that were allocated to the LP video were due to timing and the video option that received the last sequence of responses.

Jon

After three stimulus presentations during the MSWO assessment, Jon did not show a clear differentiation between the video options, therefore, two additional stimulus-presentations were implemented. *Ice Age, Looney Tunes, Harry Potter, Teen Titans,* and *Pokémon* were assessed for preference. The percentages of selections for these videos were 64%, 60%, 48%, 32%, and 24%, respectively. Jon had three COA sessions. He emitted 12, 14, and 15 responses that accessed the HP video and 9, 14, and 14 responses that accessed the LP video. The control video received 7, 1, and 0 responses across sessions. Jon also often switched between video options during the COA phase. As with Rene and Joel, a COA-R phase was implemented for him. During the COA-R, Jon continued to switch often between alternatives. He made 15 and 14
responses to the HP and LP video, respectively, under this condition. Two responses were
directed to the control video.

During the three sessions in which the COA PR was in effect, Jon emitted 220, 220, and
271 responses that accessed the HP video and 160, 160, and 220 responses that accessed the LP
video. The control video did not receive any responses. The largest ratios completed for the HP
were 60, 60, and 60. For the LP they were 50, 50, and 50 (see Figure 2). Regular switching
between alternatives occurred throughout all sessions.

Discussion

The current study used the same web-based assessment program and procedures as Curiel
et al. (2018). The participants in the present study, like those in Study 1, demonstrated distinct
preference hierarchies. Brief MSWOs were sufficient to produce clear preference hierarchies for
four of the five participants in the present study, suggesting that the web-based procedure was
efficient as well as effective. A full MWSO, however, was required to clearly determine the HP
video for one participant. Three specific aspects of the present study are considered in this
section; general issues relevant to the overall research project, including limitations and
directions for future research, are considered in the General Discussion

Although they are rarely construed in this way, stimulus preference procedures can in and
of themselves be viewed as one index of reinforcing effectiveness, with any stimulus that
maintains choice responding viewed as a reinforcer and the stimulus that maintains the most
choice responding viewed as the most effective reinforcer. Often, however, researchers use other
procedures to compare the reinforcing effectiveness of various stimuli. COA with equivalent
schedules of reinforcement arranged for the stimuli of interest is one such measure, and under
such procedures HP stimuli often, but not always, engender more responding than LP stimuli
(see DeLeon, Graff, Frank-Crawford, Rooker, & Bullock, 2014). Three of the five participants in the present study responded more to access their HP videos than to access their LP videos when a dense (i.e., FR 1 FR 1) concurrent schedule was in effect, which is consistent with the notion that HP stimuli are more effective reinforcers than LP stimuli. But two participants (Joel and Jon) responded at similar levels to produce their HP and LP videos under both dense (i.e., FR1 FR 1) and substantially leaner (i.e., PR 10 PR 10) concurrent schedules.

PR schedules are typically kept in effect until no responding occurs for a specified period of time (e.g., often 5 min), and the largest ratio completed, termed the breaking point, is taken as a measure of reinforcer effectiveness (Hodos, 1961; Poling, 2010; Roane, 2008). In this case, we did not continue daily sessions for a sufficient time to ascertain breaking points or increase ratios across sessions until they were evident due to limited time with the participants. Rather, we arranged relatively brief exposures to concurrent PR schedules to examine whether this procedure, which quickly increases response requirements, would lead to the kind of differential responding for HP and LP stimuli that DeLeon et al. (1997) demonstrated when ratios were increased across sessions. Although differentiation for one stimulus did not occur, further examination of the procedure may be merited.

Three of the five participants (Rene, Joel, and Jon) often switched between the HP and LP during COA sessions. In an attempt to reduce switching, the COA-R phase randomized the location of the video options after every selection. In response to this modification, Rene demonstrated a clear differentiation, with the HP video maintaining higher levels of responding than the LP video. Joel and Jon, however, continued to switch during the COA-R phase. That phase did not arrange a changeover delay (COD), in which a specified time must elapse between the last response under one schedule (e.g., the one that produced the LP video) and the first
response under the other schedule (e.g., the one that produced the HP video). CODs often, but not always, reduce switching (see Davison & McCarthy, 1988; Foster, Temple, Robertson, Nair, & Poling, 1996). It is certainly possible that arranging a COD of sufficient duration for the responding of Joel and Jon would have reduced switching and led to a selective increase in responding for their HP video. We did not evaluate this possibility because in our opinion evidence that one stimulus is a more effective reinforcer than another in a contrived situation is of limited applied significance. This point will be further addressed in the overall discussion, as it is applicable to both studies.

**General Discussion**

Overall, the web-based MSWO, SOA, and COA procedures proved to be effective in identifying video preferences and verifying the reinforcing function of the selected videos. These studies incorporated self-nominated stimuli as an initial step in the process of identifying preferences hierarchies. Of the 10 participants in both studies, three participants (Carla, Andy, and Joel) had vocal repertoires or the capability of typing preferences onto a computer keyboard. Based on the participants’ results, self-nominations embedded with the web-based MSWO were effective. Although the use of self-nominated stimuli in preference assessment is certainly appropriate, many participants (including 7 of the 10 in the present studies) are unable to specify such stimuli. For that reason, many studies have incorporated staff-nominated, caregiver-nominated, or arbitrary selected stimuli to the assessment process. Although the present studies embedded self-nominated stimuli, the nominations were not directly compared to the results of the web-based MSWOs. Thus, future research should consider including self-nominated stimuli, as deemed appropriate, and further assess the predictive validity of self-nominated stimuli by
comparing self-nominated stimuli to the outcomes of direct stimulus preference assessments, as conducted by Northup et al. (1996).

The use of technology was appropriate for the stimulus modality (i.e., videos) that was assessed in both studies. The device and the automated web-based programs were beneficial in the data collection process and in the overall presentation of the procedures. The iPad’s functions, display capabilities, and size were ideal for presenting videos. The touchscreen technology enabled the researchers to collect data on a distinct target response (i.e., button presses) that was well within the participants’ behavioral repertoires. The automated web-based programs allowed the researchers to present the stimuli (e.g., display a specified number of videos, eliminate videos upon selection, play videos for predetermined durations, and display videos after predetermined number of responses were completed) with high levels of precision. Cohen and Rozenblat (2015), Goldsmith and LeBlanc (2004), and Kahng and Iwata (1998) have addressed and outlined the advantages of incorporating technology to areas of research and practice. Based on their recommendations and our findings, future researchers are well advised to continue their efforts in using technology to address issues pertinent to our field.

The reinforcer assessments, SOA and COA, in both studies corroborated the reinforcing function of the HP videos. As an initial evaluation, this information is useful but limited. It is useful because it allowed the researchers to assess the predictive value of the web-based MSWOs. However, it did so with arbitrary responses in contrived evaluations. Given that stimulus functions of environmental events are inevitably context-dependent (Fisher & Mazur, 1997; Neef, Shade, & Miller, 1994; Tustin, 1994), it is important and highly encouraged that future research systematically assess these assessments under naturalistic conditions. Moreover, using widely available and relatively inexpensive technology to provide access to videos should
offer a valuable strategy for reinforcing a wide variety of socially significant responses in diverse populations. Many people spend a substantial amount of time interacting with cellular phones, computers, and electronic tablets, and it is clear that video (and audio) material accessed through these interactions maintains their behavior. That is, such material has a reinforcing function. This function can be very powerful, to the point that addiction to video games and other stimuli assessed via the internet is increasingly recognized as a serious and widespread problem (e.g., Van Roos, Schoenmakers, Vermulst, Van Den Eijnden, & Van De Mheen, 2011; Shaw & Black, 2008; Weinstein, 2010). We believe that behavior analysts should take full advantage of the power of such reinforcers.

Conclusion

The web-based MSWO assessment proved to have predictive value in identifying stimuli that functioned as reinforcers, as was verified with web-based SOAs and COAs. That is, the HP videos always maintained substantial responding and often maintained highest levels of responding than LP videos. Each of the three assessments used in the present studies, MSWO, SOAs, and COAs, were delivered in an accurate, effective, and efficient manner via the integration of technology. Behavior analysts are highly encouraged to consider other areas in which technology may benefit consumers, whose lives may be greatly impacted by its use, and our field.
REFERENCES


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Appendix A

Human Subject Institutional Review Board Approval Letter
Date: February 14, 2017

To: Alan Poling, Principal Investigator
    Emily Curiel, Co-Principal Investigator
    Hugo Curiel, Student Investigator for dissertation
    Anita Li, Student Investigator

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 17-02-20

This letter will serve as confirmation that your research project titled “Preference Assessment of Electronic Media: Predictive Validity as Reinforcers for Individuals with Autism Spectrum Disorder and Other Developmental Disabilities” has been approved under the expedited category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study”). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: February 13, 2018
Appendix B

Informed Consent (Own Guardianship)
Western Michigan University
Department of Psychology

Principal Investigator: Alan Poling, Ph.D.
Co-Principal Investigator: Emily Curiel, Ph.D., BCBA-D
Student Investigator: Hugo Curiel, M.A., BCBA and Anita Li, M.S., BCBA
Title of Study: Preference Assessment of Electronic Media: Predictive Validity as Reinforcers for Individuals With Autism Spectrum Disorder and Other Developmental Disabilities

You have been invited to participate in a research study. The study is named Preference Assessment of Electronic Media: Predictive Validity as Reinforcers for Individuals With Autism Spectrum Disorder and Other Developmental Disabilities. This study is a project that Hugo Curiel is doing for school. This paper will explain what we are trying to achieve, how we are going to do it, how long it is going to take, and what are some good things and bad things that can happen. I will read this paper slowly. Please let me know if you do not understand or have questions about the study.

**What are we trying to find out in this study?**
We want to find out if students have preferred videos and if they will press a button to see their favorite television show, movie, music video, or YouTube video.

**Who can participate in this study?**
You can participate in the study if:
- have a diagnosis of ASD and/or other developmental disability
- are between the ages of 18 through 26 years
- you can sit or stand by a work area (i.e., table and materials that are put in front of you) for up to 20 minutes
- you can choose an item (i.e., touch or reach for a stimulus) when we give you two or more items at the same time
- you have like electronic media (i.e., movies, cartoons, music videos)
- you can touch an electronic screen (e.g., computer screen, iPad)

You cannot participate in the study if:
- you have to be reminded to sit or stand near a work area more than 10 times in 20 minutes
- you cannot make a choice (i.e., touch or reach for a stimulus) when we give you two or more things at the same time
- you do not like electronic media (i.e., movies, cartoons, music videos)
- you cannot touch an electronic screen (e.g., computer screen, iPad)
Where will this study take place?
The study will take place at YAP.

What is the time commitment for participating in this study?
The study will take up to five sessions. This means that we will meet with you up to five times. The first time we meet, it should not take more than 10 minutes. We will ask you questions about what you like to watch. The second, third, and fourth time we meet, it should not take more than 10 minutes each time. We will ask you to pick from your favorite videos. The last time we meet should not take more than 15 minutes. We will ask you to press a button to watch your favorite video.

What will you be asked to do if you choose to participate in this study?
Open-Ended Interview
We will ask you questions about how much time you spend watching television, computer, and phone, Tablet, or iPad. We will ask you to tell us at least three favorite movies, music videos, television shows, cartoons, and YouTube videos.

Preference Assessment
We will use an electronic device (e.g., iPad) to show you five video pictures and five short videos. Then, we will ask you to pick the video you want to watch first. When you pick a video picture, a short video will play. Once you pick a video, it will not be available any more. For example, after you pick the first video, you will be allowed to pick from the other four videos that have not picked. We will ask you to pick your favorite videos until you have picked all five videos.

Reinforcer Assessment
We will use the same electronic device that was used for the videos. We will show you how to press a button that will show up on the screen. We will tell you to press the button as many times as you want. Sometimes your favorite video will play after pressing the button and sometimes it will not play.

What information is being measured during the study?
During the preference assessment, we will write down the order that you picked your favorite videos. During the reinforcer assessment, we will count the number of times that you press the button on the electronic device.

What are the risks of participating in this study and how will these risks be minimized?
One bad thing that may happen is that we will ask you to give us the electronic device after you are done watching each video. To make it easier on you, we will say, “My turn,” when it is time to give the electronic device back to us. When you give it back to us, we will praise you. For example, we will say things like “Great job sharing!”
What are the benefits of participating in this study?
There are no direct benefits for participating in this study. If we find out what your favorite videos are and they help your teacher, parent, or guardian, teach you new things, we will share that information with them. They will decide how to use the information.

Are there any costs associated with participating in this study?
There are no costs associated with participating in this study. We will provide the electronic device for all sessions.

Is there any compensation for participating in this study?
There will be no compensation for participating in this study.

Who will have access to the information collected during this study?
The students and teachers that are helping with this study are the only ones that will have your information. When we are done with the study, we will write a report about what we found out. We will not use your name in this report.

What if you want to stop participating in this study?
You do not have to be in the study. You can say “no” and nothing bad will happen. If you say “yes” now, but you want to stop later, that is okay too. No one will be mad at you, or punish you if you want to stop. All you have to do is tell us you want to stop.

We can also decide to stop your participation in the study without your consent.

If you have any questions or concerns about the study, you can call Alan Poling at (269) 387-4483 or Hugo Curiel at (559) 731-7112. You may also contact the Chair, Human Subjects Institutional Review Board at (269) 387-8293 or the Vice President for Research at (269) 387-8298 if questions when the study is taking place.

This consent document has been approved for use for one year by the Human Subjects Institutional Review Board (HSIRB) as indicated by the stamped date and signature of the board chair in the upper right corner. Do not participate in this study if the stamped date is older than one year.

I have read this informed consent document. The risks and benefits have been explained to me. I agree to take part in this study.

Please Print Your Name

Participant’s signature Date
Appendix C

Informed Consent (Dependent)
Western Michigan University
Department of Psychology

Principal Investigator: Alan Poling, Ph.D.
Co-Principal Investigator: Emily Curiel, Ph.D., BCBA-D
Student Investigator: Hugo Curiel, M.A., BCBA and Anita Li, M.S., BCBA
Title of Study: Preference Assessment of Electronic Media: Predictive Validity as Reinforcers for Individuals With Autism Spectrum Disorder and Other Developmental Disabilities

Your child is invited to participate in a research project titled, Preference Assessment of Electronic Media: Predictive Validity as Reinforcers for Individuals With Autism Spectrum Disorder and Other Developmental Disabilities. This project will serve as Hugo Curiel’s dissertation for the requirements of a Doctor of Philosophy in Behavioral Analysis. This consent document will explain the purpose of this research project and will go over all of the time commitments, the procedures used in the study, and the risks and benefits of participating in this research project. Please read this consent form carefully and completely and please ask any questions if you need more clarification.

What are we trying to find out in this study?
The purpose of this study is to identify preferred videos through a procedure known as a “preference assessment.” If the preference assessment helps to identifying preferred videos, this information can be used for teaching procedures and behavioral interventions for individuals diagnosed with autism spectrum disorder (ASD) and/or other developmental disabilities.

Who can participate in this study?
The inclusion criteria are listed below:
- have a diagnosis of ASD and/or other developmental disability
- be between the ages of 18 through 26 years
- sit or stand within the confines of a designated work area (i.e., table and stimuli) for the duration of 20 minutes
- make a selection/choice (i.e., touch or reach for a stimulus) when presented with two or more items simultaneously
- have a preference or liking for electronic media (i.e., movies, cartoons, music videos)
- can physically touch an electronic screen (e.g., computer screen, iPad)

The exclusion criteria are listed below:
- requires more than 10 redirections/prompts to sit or stand within the confines of a designated work area (i.e., table and stimuli), in a 20-minute period
- does not make a selection/choice (i.e., touch or reach for a stimulus) when presented with two or more stimuli simultaneously
- does not have an interest in electronic media (i.e., movies, cartoons, music videos)
- cannot physically touch an electronic screen (e.g., computer screen, iPad)

Where will this study take place?
The study will take place at YAP.
What is the time commitment for participating in this study?
The study will require up to five sessions. The first session, open-ended interview, is not expected to last more than 10 minutes. The preference assessment will occur on the second, third, and fourth sessions. The preference assessment sessions are not expected to exceed 10 minutes. The fifth session (i.e., reinforcer assessment) is not expected to last more than 15 minutes.

What will you be asked to do if you choose to participate in this study?
Open-Ended Interview
The researcher will ask you questions regarding the amount of time you spend watching television, computer, and phone, Tablet, iPad or similar devices. The researcher will also ask you to list at least three favorite items for the following categories: movies, music videos, television shows, cartoons, and YouTube videos.

Preference Assessment
The researcher will use an electronic device (e.g., iPad) to show you five video icons/pictures and five short video clips. Then, the researcher will ask you to select/touch the video you want to watch first. When you select a video icon, a short video clip will play. Once you select a video, it will not be available as an option. For example, after you select the first video, you will be allowed to pick from the remaining four videos that have not been selected. You will be asked to select your favorite video until all five videos have been selected.

Reinforcer Assessment
The researcher will use the same electronic device that was used for the videos. The researcher will show you how to press a button that will appear on the screen. The researcher will tell you to press the button as many times as you want. Sometimes your favorite video will play after pressing the button and sometimes it will not play.

What information is being measured during the study?
During the preference assessment, the researchers will collect data on the order that you select your favorite videos. They will collect the same type of data during all three sessions. During the reinforcer assessment, they will count the number of times that you press the button on the electronic device.

What are the risks of participating in this study and how will these risks be minimized?
A potential discomfort may be transitioning the electronic device to the researcher after each video clip is done playing. In order to reduce this discomfort, the researcher will provide you with a verbal cue (i.e., “My turn”) and a gestural cue (i.e., showing you his/her open palm). This will mean that the electronic device needs to be handed to the researcher. The researcher will also provide a social praise statement (e.g., “Great job sharing!”).

What are the benefits of participating in this study?
There are no direct benefits for participating in this study.
Appendix D

Assent Form
Assent Form

Western Michigan University
Department of: Psychology
Principal Investigator: Alan Poling, Ph.D.
Co-Principal Investigator: Emily Curiel, Ph.D., BCBA-D
Student Investigator: Hugo Curiel, M.A., BCBA and Anita Li, M.S., BCBA

Project Title: Preference Assessment of Electronic Media: Predictive Validity as Reinforcers for Individuals With Autism Spectrum Disorder and Other Developmental Disabilities

We are doing a research study. A research study is a special way to find out about something. We want to find out if students have preferred videos and if they will press a button to see their favorite television show, movie, music video, or YouTube video.

We want to tell you about some things that might happen to you if you are in this study. First, we will ask you about your favorite videos. Then, we are going to let you choose and watch your favorite videos for short periods of time. That means that you will be able to watch your favorite video for 10-30 seconds at a time. We will say, “My turn,” when it is time to give it back to the adult. After we find out what your favorite videos are, we will ask you to “press a button” to watch the videos. Sometimes, the button will play a video and sometimes it might not.

If you decide to be in this study, some good things might happen to you. You will be allowed to watch some of your favorite videos. If we find out what your favorite videos are, we will tell your teacher or parents. They may be able to use the videos when you are at school or during times that you are learning new things.

When we are done with the study, we will write a report about what we found out. We will not use your name in the report.

You do not have to be in the study. You can say “no” and nothing bad will happen. If you say “yes” now, but you want to stop later, that is okay too. No one will be mad at you, or punish you if you want to stop. All you have to do is tell us you want to stop.

If you have any questions or concerns about the study, you can call Alan Poling at (269) 387-4483 or Hugo Curiel at (559) 731-7112.

The stamped date and signature of the board chair in the upper right corner means this consent document is approved for use for one year by the Human Subjects Institutional Review Board. Do not participate if the stamped date is more than one year old.

If you want to be in this study, please sign your name.

I, ________________________________, want to be in this research study.

(write your name here)

Investigator signature ____________________________ Date ____________________________
Appendix E

Interview of Preferred Videos
Open-Ended Interview: Preferred Videos

1. How much time (do you/ does the participant) spend watching television? (How much time in one day?)

2. How much time (do you/does the participant) spend on a computer? (How much time in one day?)

3. How much time (do you/does the participant) spend on a phone, tablet, iPad, or similar device? (How much time in one day?)

If possible, name at least 3 items per category.

4. What are your favorite movies?

5. What are your favorite music videos?

6. What are your favorite television shows?

7. What are your favorite cartoon videos?

8. What are your favorite YouTube videos?

From the list of movies, music videos, television shows, cartoons, and YouTube videos, which are the top five?
Appendix F

Multiple Stimulus Without Replacement Preference Assessment Data Sheet
Stimulus Preference Assessment Treatment Integrity Data Sheets

<table>
<thead>
<tr>
<th>#</th>
<th>Step</th>
<th>Step Presented</th>
<th>Notes</th>
<th>2nd Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>RA samples (video 1)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>2</td>
<td>RA samples (video 2)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>3</td>
<td>RA samples (video 3)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>4</td>
<td>RA samples (video 4)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>5</td>
<td>RA samples (video 5)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>6</td>
<td>Present screen with 5 video icons</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>7</td>
<td>“Which one do you want to watch?” (can be repeated up to 3 times)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>8</td>
<td>Selected video plays for 30 seconds</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>9</td>
<td>Present screen with 4 video icons</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>10</td>
<td>“Which one do you want to watch?” (can be repeated up to 3 times)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>11</td>
<td>Selected video plays for 30 seconds</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>12</td>
<td>Present screen with 3 video icons</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>13</td>
<td>“Which one do you want to watch?” (can be repeated up to 3 times)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>14</td>
<td>Selected video plays for 30 seconds</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>15</td>
<td>Present screen with 2 video icons</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>16</td>
<td>“Which one do you want to watch?” (can be repeated up to 3 times)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>17</td>
<td>Selected video plays for 30 seconds</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>18</td>
<td>Present screen with 1 video icons</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>19</td>
<td>“Which one do you want to watch?” (can be repeated up to 3 times)</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td>20</td>
<td>Selected video plays for 30 seconds</td>
<td>Y N</td>
<td></td>
<td>+ -</td>
</tr>
</tbody>
</table>

________(correspondence)/______(Total)=

<table>
<thead>
<tr>
<th>RA Order of Selection</th>
<th>Order of Selection</th>
<th>Video</th>
<th>Notes</th>
<th>2nd Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>+ -</td>
</tr>
<tr>
<td></td>
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<td></td>
<td>+ -</td>
</tr>
<tr>
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<td></td>
<td></td>
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<td>+ -</td>
</tr>
</tbody>
</table>

________(correspondence)/______(Total)=

68
Appendix G

Single-Operant Arrangement Baseline Data Sheet IOA/PI
Baseline Data Sheet Data Sheets

<table>
<thead>
<tr>
<th>Participant:</th>
<th>RA initials:</th>
<th>Baseline Session: 1</th>
<th>2</th>
<th>3</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>Step</td>
<td>Step Presented</td>
<td>Notes/Button Presses</td>
<td>2nd Observer</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>“I’m going to press the button”</td>
<td>Y</td>
<td>N</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>2</td>
<td>RA presses button</td>
<td>Y</td>
<td>N</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>3</td>
<td>“You can press the button as many times as you want, or tell me when you are done”</td>
<td>Y</td>
<td>N</td>
<td>+</td>
<td>-</td>
</tr>
<tr>
<td>4</td>
<td>Responses</td>
<td></td>
<td></td>
<td>Total</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>End session when appropriate</td>
<td>Y</td>
<td>N</td>
<td>Why? a b c d e</td>
<td>+</td>
</tr>
</tbody>
</table>

Tx Integrity: /4= IOA for responses: / =

Termination Criteria: a) vocally states that he/she is done, b) touches RA and responds to done prompt, c) turns screen towards RA and responds to done prompts, d) presses other buttons (e.g., home button, off button, URL pane), or e) leaves work area (exceeding 2 feet from original seated location)
Appendix H

Single-Operant Arrangement Reinforcer Assessment Data Sheet IOA/PI
<table>
<thead>
<tr>
<th>#</th>
<th>Step</th>
<th>Step Presented</th>
<th>Notes</th>
<th>2nd Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“I’m going to press the button”</td>
<td>Y</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>RA presses button 2 times</td>
<td>Y</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Video plays for 10 sec</td>
<td>Y</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>“You can press the button as many times as you want, or tell me when you are done”</td>
<td>Y</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>End session when appropriate</td>
<td>Y</td>
<td>N</td>
<td>Why? a b c d other: +</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>#</th>
<th>Step</th>
<th>Step Presented</th>
<th>Notes</th>
<th>2nd Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>“I’m going to press the button”</td>
<td>Y</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>2</td>
<td>RA presses button 2 times</td>
<td>Y</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>3</td>
<td>Video plays for 10 sec</td>
<td>Y</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>4</td>
<td>“You can press the button as many times as you want, or tell me when you are done”</td>
<td>Y</td>
<td>N</td>
<td>+</td>
</tr>
<tr>
<td>5</td>
<td>End session when appropriate</td>
<td>Y</td>
<td>N</td>
<td>Why? a b c d other: +</td>
</tr>
</tbody>
</table>

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

---

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

**Participant:** RA initials: Session: 1 2 3 4 5 6 Date: Video name: Low Preference Medium Preference High Preference

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Appendix I

Concurrent-Operants Arrangement Reinforcer Assessment Data Sheet IOA/PI
<table>
<thead>
<tr>
<th>#</th>
<th>Step</th>
<th>Presented</th>
<th>Notes</th>
<th>2nd Observer</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>LP</td>
<td>HP</td>
<td>C</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>“I’m going to press the button” <em>(Video 1)</em></td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>RA presses button 1 time</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Video plays for 10 sec</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>“I’m going to press the button” <em>(Video 2)</em></td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>RA presses button 1 time</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Video plays for 10 sec</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>“I’m going to press the button” <em>(Video 3)</em></td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>RA presses button 1 time</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Video plays for 10 sec</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
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<td>30</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>31</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td></td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>---</td>
<td>----------------------------</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>32</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>33</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>34</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>36</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>37</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>38</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>39</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>40</td>
<td>“Pick the one you want.”</td>
<td>Y</td>
<td>N</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>End session when appropriate</td>
<td>Y</td>
<td>N</td>
<td>Why?</td>
</tr>
</tbody>
</table>

Tx Integrity: / = IOA total responses: / =

Video: ________________ LP HP C Total number:________

Video: ________________ LP HP C Total number:________

Video: ________________ LP HP C Total number:________