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The Use of Progressive-Ratio Schedules to Assess Negative Reinforcers

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THE USE OF PROGRESSIVE-RATIO SCHEDULES TO ASSESS NEGATIVE REINFORCERS

by

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ABSTRACT

The Use of Progressive-Ratio Schedules to Assess Negative Reinforcers

by

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We used a combined multi-element, ABCBC reversal design to examine whether qualities of various negative reinforcers can be assessed under progressive-ratio schedules. Two adults with disabilities participated in this study. We assessed five sounds three times using progressive-ratio schedules to obtain mean break points for each stimulus and ranked negative reinforcers according to their mean break points. We called the stimulus with the highest mean break point the high-quality escape (HQE) stimulus and the stimulus with the lowest break point the low-quality escape (LQE) stimulus and examined responding according to different schedules of reinforcement for each stimulus: FR2, FR4, and FR8 for Jenny and FR1 and FR11 for April. We identified preferred and nonpreferred sounds for both participants.We observed differential responding for both participants between preferred and nonpreferred sounds. We observed differential responding between HQE and LQE stimuli for April but not for Jenny; a larger range in break points was observed for April. These results demonstrate a method to identify preferred and nonpreferred sounds and provide support for the possibility of using progressive-ratio schedules to rank negative reinforcers of various qualities.

(57 pages)

PUBLIC ABSTRACT

An Analysis of The Use of Progressive-Ratio Schedules to Assess Negative Reinforcers

by

Ryan Knighton

The purpose of this investigation was to determine if negative reinforcers can be ranked from high- to low-quality using a progressive-ratio assessment. This area of research is important for individuals with disabilities: in behavioral treatments it may be important to use negative reinforcers of varying qualities to reduce or increase socially relevant behavior such as communicative responses.

This investigation was carried out by Ryan Knighton in the Department of Special Education and Rehabilitation at Utah State University under the supervision of Sarah E. Bloom in partial fulfillment of the requirements for the degree of Master of Science. This research was conducted with resources already in possession of the Severe Behavior Clinic and did not exceed $25.

Two adults with disabilities participated in this research. These individuals learned to communicate to remove stimuli (i.e., sound) that were perceived as aversive. One individual responded more to remove stimuli that were high-quality negative reinforcers and the other individual responded equally to remove stimuli that were high- and low quality. This research demonstrated the use of progressive-ratio assessments to rank negative reinforcers of varying qualities and demonstrated the use of methods to

identify preferred and nonpreferred sounds for individuals with limited communication skills.

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INTRODUCTION

Behavior is sensitive to dimensions of reinforcement including rate, delay, response effort, and quality (Neef, Shade, & Miller, 1994). In other words, each of these dimensions influence the degree to which a response will occur in the future. For instance, Neef, Mace, Shea, and Shade (1992) examined the effects of reinforcer quality (i.e., relative preference for one reinforcer over available reinforcers; Neef et al., 1994) and rate of reinforcement on time allocation between two sets of concurrently available math problems. Researchers used nickels as high-quality reinforcers and "program money" (i.e., tokens) as low-quality reinforcers. Neef et al. (1992) assumed the matching law would predict the proportion of time allocation on each set of math problems. For example, when participants had access to equal-quality reinforcers across different schedules of reinforcement (VI 120 s or VI 30 s), they allocated more time to the set of math problems on the richer schedule (i.e., VI 30 s); when participants had access to high-quality reinforcers on the VI 120 s and low-quality reinforcers on the VI 30 s, they responded on the lean schedule (i.e., VI 120 s) at slightly higher rates during the condition with unequal-quality reinforcers than during the conditions with equal-quality reinforcers. Thus, Neef et al. (1992) concluded, "unequal-quality reinforcers can produce biased responding in favor of the high-quality reinforcer that alters the effects produced by rate of reinforcement alone" (p. 698). In other words, changes in the quality of reinforcers disrupted response rates predicted by the matching law.

One way to conceptualize quality of reinforcement is the degree to which an individual prefers one reinforcer over another reinforcer. Preference assessments are conducted to determine relative preference for stimuli, and stimuli are ranked in a hierarchy of preference (e.g., high-, middle-, and low-preference stimuli; Piazza, Fisher, Hagopian, Bowman, & Toole, 1996). For example, Piazza et al. (1996) presented pairs of stimuli to participants, and participants selected one stimulus. High-preference stimuli were those stimuli selected most frequently, middle-preference stimuli were selected the mean number of times, and low-preference stimuli were those stimuli chosen the least. If "relative preference" is synonymous with "reinforcer quality," the hierarchy establishes high-, middle-, and low-quality reinforcers as well. Moreover, Roscoe, Iwata, and Kahng (1999) distinguished between reinforcer potency and reinforcer preference. Potency refers to "the ability of a reinforcer to maintain performance" and preference refers to choice. They found that low-preference (LP) stimuli presented in single arrangements were as potent (i.e., maintained responding) as high-preference (HP) stimuli presented in concurrent arrangements despite participants' preference for HP stimuli. However, Hursh and Silberberg (2008) explained that concurrent-schedule measures of reinforcer strength or value (i.e., quality) have been challenged by combined approaches of operant analyses and human economic consumer theories. According to Hursh and Silberberg, reinforcer value (quality) is influenced by the price (i.e., responses emitted per unit of time divided by reinforcers earned per unit of time; see Hursh, 1984) of the reinforcer. In so much that progressive-ratio schedules measure the degree to which an individual will work to obtain reinforcement, they posited that, despite potential disadvantages, progressive-ratio schedules are a credible approach to measuring reinforcer value (p. 187). I discuss progressive-ratio schedules in greater detail later in this paper.

Assessment of Negative Reinforcers

Assessment methodologies have not been used as frequently in assessing the quality of negative reinforcers. Important to note in the discussion of negative reinforcement is stimuli do not maintain responding; rather escape from stimuli maintains responding. It would be erroneous to refer to stimuli in this study as high- or low-quality. Thus, I will refer to high-quality escape (HQE) and low-quality escape (LQE) rather than to HQ and LQ stimuli. To date, four applied studies have been conducted on assessing and ranking negative reinforcers. These procedures have been referred to as negative-reinforcer assessments (Zarcone, Crosland, Fisher, Wordsell, & Herman, 1999), demand assessments (Call, Pabico, & Lomas, 2009; Roscoe, Rooker, Pence, & Longworth, 2009), and stimulus avoidance assessments (Fisher, Piazza, Bowman, Hagopian, & Langdon, 1994). Experimental methods examined include latency to problem behavior (Call et al., 2009; Zarcone et al., 1999), compliance and rate of problem behavior (Roscoe et al., 2009), and rate of negative vocalizations plus avoidant movements minus positive vocalizations (Fisher et al., 1994). Important to note is that in the Fisher et al. (1994) study, researchers used stimuli as punishers to suppress automatically maintained problem behavior; this study was included in negative reinforcer assessment because Zarcone et al. (1999) used the same methods to develop a rating scale to identify tasks that could function as negative reinforcers for escape-maintained problem behavior.

Researchers have identified challenges to assessing and ranking negative reinforcers. First, rankings of demands identified in indirect assessments methods such as interviews and rating scales do not always correspond with rankings of demands identified experimentally. For instance, Zarcone et al. (1999) developed the Negative

Reinforcement Rating Scale (NRRS). Parents ranked tasks (e.g., self-care, schoolwork, transitions) according to the following scale: does not always bother child (1), sometimes bothers child (2), often bothers child (3), and always bothers child (4). Thus, an NRRS score of 4 signifies the least preferred (or most aversive) task. The same tasks were then ranked according to mean latency to problem behavior; the briefest latencies were given the highest number ranking signifying the least preferred (or most aversive) task (i.e., high-quality reinforcers) and the longest latencies were given the lowest number ranking signifying more preferred (or less aversive) tasks (i.e., low-quality reinforcers). They found correspondence for two of five participants (40%) in rankings of the least preferred task and for one of five participants (20%) in rankings of the most preferred tasks. Important to note is that for three of five participants (60%), the most preferred task identified in the NRRS was reported as one of the least preferred tasks in the latency-to-problem-behavior method. Moreover, for these same participants, the least preferred task identified in the NRRS was reported as one of the most preferred tasks in the latency-to-problem-behavior method. Roscoe et al. (2009) claimed that, when asked questions about their child's problem behavior in relation to demands, parents and caretakers may attend to compliance or rate of problem behavior but usually not both. In other words, they suggested that one potential reason for incongruent results between indirect and experimental demand assessment methods is caretakers and parents focus on one aspect of the behavior.

Second, demands used in functional analyses to test for escape-maintained behavior can produce false-negatives if the demands do not sufficiently establish escape from demands as a motivating operation (Roscoe et al., 2009; see also Call et al., 2009).

Roscoe et al. found that tasks empirically identified as high-*p* tasks did not result in much behavior for three of four participants and led to false-negative results in the functional analysis (i.e., escape was not identified as a maintaining consequence for problem behavior). On the other hand, tasks empirically identified as low-*p* tasks resulted in frequent incidents of problem behavior and clear results in the functional analysis. Thus, it might be important to identify demands using experimental methods rather than relying solely on rating scales and interviews lest escape-functions are missed in functional analyses.

It is unclear whether procedures used to establish a hierarchy of positive reinforcers can be used to establish a hierarchy of negative reinforcers. For instance, paired-choice and paired-stimulus preference assessment methods for positive reinforcers require simultaneous presentation of multiple stimuli from which participants select. It is unknown whether participants will select from an array of tasks or other aversive stimuli (e.g., sound) when negative reinforcers are assessed. Moreover, if multiple stimuli like sound are presented at the same time, it is likely these stimuli will have an additive effect: it may be difficult to discriminate between stimuli.

Progressive-ratio Schedules

Positive reinforcers. Researchers have used progressive-ratio (PR) schedules to establish preference hierarchies for positive reinforcers (e.g., DeLeon, Fisher, Herman, & Crosland, 2000; DeLeon, Frank, Gregory, & Allman, 2009; Francisco, Borrero, & Sy, 2008; Glover, Roane, Kadey, & Grow, 2008; Jerome & Sturmey, 2008; Penrod, Wallace, & Dyer, 2008; Roane, Lerman, & Vorndran, 2001). Preference is determined in PR schedules by increasing response requirements within session until responding ceases for a specified amount of time (i.e., the break point). Roane (2008) defined the break point as "the last reinforced PR requirement that is completed" (p. 155). He offered this description of how reinforcer preference is established by break points under PR schedules:

If a participant completed five trials and emitted 25 responses during the last trial before responding ceased with Stimulus A and completed eight trials and emitted 40 responses during the last trial with Stimulus B before responding ceased, one would conclude that Stimulus B was a more potent reinforcer than Stimulus A because Stimulus B had a higher break point. That is, Stimulus B supported more responding as the schedule requirements increased (Roane, 2008 pp. 155-156).

DeLeon et al. (2009) demonstrated that more potent reinforcers (as measured under PR schedules) can be high-preferred stimuli (as measured by paired-choice preference assessments). They identified high-, moderate, and low-preference stimuli (HP, MP, and LP, respectively) using a paired-choice preference assessment and compared the results of the paired-choice preference assessment with mean break points (3 sessions) for HP, MP, and LP stimuli. They found that HP stimuli were associated with higher break points than MP and LP stimuli for 10 of 12 stimuli assessed across four participants suggesting HP stimuli support more responding than MP and LP stimuli. These results are consistent with the findings of Glover et al. (2008) and Penrod et al. (2008). Glover et al. (2008) used a paired-stimulus preference assessment to identify an HP stimulus and an LP stimulus for each participant to assess under PR schedules. HP and LP stimuli were presented on single and concurrent schedules. Response rates (responses per min) and break points were higher for HP stimuli in single-schedule and concurrent-schedule arrangements for all three participants. Penrod et al. (2008) observed similar results when they compared results of single-stimulus and paired-stimulus preference to results of progressive-ratio assessments. They identified HP and LP stimuli for four participants using single- and paired-stimulus preference assessment. They observed higher response rates for two of four participants and higher break points for three of four participants when HP stimuli were used as reinforcers. It is important to note that HP stimuli supported more total responses per unit of time (532 responses in 155 min) across participants than LP stimuli (279 responses in 116 min).

Negative reinforcers.

PR schedules enable the analysis of negative reinforcers in isolation, and break points enable comparisons between negative reinforcers. Thus, progressive-ratio schedules may be one way to examine the quality of negative reinforcers and establish a hierarchy of varying qualities of negative reinforcers. However, it might be possible for a stimulus to be aversive and not function as a negative reinforcer, and the distinction between negative reinforcer and an aversive stimulus is important. Negative reinforcer refers to removal of an aversive stimulus, and aversive stimulus refers to the stimulus. Thus, in this investigation we refer to negative reinforcers as the removal of stimuli that increased responding, and we refer to aversive stimuli when removal of the stimulus did not increase responding or we had not yet demonstrated an increase of responding.

To-date, no applied studies have been conducted to determine whether progressive-ratio schedules can be used to develop a hierarchy of varying qualities of negative reinforcers. Such research might be important when teaching communication responses to people with disabilities particularly when maltreatment is an issue.

Powers et al. (2002) surveyed women with disabilities (*n* = 200) and found that, in their lifetimes, these women experienced insults or put-downs (40.5%), getting yelled at (35.5%), violation of body privacy (15.0%), sexual touching (11.0%), forced sexual activity (5.5%), and other forms of maltreatment. These values may be low estimates of actual occurrence of maltreatment because the survey relied on communication skills. Individuals who are unable to communicate may be abused at much higher rates.

It might be possible to use information obtained from progressive-ratio schedules to teach communication responses that match the severity and persistence of the maltreatment. For instance, an individual could be taught a variety of escape responses to be used in various contexts: how to respond to an initial insult, how to respond to insults that persist, and how to respond if insults escalate to aggression. Or an individual might be able to express that he or she is experiencing a mild stomach ailment using a different statement than if he or she were experiencing severe pain associated with a burst appendix. Or clinicians might teach an individual to engage in one communication response in the context of a mildly aversive stimulus such as a beeping noise or nonpreferred music and teach another communication response in the context of abuse or maltreatment (i.e., to report abuse). This is an important area for research considering individuals with disabilities experience maltreatment.

The current investigation extends research on PR schedules to the assessment and ranking of negative reinforcers. The purpose of this investigation was to determine the viability of a methodology for assessing negative reinforcers using progress-ratio schedules. The research question for this study was: Will we observe differential responding for negative reinforcers of different qualities (high-quality and low-quality, as determined by a progressive-ratio assessment) in a combined multi-element reversal design?

METHOD

Participants and Setting

Two adults with disabilities participated in this study. Participants were selected from a university-affiliated day program for adults with disabilities based on whether they would benefit from communication training, whether they or their guardians provided consent to participate, and whether they demonstrated a history of problem behavior in the presence of loud sounds or have a medical condition suggesting they might experience pain in the presence of loud sounds. Individuals who were abnormally sensitive to sound were excluded from this study (i.e. individuals likely to experience pain or engage in problem behavior as a result of exposure to unpleasant sounds). This was determined in the initial interview with staff at the day program who were familiar with the individual and based on answers provided to screening questions we distributed. We delivered screening questions (see the Appendix) to day program staff and discussed the types of individuals who might benefit from this study and individuals who might not be appropriate for this study. Staff at the day program then distributed screening questions to individuals (or their guardians) who might benefit from participation in this study and did not deliver screening questions to individuals who would not be appropriate for the study (e.g., individuals with a recent history of engaging in problem behavior in the presence of loud sounds and/or individuals with medical conditions that suggest the possibility of sensitivity to sound). Participants (or their guardians) completed the screening questions, which included consent to be contacted by the researchers. Screening questionnaires were returned to staff at the day program, and the researcher collected the screening questionnaires from the day program staff and contacted the participant (or guardian of the participant). The researcher discussed answers to the screening questions with the participant (or the participant's guardian) to obtain information on the participant's level of communication, to determine if the participant might engage in problem behavior in the presence of loud sounds, and find out whether the participant had medical conditions that suggests the possibility of being sensitive to sound. Jenny was referred to participate in this study because she did not have a history of requesting to terminate aversive stimuli or nonpreferred activities despite having a history of requesting preferred items and activities. April was referred to participate in this study for similar reasons: much of her communication history related to requesting a limited number of preferred items and activities and she did not have a history of requesting to terminate aversive stimuli or nonpreferred activities. Sessions were conducted at the day program in a room with two tables and two chairs. Present in the room were the sound devices (i.e., speakers and iPod), decibel meter, other materials needed to conduct sessions as described below, one to two data collectors, therapist, and an additional person to provide prompting during communication training.

Response Measurement and Reliability

Target responses for each individual were determined from information provided on the screening questions, from information provided by day program staff and the participant's guardian, and depended on the skill level of the participant. Jenny's target response was a vocal communication "off, please" or any sentence with the words "off" and "please" (e.g., turn off, please). April's target response was defined as touching the picture communication card to any part of the therapist's hand. The picture communication card was 4 in by 4.5 in, laminated, and displayed a black-and-white image of an ear overlaid with the "no" symbol. Data on target responses were collected as responses per minute. Cumulative number of responses were also calculated. Independent observers collected data during 64% of Jenny's sessions (*M* = 96%, *range* = 85% - 100%) and 50% of April's sessions (*M* = 98%, *range* = 81.7% - 100%) . Sessions were divided into 10-s intervals. Data collectors scored the occurrence and nonoccurrence of target responses and removal of the stimulus in each interval. Agreement for an interval was scored as 1.0 if both observers agreed on the number of occurrences or agreed on no occurrence during a given interval. Partial agreement was scored for intervals in which data collectors reported different numbers of occurrences by dividing the fewest occurrences reported by the most occurrences reported. These values were summed for each interval (partial agreement or not) and were divided by the total number of intervals during that session. The quotient was multiplied by 100 to obtain a percentage of agreement. Reliability was calculated using the percentage of agreement for each interval divided by the number of intervals.

Sound Guidelines and Sound Exposure

The National Institute for Occupational Safety and Health (NIOSH) recommends exposure limits of 85 dB for no longer than 8 hrs (i.e., the average workday; NIOSH, 1998). Guidelines established by the Occupational Safety and Health Administration (OSHA) allow for 16 hrs daily exposure at 85 dB. The Environmental Protection Agency (EPA) and the World Health Organization (WHO) allow for 47.5 min daily exposure at 85 dB (as cited in Gershon, Neitzel, Barrera, & Akram, 2006). To ensure participants were not exposed to harmful levels of sound, we set the sound exposure limit to the strictest guidelines and decreased the volume by 5dB to 80 dB. Thus, sound exposure during this study never exceed 80 dB (about the volume of a vacuum cleaner approximately 3 m away) and was never less than 70 dB and never exceeded 47.5 min (2,850 s) per day. We ended sessions for the day if sound exposure for that day would be more than 47.5 min. Important to note is that decibels are measured on a logarithmic scale meaning an increase of 10 dB is a 10-fold increase in intensity (Gershon et al., 2006). Moreover, noise-induced hearing loss (NIHL) caused by one-time exposures (often referred to as "impulse" sound) occurs at or above 120 dB (NIDCD, 2008).

Preferred Sound Assessment

The purpose of the preferred sound assessment was to identify one sound that is most preferred per the participant's (or the participant's guardian) report. This sound was used in the control condition of the negative reinforcer assessment. During an interview with the participant or with the participant's caretaker, five preferred sounds were initially identified to use in the preferred sound assessment. The room was divided into two halves (Jenny) as marked with duct-tape on the floor or a y-shaped path was marked with duct-tape (April) on the floor (see Roane, Vollmer, Ringdahl, & Marcus, 1998). The y-shaped path started on one side of the room and ended on the other side with each fork extending to opposite corners of the room. Chairs were placed between the two paths so April was forced to walk down one fork or the other. One noise stimulus was associated with one side of the room (Jenny) or each fork in the path (April). Each of the five noise stimuli were paired with every other noise stimulus for a total of 20 pairings (see Fisher et al., 1992). The independent measure was the selection as defined by standing on one side of the room (both feet on one side of the room marked with duct-tape; Jenny) or standing on one side of the fork (one foot over the middle of the center of the path at the fork as marked with duct-tape; April). Standing on one side of the room or fork resulted in 10-s access to the noise stimulus associated with that side. We modeled walking down the path and through the fork (to the left or right) at which point the noise stimulus turned on. We then prompted April to walk down the path and make a choice by walking down the path and through the left or right fork. If she stopped at the fork and stood with one foot on each side of the divide, we ended the trial and presented the choice again. Participants were exposed to each of these sounds one time for 10 s prior to making a choice between the stimuli. After five consecutive choices of one noise stimulus were made, we switched locations of the noise stimulus to see if the participant tracked the change of location and selected the same noise stimulus. The high-preferred sound was defined as the sound selected the largest number of presentations over total number of presentations and was used in the control condition later in the study. Noise stimuli during this assessment were presented at a volume no greater than 80 dB and depending on the noise stimulus were not below 70 dB.

Nonpreferred Sound Assessment

The purpose of the nonpreferred sound assessment was to demonstrate that “no sound” (silence) is more preferred than the noise stimulus. This procedure was similar to the preferred sound assessment except that standing on one side of the room or fork resulted in 10 s of silence and standing on the other side of the room or fork resulted in 10 s of a noise stimulus. The room was divided into two halves (Jenny) or a y-shaped path was marked with duct-tape (April) as in the preferred sound assessment. The participant was pre-exposed to the noise stimulus or silence prior to making a choice: we modeled the response (standing on one side of the room or walking down the path and through the right or left fork) and then prompted the participant to respond. These steps were repeated for a given noise stimulus until the participant made five consecutive "no sound" choices. If the participant made five consecutive choices for a noise stimulus, we tested additional stimuli until we identified five stimuli for which the participant selected "no sound" five times consecutively. All noise stimuli were presented at volumes no greater than 80 dB and no less than 70 dB when measured 1 m (3 ft) from the source of sound using a decibel meter.

Communication Training

The purpose of communication training was to establish the target response as an escape response. Sessions began with the presentation of a nonpreferred sound at a volume no greater than 80 dB and no less than 70 dB, and we used a time-delay prompting procedure similar to that employed by Touchette and Howard (1984). During the first session, we prompted the participant to engage in the target response as we presented the noise stimulus (i.e., 0-s time delay). The person providing prompts sat behind the participant and used the least intrusive method of physical guidance (e.g., light touch to the participant's elbow) required. When the participant engaged in the target response, the therapist terminated the sound for 30 s and stated "Okay, I'll turn it off." After 30 s elapsed, the therapist turned the sound on again, prompting continued, and each target response resulted in termination of the noise stimulus (FR1). In subsequent sessions, we faded prompts by 5 s across sessions until the participant engaged in the target response independently for 80% or more of opportunities. We ended communication training when a participant engaged in the target response independently 80% or more of opportunities during the session and the first response of that session was independent. Data were graphed as the number of independent target responses over the number of target responses, and the quotient was multiplied by 100 to obtain the percentage of independent target responses per session.

Negative Reinforcer Quality Assessment

The purpose of the negative reinforcer quality assessment was to assess each of the nonpreferred sounds under progressive-ratio schedules and obtain three break points per sound. This enabled examination of each reinforcer in isolation while enabling comparisons across reinforcers. That is, we used break points as a measure of quality of reinforcement. During these sessions, participants were exposed to five sounds identified in the nonpreferred sound assessment. Sound did not exceed 80 dB (as measured by a decibel meter held 1 m or 3 ft away from the source of the sound) and only one sound was presented during a session. If the participant engaged in the target response, the therapist stated, “Okay, I’ll turn it off” and terminated the sound for 30 s. After 30 s elapsed, the therapist resumed the sound. Response requirements increased within session starting with FR1 and increased by 1.5 (rounded to the nearest whole number): FR1, FR2, FR3, FR5, FR8, FR12, FR18, FR27, FR41, FR62, and FR93. It would be impossible for participants to reach an FR schedule higher than FR93 during 10-min. Sessions were terminated when the participant ceased to respond for 1 min or until 10 min elapsed. The break point was defined as the last PR ratio that contacted reinforcement. Three sessions were conducted per sound, and break points were reported as an average across three sessions. The stimulus associated with the highest break point was called the high-quality escape (HQE) stimulus and the stimulus associated with the lowest break point was called the low-quality escape (LQE) stimulus.

Negative Reinforcer Assessment

Phase 1

As determined in the negative reinforcer assessment, participants were exposed to HQE and LQE, and a preferred stimulus was used as a control. Sessions were conducted in a multi-element fashion (HQE, LQE, control) and lasted 10 min. If the participant engaged in the target response, the stimulus was terminated for 30 s. After 30 s elapsed, the stimulus was presented again. This process continued until a trend in the data appeared. Data were graphed as the number of target responses per minute, and cumulative number of responses.

Phase 2

The FR schedules in Phase 2 were yoked to the mean break point of the LQE stimulus obtained during the PR assessment (rounded to the nearest whole number). If the mean break point was less than one, the FR schedule was FR1 and this phase was omitted as with April. If the mean break point was greater than one but less than two we assessed responding at FR2 as with Jenny. Procedures in Phase 2 were similar to procedures in Phase 1 using the new FR schedules. Data were graphed as the number of target responses per minute and cumulative number of responses.

Phase 3

The FR schedules in Phase 3 were yoked to the mean break points of the HQE stimulus in the progressive-ratio assessment: FR4 or Jenny and FR11 for April. We did not observe differentiation in responding for Jenny at reinforcement schedule FR4, so we increased the reinforcement schedule to the highest break point observed, which was FR8. Data were graphed as the number of target responses per minute and cumulative number of responses.

RESULTS

Preferred Sound Assessment

Figure 1 shows results of the preferred sound assessment for Jenny and April, respectively. Each stimulus is represented on the x-axis with percentage of selections represented on the y-axis. Jenny selected music 78.8% of selections; therefore music was used as a control in the multi-element design. April selected music and laughing 57% of selections. We conducted a second assessment to determine which of the two was most preferred. April selected music over laughing and therefore music was used as a control in the multi-element design.

Nonpreferred Sound Assessment

Figure 2 shows results of the nonpreferred sound assessment for Jenny. Stimuli are on the x-axis and number of consecutive "no sound" selections are on the y-axis. Two sounds were assessed for which Jenny did not choose "no sound" over sound: constant tone (represented as "tone") and a crying baby ("crying"). Additional sounds were assessed until five nonpreferred sounds were identified: arrhythmic beeps ("arrhythmic"), vacuum, white noise, traffic, and a tone that alternated in pitch ("alternating"). *Figure 3* shows results of the nonpreferred sound assessment for April. Three sounds were assessed for which April did not choose "no sound" over sound: constant pitch tone ("tone"), arrhythmic beeps ("arrhythmic"), and bagpipes. Additional sounds were assessed until five nonpreferred sounds were identified: vacuum, white noise, traffic, smoke alarm, and violin.

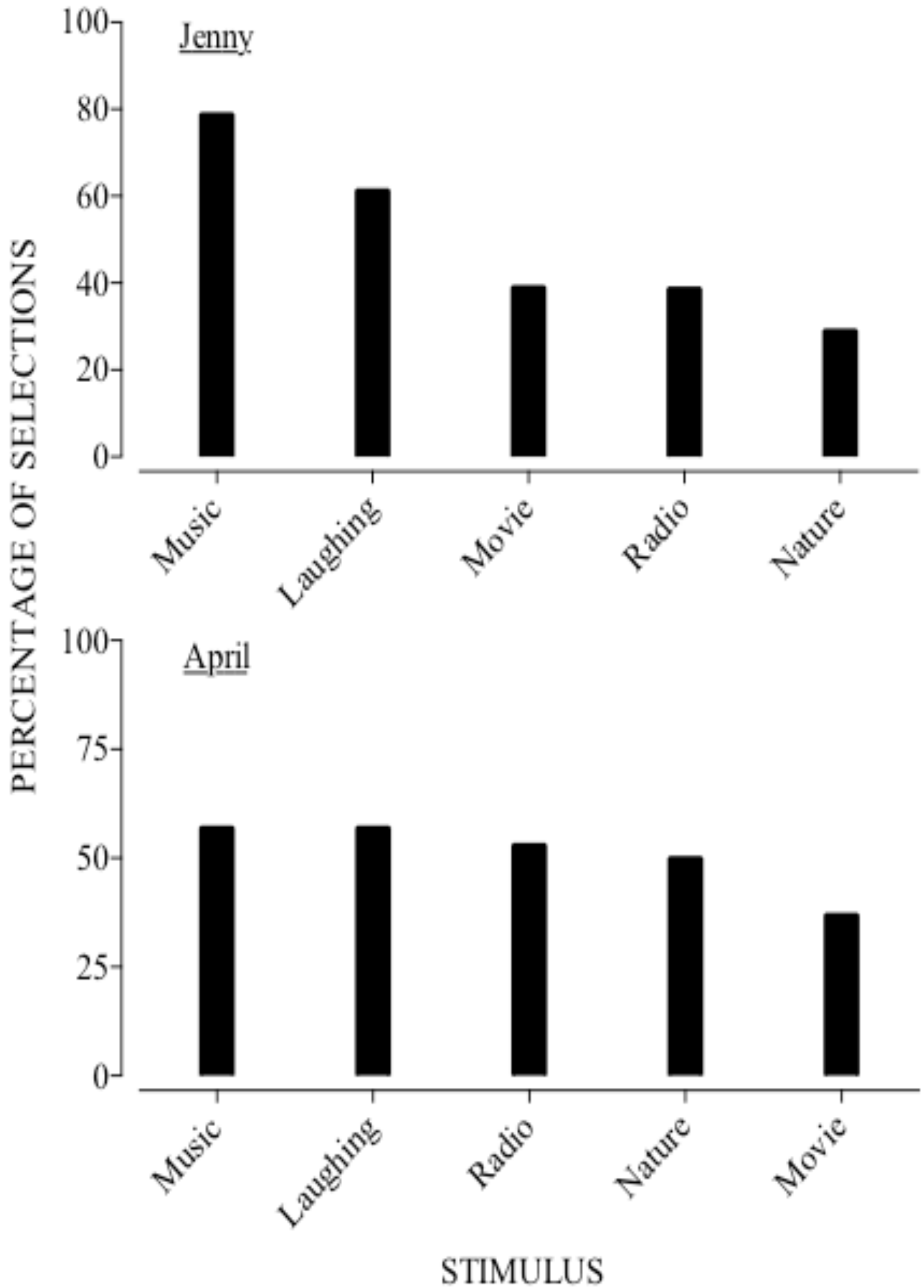

Figure 1. Results of the preferred sound assessment for Jenny (top) and April (bottom).

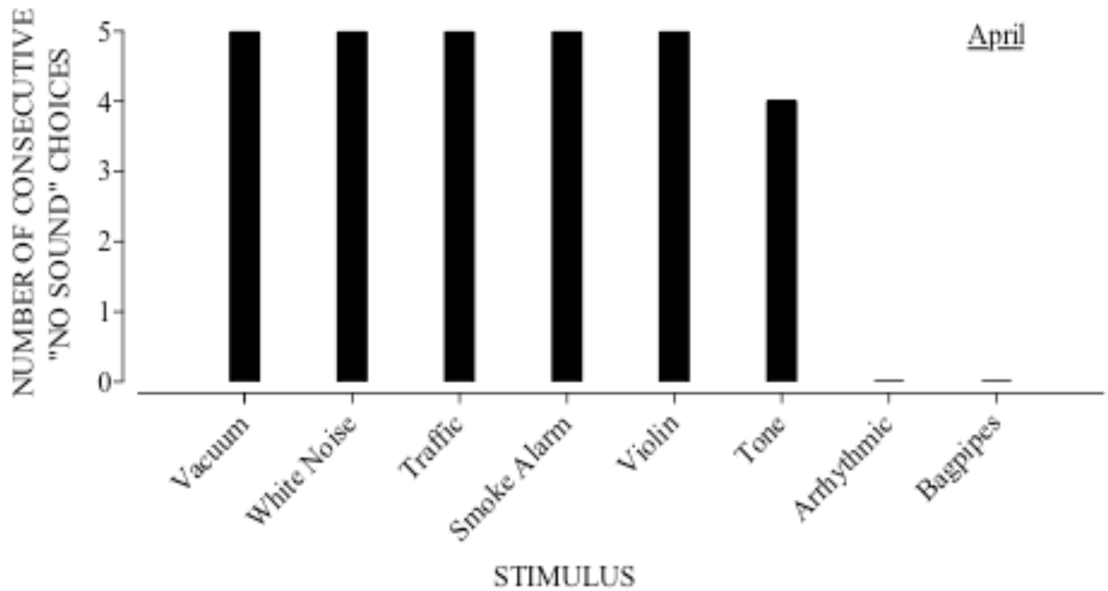

Figure 2. Results of the nonpreferred sound assessment for Jenny. The x-axis shows stimuli and the y-axis shows consecutive "no sound" choices.

Figure 3. Results of the nonpreferred sound assessment for April. The x-axis shows stimuli and the y-axis shows consecutive "no sound" choices.

Communication Training

Figure 4 shows the results of communication training for Jenny and April. Participants completed communication training when they engaged in target responses independently 80% of opportunities in a session and the first response of that session was independent. Jenny completed communication training in two sessions, and April completed communication training in eight sessions.

Negative Reinforcer Quality Assessment

Figures 5 (Jenny) and *6* (April) show results of the negative reinforcer quality assessment. Sessions are on the x-axes. The break points are on the y-axis (top panel), responses per minute are on the y-axis (middle panel), and cumulative number of responses are on the y-axis (bottom panel). The stimulus associated with the highest break point for Jenny was arrhythmic beeps and white noise had the lowest break point. The arrhythmic stimulus supported the highest number of responses (33) and was selected as the HQE stimulus. The alternating tone stimulus supported the fewest number of responses (8) and shared a mean break point with white noise. White noise supported 10 responses and was selected as the LQE stimulus because during one session Jenny did not respond to terminate the sound suggesting it was less aversive than the alternating tone stimulus. The stimulus associated with the highest break point for April was the sound of traffic and vacuum had the lowest break point. Despite choosing “no sound” five consecutive times during the nonpreferred sound assessment when presented with a choice between “no sound” and the sound of a smoke alarm, April never engaged in the target response to terminate the sound of the smoke alarm during the negative reinforce quality assessment. Traffic supported the largest number of responses (93) and vacuum supported fewest responses (3). Traffic was selected as the HQE stimulus and vacuum was selected as the LQE stimulus.

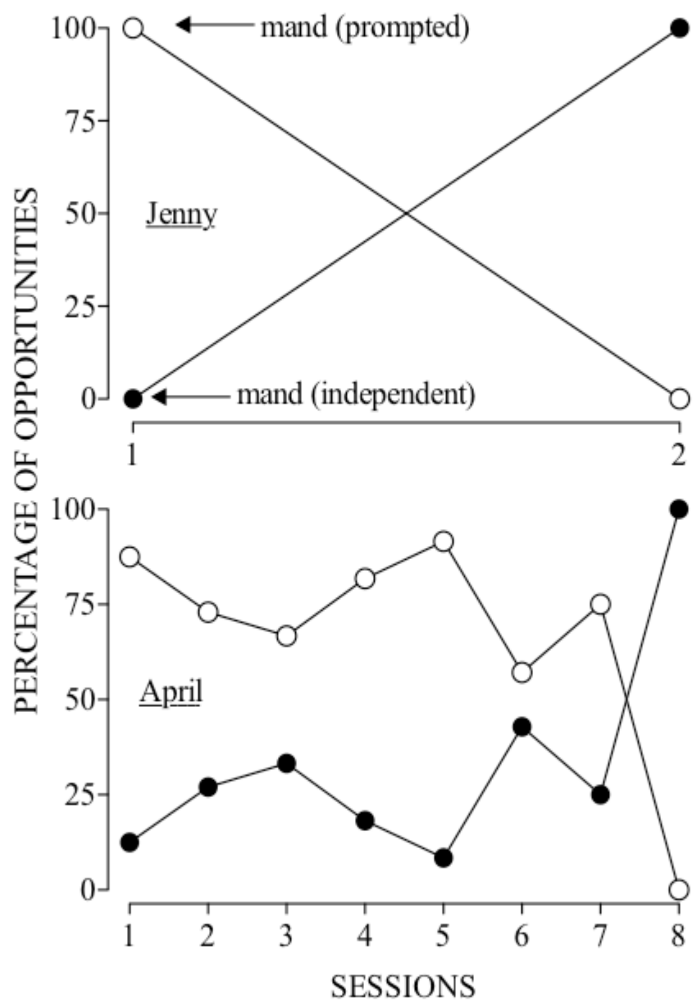

Figure 4. Results of communication training for Jenny (top) and April (bottom). Open circles represent target responses (mands) that were prompted and closed circles represent target responses (mands) that were independent.

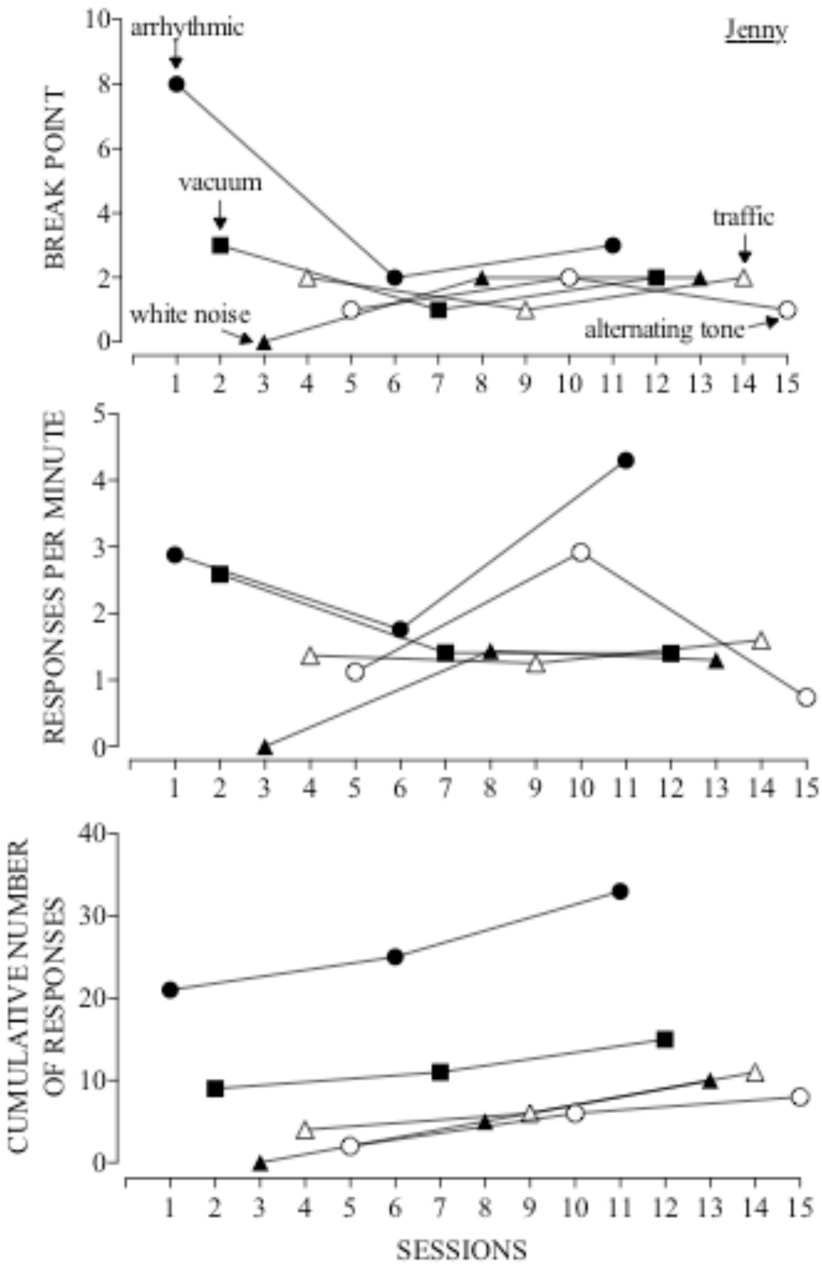

Figure 5. Results of the negative reinforcer quality assessment (PR assessment) for Jenny. Results are depicted break points (top), responses per minute (middle), and cumulative number of responses (bottom). Closed circles represent arrhthymic beeps (HQE), closed squares represent vacuum, closed triangles represent white noise (LQE), open triangles represent traffic, and open circles represent the alternating tone.

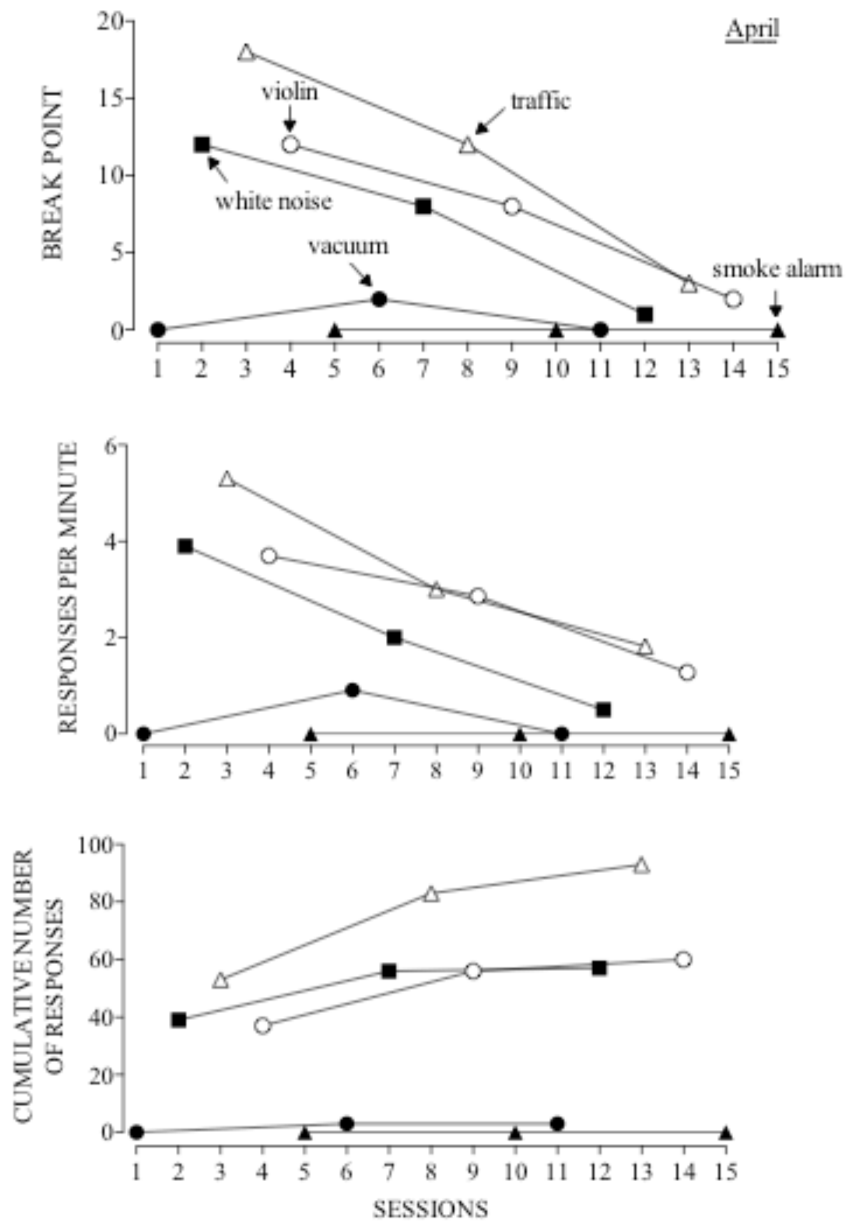

Figure 6. Results of the negative reinforcer quality assessment (PR assessment) for April. Results are depicted break points (top), responses per minute (middle), and cumulative number of responses (bottom). Open triangles represent traffic (HQE), open circles represent violin, closed squares represent white noise, closed circles represent vacuum (LQE), and closed triangles represent smoke alarm.

Figures 7 (Jenny) and *8* (April) show mean break points obtained during the negative reinforcer quality assessment. Stimuli are on the x-axis and mean break points are on the y-axis and error bars show the range of the break points for three sessions. Mean break points for stimuli presented to Jenny were as follows: arrhythmic (4.3; range 2-8), vacuum (2; range 1-3), traffic (1.7; range 1-2), alternating tone (1.3; range 1-2), and white noise (1.3; range 0-2). Mean break points for stimuli presented to April were as follows: traffic (11; range 3-18), violin (7.3; range 2-12), white noise (7; range 1-12), vacuum 0.7; range 0-2), and smoke alarm (0).

Negative Reinforcer Assessment

Jenny

Figure 9 shows results of the negative reinforcer assessment. Sessions are on the x-axis and responses per minute (top panel) and cumulative number of responses (bottom panel) are on the y-axes. At the FR1 reinforcement schedule, Jenny's responses per minute stabilized for five consecutive series of data points for HQE (M = 1.6 responses per minute) and LQE (M = 1.6 responses per minute), and cumulative number of responses were 124 (HQE) and 125 (LQE). We observed some responding in the first session when the preferred sound was presented but responding stopped within the first minute of the first session and never occurred thereafter. At the FR2 reinforcement schedule, data were variable until the last three series. Mean responses per minute obtained were 1.4 (HQE) and 1.3 (LQE), and cumulative number of responses were 142 (HQE) and 119 (LQE). At the FR4 reinforcement schedule, Jenny stopped responding at which point we modified the pre-session prompting procedure to include a direct

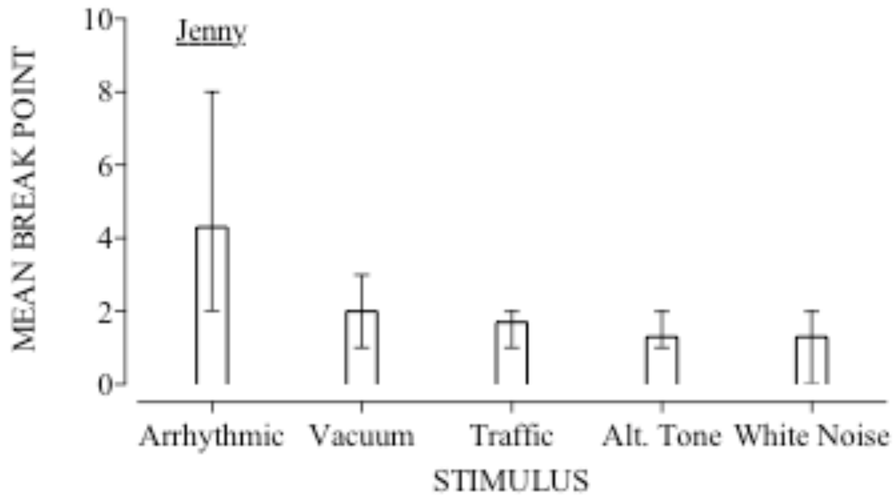

Figure 7. Mean break points of the negative reinforcer quality assessment (PR assessment) for Jenny. Error bars show the range of break points obtained for three sessions.

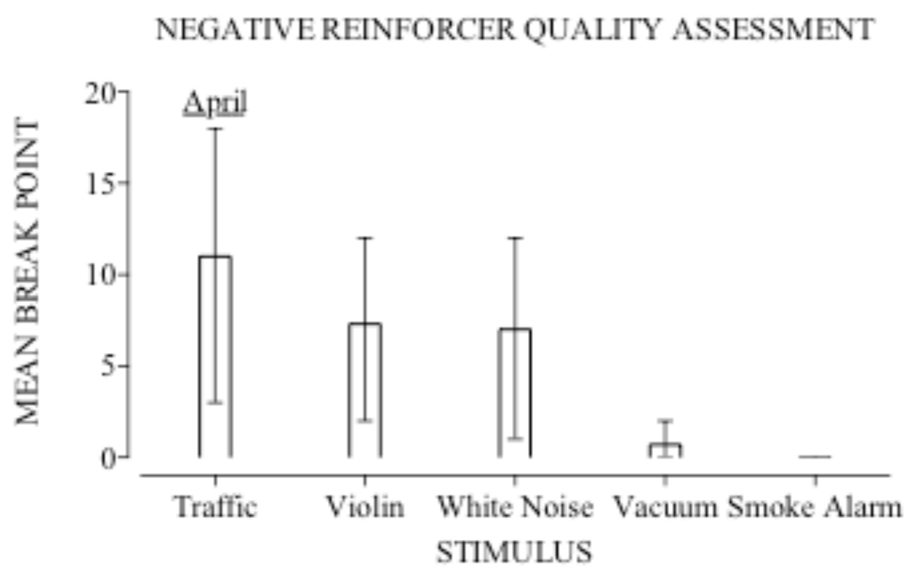

Figure 8. Mean break points of the negative reinforcer quality assessment (PR assessment) for April. Error bars represent the range of break points obtained for three sessions.

Figure 9. Results of the negative reinforcer assessment for Jenny. Results are depicted as responses per minute (top) and cumulative number of responses (bottom). Open circles represent HQE, closed circles represent LQE, and closed triangles represent the preferred sound.

exposure to the contingency during session (rather than a pre-session discussion of the contingency during session) and responding increased and reached stability.

Mean responses per minute obtained were 4.0 for HQE and LQE, and cumulative number of responses was 324 (HQE) and 326 (LQE). We did not observe meaningful differences between responses per minute for HQE and LQE at FR schedules yoked to the mean break points obtained in the negative reinforcer quality assessment. Because we did not see differentiation, we assessed responses per minute at an FR8 reinforcement schedule, which was the highest break point obtained during the negative reinforcer quality assessment. At the FR8 reinforcement schedule, mean responses per minute were 11.2 for HQE and LQE and cumulative number of responses were 336 for HQE and LQE. These results suggest there is no difference in the quality of negative reinforcement at reinforcement schedules FR2, FR4, and FR8 for Jenny. During the control condition when the preferred sound was presented, Jenny engaged in the target response twice during the first session but never again through the rest of the negative reinforcer assessment. These results suggest the preferred sound was more preferred than silence. Responding occurred when nonpreferred sounds were presented suggesting silence was more preferred than the nonpreferred stimuli but that both were equally non-preferred, at least in terms of how much responding their removal supported.

Figure 10 shows results of a second progressive-ratio analysis conducted after Jenny completed the negative reinforcer assessment. Break points for HQE from this assessment ranged from 5 to 12 (*M* = 7.3) and 3 to 8 (*M* = 4.7) for LQE, which were higher than those observed in the first progressive-ratio analysis. It is possible differential responding might be observed at higher response requirements (e.g., FR12) for Jenny. At the beginning of the study Jenny engaged in (on average) four responses to terminate the HQE stimulus, up to eight responses. After more exposure to the contingency through the remainder of the study and as assessed in the second PR analysis, Jenny engaged in (on average) seven responses to terminate the HQE stimulus, up to 12 responses. Moreover, she responded 17 times in the first PR session but stopped responding for 1 min before reaching the next response requirement (18), which provides evidence she might engage in more responding to terminate the HQE stimulus. The mean break point for the LQE stimulus as assessed in the second PR analysis also increased but remained below the mean break point of the HQE stimulus suggesting we might observe differentiation between HQE and LQE at higher requirements for reinforcement.

April

Figure 11 shows results of the negative reinforcer assessment. At the FR1 reinforcement schedule for April, responses per minute stabilized for HQE (*M* = 1.4) and decreased for LQE (*M* = 1.1). Cumulative number of responses was 97 (HQE) and 76 (LQE). We observed one response at the beginning of the first session during presentation of the preferred sound but responding stopped and never occurred thereafter.

Figure 10. Results of the negative reinforcer quality assessment of HQE and LQE for Jenny. Results are depicted as break points for each stimulus.

At the FR11 reinforcement schedule, mean responses per minute were 4.4 (HQE) and 1.0 (LQE), and cumulative number of responses was 175 and 40 respectively. When we returned to the FR1 reinforcement schedule, mean responses per minute were 1.3 (HQE) and 0.4 (LQE), and cumulative number of responses were 51 and 17 respectively. When we returned to the FR11 reinforcement schedule, mean responses per minute were 1.6 (HQE) and 0.14 (LQE) and cumulative number of responses were 81 and 7, respectively. During exposure to the preferred sound (control), April responded one time at the beginning of the first session and never responded again during the control throughout the remainder of the study.

Figure 11. Results of the negative reinforcer assessment for April. Results are depicted as responses per minute (top) and cumulative number of responses (bottom). Open circles represent HQE, closed circles represent LQE, and closed triangles represent the preferred sound.

Thus, results for both participants suggest the preferred sound was more preferred than silence.

Sound Exposure

Figure 12 shows sound exposure per participant per day. The x-axis represents

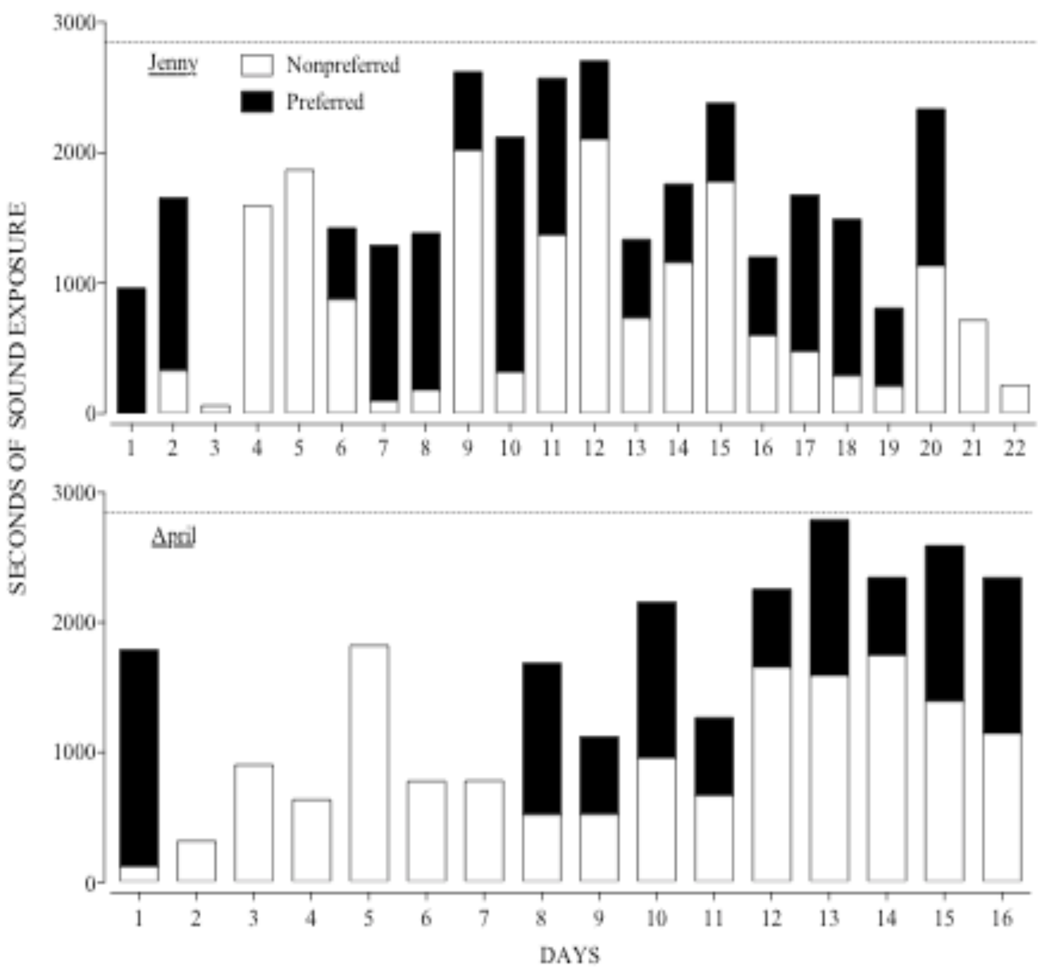

Figure 12. Daily sound exposure of preferred and nonpreferred sounds for Jenny (top) and April (bottom). Shaded areas show exposure to preferred sounds and non-shaded areas show exposure to nonpreferred sounds. The dotted line is the maximum number of seconds of sound exposure allowed per day (2,850 s or 47.5 min).

days, the y-axis represents the number of seconds of sound exposure, and the dotted line represents the sound exposure limit of 47.5 min per day (2,850 s). Jenny was exposed to 302 min and 14 s of nonpreferred sound and 267 min and 8 s of preferred sound totaling 569 min and 22 s across all phases of the study. April was exposed to 347 min and 32 s of nonpreferred sound and 207 min and 15 s of preferred sound totaling 554 min and 47 s across all phases of the study.

DISCUSSION

We used a preferred sound assessment to identify preferred sounds for each participant to serve as a control in the multi-element design. Neither participant responded more than twice to terminate this sound. These results suggest this procedure is a viable method for identifying preferred sounds. We used a nonpreferred sound assessment to demonstrate that “no sound” is more preferred than the noise stimuli assessed. We identified five sounds for each participant and assessed these sounds under progressive-ratio schedules to obtain break points. Mean break points were then used to determine the schedule of reinforcement to be used to determine whether the removal of stimuli would be of different qualities and support different amounts of responding. Specifically, our research question was whether we would observe differential responding for negative reinforcers of high- and low-quality as determined by the progressive-ratio assessment. We observed differential responding between HQE and LQE for April but not for Jenny. Important to point out is the trend in data of the negative reinforcer quality assessment for Jenny. We did not observe large differences in break points for Jenny after the first presentation of any given stimulus. In other words, we did not observe a large range in break points (0 to 8) and the difference between the mean break points for HQE and LQE was small (3). In comparison, we observed a larger range in break points for April (0 to 18) and a larger difference between mean break points for HQE and LQE (10.3). It is possible that we did not observe differential responding for Jenny because this small range and similarity in mean break points suggests removal of the HQE stimulus and the LQE stimulus were similar enough in quality that differences were not detected by the schedules of reinforcement we used. It is possible we might have observed differentiation at higher response requirements for reinforcement. For instance, we observed an increase in mean break points in Jenny's second progressive-ratio analysis from 4.3 to 7.3 (HQE) and 1.3 to 4.7 (LQE). We also observed a larger range in break points in the second analysis: 2-8 (first analysis) and 5-12 (second analysis) for HQE; 0-2 and 3-8 for LQE. Increases in mean break points and ranges between the first and second analysis might be due to increased exposure to the contingency and mastery of the communication skill. It is possible that as Jenny gained more experience with the response, response effort decreased. Thus, given the novelty of this research and the differences in results between participants, more research is needed to draw conclusions about the viability of this assessment methodology.

One way to conceptualize this investigation is to compare results of the three methods we used to assess the quality of negative reinforcers. The first method (nonpreferred sound assessment) provided evidence that a stimulus is aversive but did not provide evidence that a stimulus would function as a reinforcer nor did it allow us to draw comparisons between reinforcers. For instance, April chose no sound over the sound of a smoke alarm but did not engage in the target response (i.e., card exchange) to terminate the sound suggesting that stimulus did not function as a negative reinforcer even though it was aversive. The second method (negative reinforcer quality assessment) provided evidence (i.e., break points) that allowed us to make comparisons between reinforcers. The third method (negative reinforcer assessment) allowed us to examine whether stimuli functioned as a reinforcers and whether stimuli would support more or less responding than other stimuli. We observed differences between stimuli for Jenny in the negative reinforcer quality assessment but did not observe differences in the negative reinforcer assessment. This suggests the negative reinforcer quality assessment might have been a more sensitive measure of reinforcer quality for Jenny. We observed differences between stimuli for April in the negative reinforcer quality assessment and observed differences in the negative reinforcer assessment. This suggests both the negative reinforcer quality assessment and the negative reinforcer assessment detected differences in reinforcer quality for April.

Differences in results might be due to differences in ranges and means of break points obtained during the negative reinforcer quality assessment. As mentioned earlier, the difference between mean break points for HQE and LQE for Jenny and April were 3.0 and 10.3 respectively, and the ranges of mean break points for all stimuli assessed for Jenny and April were 0 to 8 and 0 to 11 respectively. Differences observed might be due to similarities in reinforcer quality (or preference for the removal of the stimulus) for Jenny. Thus, future research is needed to determine if similarities in reinforcer quality influence the degree to which response differentiation is observed. In other words, do results from the negative reinforcer quality assessment (i.e., similar and different mean break points) predict the outcome of the negative reinforcer assessment (i.e., no differentiation and differentiation)? If similar mean break points do not result differentiation, researchers might set a difference criterion for mean break points between HQE and LQE and assess additional stimuli if a large difference is not observed.

April's results are consistent with research on response differentiation for positive reinforcers of different qualities: when response requirements are low the effects of quality reinforcers do not emerge (i.e., no response differentiation) and when response requirements are high the effects of quality reinforcers emerge (i.e., response differentiation where more responding occurs for high-quality reinforcement). For example, Glover et al. (2008) conducted a study with three children with disabilities. They used a paired-stimulus preference assessment to identify high- and low-preferred (HP and LP, respectively) positive reinforcers to assess under progressive-ratio schedules. Break points were obtained for each stimulus and responding was assessed under FR schedules yoked to the break points as we did in this study. Their research question was whether participants would engage in the maximum number of responses possible per schedule of reinforcement and session time for LP and HP stimuli. They found that all participants responded more during PR analyses for HP stimuli than for LP stimuli. Only one of the three participants engaged in the maximum number of responses possible when presented with the LP stimulus. Important to note is that Glover et al. (2008) observed larger differences in mean break points between HP and LP than we observed for April between the LQE and HQE stimuli. They observed the following differences in mean break points: 13, 21, and 18. The participant for whom a difference of 13 was observed is the participant who engaged in the maximum number of responses for the LP stimulus.

April's results are also consistent with the results of research by Roane et al. (2001). Three individuals with developmental disabilities for whom destructive behavior was observed participated in their study (destructive behavior was not observed for a fourth participant and he did not complete the study; only data for three participants who completed their study are discussed here). They examined whether preference between two stimuli would emerge under increasing response requirements (i.e., progressive-ratio analyses) for stimuli that were ranked similar in preference using a paired-stimulus preference assessment. All participants responded more for one stimulus than the other as response requirements increased.

However, April's results are not consistent with those of Francisco et al. (2008). They examined whether break points would be different for HP and LP stimuli, as ranked using a paired-stimulus preference assessment, when HP and LP were presented concurrently (i.e., both stimuli available in the same session) and whether LP break points would be similar to HP break points when LP is presented alone. Two children with developmental disabilities participated in the PR assessment portion of their study. They observed differences in break points when HP and LP were presented concurrently but did not observe those differences when LP was presented alone. When HP and LP stimuli were presented concurrently, they observed higher responses per min for the HP stimulus; when LP was presented alone responses per min were similar to those observed for HP during concurrent presentation. In the current investigation, all stimuli were presented alone. Jenny's results are more consistent with this research. We observed differences in break points between HQE and LQE as Francisco et al. (2008) observed when HP and LP stimuli were presented concurrently. However, differences in break points between HQE and LQE did not result in differences in responses per min during the reinforcer assessment. One difference between this study and the current investigation is LQE stimuli were those for which the lowest mean break points were obtained (if greater than zero) whereas Francisco et al. (2008) selected LP stimuli that were ranked low in the paired-stimulus preference assessment but did not have the lowest ranking.

A limitation of this investigation is we assessed one class of stimuli (sound) and used fixed-ratio schedules of reinforcement. It is possible that participants habituated to aversive sounds over time. To minimize or slow the effect of habituation, Murphy, McSweeney, Smith, and McComas (2003) suggested using variable-ratio rather than fixed-ratio schedules of reinforcement. Future direction in research might include extending this investigation to include variable-ratio schedules of reinforcement.

Another limitation of this study is we examined one parameter of negative reinforcement (quality). Other parameters of reinforcement include magnitude, immediacy or delay, reinforcer rate, and response effort (see Neef et al., 1994). In the current investigation, reinforcer magnitude might be conceptualized as the volume of the sound. Future research in this area might include manipulating the volume of one sound stimulus to observe the effect on break points. Other research might include manipulating the delay to reinforcement (i.e., delay to removal of the stimulus) to observe the effect on break points.

These results have social and clinical importance. Both participants were referred to participate in this study because, despite a reported history of requesting preferred stimuli and activities, staff of the day program reported participants had no history of requesting to terminate aversive stimuli or nonpreferred activities. Thus, these results contribute to self-advocacy for individuals with disabilities: we taught participants to successfully request for aversive sounds to be terminated. However, it is unclear whether the communication observed in this study will generalize to other contexts. Because we selected participants who did not engage in problem behavior in the presence of loud sounds nor demonstrated a history of engaging in communication responses to terminate aversive stimuli, we limited the number of individuals who might benefit from this study. Specifically, they might have learned to engage in an alternative response that might have decreased inappropriate behavior and increased appropriate behavior in the presence of loud sounds. In addition, it is possible we might have obtained different results for participants with a history of problem behavior in the presence of loud sounds. Escape from loud sounds might be a more effective reinforcer for individuals who engage in problem behavior in the presence of loud sounds. Thus, we might expect more persistent behavior from individuals with a history of problem behavior in the presence of loud sounds. Future researchers might want to include individuals who engage in problem behavior in the presence of loud sounds to benefit the individuals (i.e., teach alternative responses) and to benefit this area of research.

We demonstrated the use of a method to identify preferred and nonpreferred sounds. This method might be used to expand the types of reinforcers used in clinical settings. Sound assessments are not common in the applied literature and might therefore be overlooked in clinical settings. Clinicians might use these procedures to identify preferred and nonpreferred sounds to use in treatment settings. Another important contribution is we observed that even though a stimulus might be perceived as aversive (i.e., no sound is preferred over sound) an individual may not engage in the target response to terminate the sound. That is, the stimulus may not function as a negative reinforcer. For instance, April chose no sound over listening to the sound of the fire alarm but did not engage in the target response to terminate the sound during the negative reinforcer assessment (see *Figures 3* and *6).*

If April's results are replicated in subsequent research, it suggests the possibility that communication responses might be taught to match the quality of the reinforcer (or the intensity of the aversion to the stimulus to be removed). For example, an escape response (e.g., no thanks) can be trained when an individual comes in contact with moderately nonpreferred stimuli (edible) and a different escape response (e.g., please stop) can be trained when a stimulus is highly nonpreferred or aversive (e.g., loud sounds), and another response (e.g., someone is hurting me, please stop) might be trained when serious maltreatment is experienced.

Finally, it is important to understand how negative reinforcement of varying qualities might impact the results of functional analyses. Roscoe et al. (2009) examined the results of functional analyses when low- and high-probability tasks were used in demand conditions. Four individuals diagnosed with autism participated in their study. They found that for three of four participants, when high-probability tasks were in the demand condition, results of the functional analyses were unclear: it was difficult to determine whether the behavior was maintained by escape. On the other hand, when they used low-probability tasks in the demand condition, results were much clearer. They concluded it is possible to obtain false-negative results for escape-maintained problem behavior depending on the demand and participant. If high-quality and low-quality escape can be conceptualized as low- and high-probability tasks, it is possible that using low-quality escape in functional analyses during the demand condition might result in false-negative results. It might be important to extend the research of Roscoe et al. (2009) by using progressive-ratio analyses to assess tasks to be used in demand conditions of functional analyses to determine whether tasks associated with low-quality escape would result in false-negative results.

We demonstrated the use of methods to identify preferred and nonpreferred sounds, which might be used in clinical settings to expand the types of stimuli used in treatment. We also demonstrated the use of progressive-ratio schedules to assess negative reinforcers, which offers another assessment methodology to be considered by clinicians and future researchers. Due to inconsistent results obtained between participants we cannot recommend this assessment methodology as an accurate measure for qualities of negative reinforcers. One consideration for future research in this area relates to Jenny's results: it might be important to introduce more stimuli if large differences in break points are not observed during progressive-ratio analyses or to increase schedule requirements based on mean break point values obtained from a second PR analysis. More research is needed to justify the use of this assessment methodology.

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APPENDIX

Dr. Sarah E. Bloom and Ryan K. Knighton of the Department of Special Education and Rehabilitation will be conducting a study that involves teaching individuals with disabilities to communicate in order to stop something they don't like. Specifically, participants of the study will learn to communicate to turn off sounds during the study. Answers to the questions below will help the researchers know whether you (or the person for whom you are the guardian) would benefit from this study. By answering these question and signing below, you agree to let the Developmental Skills Laboratory release your answers to the researchers named above. You also agree to release your contact information to the researchers. You will be contacted by the researchers to let you know whether you (or the person for whom you are the guardian) will benefit from the study or not. If you (or the person for whom you are the guardian) will benefit from the study, you will be contacted by the researchers to talk more in depth about the study and to obtain consent to participate. (This form does not give consent to participate in the study.)

If you have questions about this research, you may contact Dr. Bloom (sarah.bloom@usu.edu) or Ryan Knighton (ryan.knighton@aggiemail.usu.edu).

Screening Questions

1. (Individual) typically communicates through:

☐ Full or incomplete sentences, either vocally or using sign language (e.g., saying or signing "I want to eat")

☐ One to two words, either vocally or using sign language (e.g., saying or signing "food" or "eat")

☐ Gestures (e.g., pointing to food)

☐ Picture exchange (e.g., PECS)

☐ Other ____

☐ None of the above

2. If he/she is able to communicate by exchanging pictures or gesturing, does he/she do so to communicate when something is annoying or when they want something to stop (e.g., music is playing that isn't liked or music is too loud)?

☐ Yes ☐ No

3. How does he/she typically behave when he/she is around loud sounds (e.g., vacuum cleaner, movie or music playing loudly, applause, thunder)?

☐ Covers ears and/or tries to get away from the sound (e.g., runs, moves out of the room)

☐ Acts aggressively (e.g., pushes, shoves, hits, bites)

☐ Engages in self-injurious behavior (e.g., head hitting, hand mouthing/biting)

☐ Does bother me/does not seem to bother him/her

☐ Other ____

4. Does he/she have any condition that suggests the possibility he/she is sensitive to sound?

☐ Yes ☐ No

<u>Signatures</u> By signing below, I agree that this information may be released to Dr. Sarah E. Bloom and Ryan Knighton.

____

Signature Date

____

Guardian's signature Date

____

Participant's Name and Relationship to Participant

<u>Contact information:</u>

I may be contacted by:

☐ Phone: ________________and/or ☐ Email: ________________________