8-1-2015

COMPUTERIZED BEHAVIORAL SKILLS TRAINING, SELECTION-BASED INSTRUCTION, LAG REINFORCEMENT SCHEDULES, AND THE EMERGENCE OF TOPOGRAPHY-BASED RESPONSES TO INTERVIEW QUESTIONS

John O'Neill
Southern Illinois University Carbondale, john.o.neill@hotmail.com

COMPUTERIZED BEHAVIORAL SKILLS TRAINING, SELECTION-BASED INSTRUCTION, LAG REINFORCEMENT SCHEDULES, AND THE EMERGENCE OF TOPOGRAPHY-BASED RESPONSES TO INTERVIEW QUESTIONS

by

John O'Neill

B.A., University of South Florida St. Petersburg, 2007
M.A., University of South Florida, 2012

A Dissertation
Submitted in Partial Fulfillment of the Requirements for the
Doctorate of Philosophy in Rehabilitation
with a Specialization in Behavior Analysis and Therapy

Department of Rehabilitation
in the Graduate School
Southern Illinois University Carbondale
August 2015

DISSERTATION APPROVAL

COMPUTERIZED BEHAVIORAL SKILLS TRAINING, SELECTION-BASED INSTRUCTION, LAG REINFORCEMENT SCHEDULES, AND THE EMERGENCE OF TOPOGRAPHY-BASED RESPONSES TO INTERVIEW QUESTIONS

by

John O'Neill

A Dissertation Submitted in Partial

Fulfillment of the Requirements

for the Degree of

Doctorate of Philosophy

in the field of Rehabilitation with a specialization in Behavior Analysis and Therapy

Approved by:

Ruth Anne Rehfeldt, Chair

Jonathan Baker

Mark Dixon

Michael May

Joel Ringdahl

Graduate School
Southern Illinois University Carbondale
May 4, 2015

AN ABSTRACT OF THE DISSERTATION OF

JOHN O'NEILL, for the Doctor of Philosophy degree in REHABILITATION WITH A SPECIALIZATION IN BEHAVIOR ANALYSIS AND THERAPY, presented on May 4, 2015, at Southern Illinois University Carbondale.

TITLE: COMPUTERIZED BEHAVIORAL SKILLS TRAINING, SELECTION-BASED INSTRUCTION, LAG REINFORCEMENT SCHEDULES, AND THE EMERGENCE OF TOPOGRAPHY-BASED RESPONSES TO INTERVIEW QUESTIONS

MAJOR PROFESSOR: Dr. Ruth Anne Rehfeldt

This investigation evaluated a computerized behavioral skills training package for teaching responses to interview skills by adolescents and young adults with learning disabilities. The package consisted of instructional videos, video-modeling, rehearsal, feedback, and selection-based instruction.

Experiment 1 replicated and extended recent research which has suggested that a selection-based protocol operating on a lag schedule of reinforcement is an effective and efficient method for teaching responses to interview questions (O'Neill, Blowers, Henson, & Rehfeldt, 2015; O'Neill & Rehfeldt, 2014). The purpose was to address some of the limitations of these studies while testing the limits of the selection-based protocol in promoting topography-based responses to interview questions by adolescents and young adults with learning disabilities.

Experiment 2 evaluated the efficacy of the computerized behavioral skills training protocol while simultaneously comparing the basic package to an identical package plus the selection-based protocol from Experiment 1. This experiment attempted to isolate the additive effect of selection-based instruction from that of computerized behavioral skills training for teaching topography-based responses to interview questions by adolescents and young adults with learning disabilities.

TABLE OF CONTENTS

CHAPTER	PAGE
ABSTRACT	i
LIST OF TABLES	iii
LIST OF FIGURES	iv
CHAPTERS	
CHAPTER 1 – Introduction	1
CHAPTER 2 – Behavioral Skills Training	6
CHAPTER 3 – Verbal Behavior	14
CHAPTER 4 – Creativity and Behavioral Variability	21
CHAPTER 5 – Computer Technology and Learning	27
CHAPTER 6 – Purpose of the Present Study	33
CHAPTER 7 – Method	35
CHAPTER 8 – Results	48
CHAPTER 9 – Discussion	54
REFERENCES	75
APPENDICES	
Appendix A	87
Appendix B	88
Appendix C	89
Appendix D	91
VITA	103

LIST OF TABLES

TABLE PAGE

Table 1 93

LIST OF FIGURES

FIGURE PAGE

Figure 1 94

Figure 2 95

Figure 3 96

Figure 4 97

Figure 5 98

Figure 6 99

Figure 7 100

Figure 8 101

Figure 9 102

CHAPTER 1

INTRODUCTION

According to the American Psychiatric Association, the category of learning disabilities was broadened in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association, 2013) in order to increase diagnostic accuracy and effectively target care. Specific learning disorder is now an overall diagnosis incorporating deficits that impact academic achievement with specification in the areas of reading, mathematics, and written expression. The National Center for Learning Disabilities (NCLD) website (http://ncld.org) reports that 42% (2.4 million) of all students receiving special education are diagnosed with a learning disability. This amounts to approximately 5% of the total public school enrollment in the United States of America. Twenty percent of those students with a learning disability drop out of high school as compared to 8% of students in the general population and among working-age adults, only 55% of those with a learning disability are employed.

The quality of education, training, and various socioeconomic factors surely play a role in acquisition of the initial job interview and then employment. However, the interview process is important because one might possess all the necessary professional attributes and have considerable experience and skills but yet, poorly executed responses to interview questions will fail to convey a satisfactory degree of information about the prospective employee's history. A poorly executed interview may result in an individual being passed over during the hiring process.

In fact, a content analysis conducted by Hollandsworth, Dressel, and Stevens (1977) looked at 338 on-campus interviews across seven interpersonal dimensions: 1. Eye contact was defined as appropriate eye contact when speaking or listening to the interviewer, 2. Loudness of voice was defined as speaking with clarity and appropriately loudness without whispers or shouts, 3. Body posture was defined as sitting erect, using appropriate hand gestures, and facial expressions that were appropriate to the verbal message, 4. Fluency of speech was defined as speaking spontaneously, using words well, and being able to articulate thoughts clearly, 5. Appropriateness of content was defined as responding concisely, cooperating fully in answering questions, stating personal opinions when relevant, and keeping the conversation to the subject at hand, 6. Personal appearance was defined as being neat and clean in appearance and being appropriately dressed, 7. Composure was defined as appearing at ease during the interview while comfortable and relaxed. The authors concluded that appropriateness of content, fluency of speech, and composure were the most important contributing factors in a positive employment decision.

These findings stress the importance of verbal behavior in the interview setting and suggest that verbal responses to interview questions should be a priority and thoroughly trained in any vocational training program. For these reasons, a considerable amount of human resources are committed to teaching appropriate responses to interview questions by individuals with disabilities in the vocational training arena.

The NCLD website recommends that individuals with learning disabilities prepare in advance to answer 18 questions included in a worksheet entitled “Practice Questions for Your Job Interview” (available for download at http://www.ncld.org.php53-22.ord1-1.websitetestlink.com/images/content/files/practice-questions-job-interview.pdf). Questions in this worksheet are separated into three main categories: Applicant, work history, and job/company. There are nine questions related to the applicant: 1. Tell me about yourself, 2.

What are your two greatest strengths? 3. What is your greatest weakness? How do you cope with it? 4. Are you an organized person? What methods of organization work for you? 5. Are you a "team player"? Explain and give some examples. 6. What kind of supervision do you prefer while you're doing your job? 7. How well do you work under pressure? Give an example. 8. Do you think you have leadership potential? Explain. 9. What are your career goals?

Next, there are four questions related to the applicant's work history: 1. Tell me about your last job. 2. Why did you leave your last job? 3. What did you like best about your last job? What did you dislike? Why? 4. What do you consider to be your greatest accomplishment in your previous job?

Finally, there are five questions related to the prospective job and hiring company: 1. Why are you interested in this job? In this company? 2. What do you know about our company? 3. What special talents or skills can you bring to this job? 4. What is your salary requirement? What benefits (for example, medical, dental, vacation time) do you expect? The last section of the worksheet recommends that an interviewee plan to ask questions during an interview that will clarify job details and skills that the interviewer feels are most important to do the job successfully.

The questions listed are not standardized and may or may not be asked by the employer. The worksheet is available as a resource for vocational trainers. However, this worksheet does not provide specific directions on how to answer questions in any of the three sections. There are no instructions or examples of appropriate nor inappropriate responses to any of the questions. Although the worksheet states that interviewees should attempt to find out more about the position by asking questions, it does not specify exactly what information to ask for nor which questions should be asked in order to acquire such information. This means that any individual wishing to educate a person with a learning disability on how to answer interview questions must first have a solid understanding of the interview process and would therefore need to be a seasoned interviewee themselves. In practice, these skills are often taught through repeated face-to-face interactions during which a client completes a worksheet with the guidance and prompting of a vocational counselor or other staff member. This process requires that the vocational counselor or staff member meet with a client either individually or in group format to provide instruction through the methods outlined by their facility.

Schloss, Santoro, Wood, and Bedner (1988) performed a review of the existing literature and recognized that although the social validity of teaching interview skills has been well documented, few studies had attempted to validate effective strategies and technologies for individuals with disabilities. Schloss et al. indicate that the process of preparing individuals to answer interview questions is often time consuming and arduous. Training requires repeated instruction, modeling, rehearsal, and feedback on the part of the vocational development center (VDC).

The practice of Applied Behavior Analysis (ABA) has spearheaded the development of one such teaching technology for skills training. ABA has demonstrated the effectiveness and validity of a behavioral approach to teaching a variety of behaviors, including those relevant to the interview process. The following chapter will outline the history and describe the behavioral approach to skills training, provide a summary of the existing behavioral literature on interview skills, discuss the implications of that literature, as well as explain how and why computer technology should be incorporated into a behavioral approach to teaching responses to interview questions by individuals diagnosed with learning disabilities.

CHAPTER 2

BEHAVIORAL SKILLS TRAINING

Behavioral skills training (BST) is a package of procedures used to teach skills which typically consists of instructions, modeling, rehearsal, reinforcement, and corrective feedback. BST was first evaluated as part of the teaching-family model which was a behavior analytic program designed to improve the conversational skills of adolescents at Achievement Place, a community-based family treatment model for youths located in Lawrence, Kansas. A handful of studies investigated the potential of the model with predelinquent youths at Achievement Place.

Origin of BST

Braukmann, Maloney, Fixsen, Phillips, and Wolf (1974) evaluated the overall validity of a training package for various interview skills across three experiments. Diagnoses of participants were not specified in any of the three experiments but all were adolescent males recruited from the Achievement Place. Experiment 1 evaluated the general effectiveness of a 45 min training package for two male participants who were 15 or 16 years of age. Four groups of behavior were measured: social behaviors, personal appearance, volunteering of information, and posture. The package consisted of the trainer reading each instruction to the participant, demonstrating the behavior, practicing the appropriate behavior on the part of the participant, and the trainer providing feedback concerning the correctness of participant responses. Increases over pretest were observed in the percentage of appropriate behaviors during staged interviews at posttest. In Experiment 2, the validity of behavioral definitions was examined and a component analysis of the training package was conducted. The same four groups of behavior were recorded with the addition of eye contact with the interviewer being recorded. The purpose was to assess the independence of the interview behaviors from one another as well as the effectiveness of each component of the training package for one new male participant who was 14 years of age. The authors concluded that the behaviors were independent of each other, with the exception of posture and eye contact and that each component of the training package was effective in increasing performance in each of the behaviors measured. In Experiment 3, the effects of the training package were replicated to see if naïve trainers could teach the skills to three new male participants who were 12 to 16 years of age. Across three studies, the authors concluded that the training package was effective in producing the desired behavior change with the possible exception of the component for volunteering of information. They concluded that the behaviors measured were independent, except posture and eye contact, and that naive trainers were as effective as the experimenters when implementing the training package.

Maloney et al. (1976) used a similar training package to increase conversation-related behaviors (i.e., answer-volunteering in response to questions), including three nonverbal conversational components ("hand on face", "hand at rest", and "facial orientation"). Four predelinquent female youths at Achievment Place were exposed to the training package in a multiple-baseline design across youths and behaviors. The study reports that training sessions were led by either a "teaching-parent" (specially trained houseparent) or by participating girls. Points were delivered a consequence when a participant met predetermined behavioral criteria with respect to conversation-related behaviors. Results suggested that the training was effective in increasing behaviors and that participating girls could assist in the training of others.

Minkin et al. (1976) employed a training consisting of instructions with rationale, demonstration, and practice with feedback. A multiple-baseline design across the behaviors of asking questions and providing positive feedback by four girls who used these behaviors minimally at Achievement Place. Adult judges were employed to rate skills in pre- and posttraining conversations of the four girls, five junior high-school peers, and five university students. Results suggest that, after training, the four girls' conversational abilities were rated substantially higher than those of their junior high-school peers.

These studies are considered the first evaluations of BST as part of a behavior analytic program designed to improve conversational skills which led to a behavioral analytic approach to teaching interview skills.

BST for Interview Skills

In a series of studies conducted by Kelly and associates, a small group format was utilized to teach interviewing skills. Furman, Geller, Simon, and Kelly (1979) used a behavioral rehearsal procedure to increase positive comments about work experience, employment interest, and asking relevant questions during role-play interviews with three psychiatric patients. This study suggests that rehearsal procedures may be an effective component of BST for some interview skills. Kelly, Laughlin, Claiborne, and Patterson (1979) used behavioral group training sessions that consisted of instructions, modeling, and in-group rehearsal of job interview behaviors. The training was successful in increasing the frequency of various appropriate job interview behaviors among formerly hospitalized aftercare patients. All participants showed evidence of increased interviewing skills during role-play job interviews and most participants obtained employment after training. Kelly, Wildman, and Burler (1980) implemented a treatment package consisting of small behavioral group sessions for interviewing skills using instructions, modeling, and rehearsal with four adolescents (14 to 16 years) with mild-moderate intellectual disability. The procedures were aimed at increasing the adolescent’s ability to provide positive information about their work-related experience, to convey their interest in the position, and to ask relevant questions during an interview. Sessions lasted 45 min and were conducted three times per week for six weeks. The authors reported increases in ratings of performance during role-play job interviews and in vivo generalization job interviews. This study demonstrated that interview skills learned during BST may generalize to actual job interviews.

Hall et al. (1980) were successful in using a BST package consisting of instructions, modeling, role playing, and positive and corrective feedback to teach interview skills to six females with mild to moderate intellectual disability ranging from 19 to 41 years old. IQ scores ranged from the low fifties to mid seventies with a mean of 61. Target behaviors included appropriate vocal rate, tone of voice, and asking and answering questions appropriately. All participants showed improvement in these areas and limited generalization was reported in this study for three of the six participants across settings and interviewers. Generalization probes were conducted in an unfamiliar office and with an unfamiliar interviewer.

Matthews and Fawcett (1984) were successful in employing BST to teach job application completion and resume writing skills to adolescents with a learning disability. The instructional materials contained written specification of the behaviors, examples of appropriate task performance, and a rationale for each task. Trainees then practiced each task and received feedback from an experimenter on the accuracy of their performance until the trainee met criterion. An average of 2.5 hours of instructor time was required for each trainee to complete the BST sequence.

Schloss et al. (1988) taught interview skills to two adult females with intellectual disabilities using a BST package consisting of instruction, rehearsal, and feedback. The study contrasted peer-directed instruction with teacher-directed instruction and found that both strategies were effective regardless of who provided the instruction. However, the authors did note that the peer-directed procedure involved less staff time than the teacher-directed procedure.

Mozingo, Ackley, and Bailey (1994) employed a job interview skills training package consisting of direct training by staff, a job coach, and a behavior analyst. The study was successful in teaching responses that were considered highly beneficial by the hiring community.

These experiments suggest that BST is a useful tool for teaching interviewing skills and other related behaviors to individuals with intellectual disabilities. Based on the existing literature reviewed here, it can be expected that effective BST sessions will last at least 45 min and that participants will require multiple administrations.

BST packages have since developed and been shown to be effective in teaching various behaviors: picture exchange communication system (PECS; Rosales, Stone, & Rehfeldt, 2009), discrete-trial teaching (DTT; Sarokoff & Sturmey, 2004), natural language paradigm (NLP; Seiverling, Pantelides, Ruiz, & Sturmey, 2010), guided compliance (Miles & Wilder, 2009), preventative safety skills (Miltenberger et al., 2004), functional analyses (Iwata et al., 2000), oral care procedures (Tufenk, Rehfeldt, DeMattei, & O'Neill, in press), and social skills (Nuernberger, Ringdahl, Vargo, Crumpecker, & Gunnarsson, 2013). With the validity of BST packages well established, researchers have conducted inquiries into the effects of the individual components of BST. It was not clear which components of the prior BST protocols were most effective in teaching interviewing behaviors but research involving component analyses of BST for unrelated behaviors suggest that some components may be more effective than others.

Components of BST

Feldman, Case, Rincover, Towns, and Betel (1989) evaluated the effectiveness of instructions alone as compared to instructions, modeling, rehearsal, and feedback to teach parenting skills (i.e., responsiveness to children) to individual with developmental disabilities.

The authors suggested that verbal instructions alone did not have a large impact on parental responsiveness and required the addition of modeling, rehearsal, and feedback.

Similarly, Krumhus and Malott (1980) found that instructions were not sufficient to teach university students to provide social reinforcement during tutoring sessions. These authors suggested that the modeling component substantially improved performance but were unable to isolate and draw definitive conclusions about the effects of the feedback component.

Hudson (1982) found that parent teaching skills and the number of programs mastered by their children with developmental disabilities were significantly greater for a BST group than a group that received only verbal instructions and another which received verbal instructions with a general description of behavioral procedures. These results were seen as evidence that instructional components were not as effective as instruction combined with the modeling, feedback, and rehearsal components of the package.

With mounting evidence to suggest that the instruction component may not be effective or sufficient to promote skill acquisition, Ward-Horner and Sturmey (2012) employed an alternating-treatment design in order to evaluate the independent effects of modeling, rehearsal, and feedback components of a BST package for training teachers to implement conditions of a functional analysis. The authors concluded that rehearsal was ineffective while feedback, and to a lesser extent, modeling were the effective components of the BST package.

Kornacki, Ringdahl, Sjostrom, and Nuernberger (2013) performed a component analysis of a conversation-based BST package to teach conversation skills to young adults with autism and other developmental disabilities. The package included instructions, modeling of appropriate conversation, rehearsal, and feedback for vocal and non-vocal conversation skills including comments related to the conversation topic. The BST package was generally effective but results suggested that the necessary components of BST in teaching such skills may differ across individuals. In other words, the effectiveness of each BST component varied across individuals.

Finally, in situ training (IST) can be incorporated with the components of BST and is typically conducted when a participant fails to demonstrate a skill during an in situ assessment. IST involves corrective feedback and reinforcement delivered in the desired context for the behavior of interest and has been found to be effective in promoting generalization in a number studies (e.g., Gatheridge et al., 2004; Himle et al.; Johnson et al., 2005, 2006; Miltenberger et al.,1999, 2004). IST has also been suggested as a procedure that can promote maintenance of skills beyond the experimental setting (Johnson et al., 2006).

Incorporating Technology into BST

As mentioned previously, the process of repeated instruction, modeling, rehearsal, and feedback can be time consuming and arduous for staff (Schloss et al., 1988). Video-modeling is one technology that has become increasingly common and has been shown to increase procedural implementation of instructional content when incorporated into BST (Catania, Almeida, Liu-Constant, & DiGennaro-Reed, 2009). Video modeling plus rehearsal and feedback have been shown to be effective in teaching abduction-prevention skills in children (Carroll-Rowan & Miltenberger, 1994; Poche et al., 1988). Beck and Miltenberger (2009) have suggested that video-only treatments may be ineffective, perhaps due to the lack of corrective feedback and reinforcement.

One study has evaluated the effects of a computerized BST (CBST) package on the acquisition, maintenance, and generalization of safety skills using a computer game with interactive components (Vanselow & Hanley, 2014). Participants did not correctly self-protect from dangers until IST was included in the CBST while performance did generalize to similar dangers that were not exposed to IST. The authors suggested that CBST, when combined with in-situ training, may be an acceptable substitute for the more traditional delivery of BST.

The continued inclusion of technologies in the delivery of BST is essential to behavior analysis if the field intends to position itself at the forefront of the learning sciences. Video recordings, computer games, and online learning environments might have the potential to decrease the amount of staff time and resources involved in the delivery of BST. For example, online or computerized BST packages could be implemented with little effort on the part of staff and allow the learner to receive instruction, modeling, rehearsal, and feedback while navigating the material at their own pace in much the same way as a teaching machine (Skinner, 1958), PSI (keller, 1968) or CAPSI (Pear & Martin, 2004). The most difficult component of BST to translate into a computerized modality is of course feedback, which traditionally, has been delivered in a face-to-face fashion by staff or experimenter.

One such technology that will allow for such a translation has been available to behavior analysts for decades and is yet to receive attention in the literature on BST. This efficient and effective technology is found within an analysis of the different types of verbal behavior. Verbal behavior is often crucial when learning complex communication skills, such as responses to interview questions and has been suggested as one of the most critical components of the interview process (Hollandsworth, Dressel, & Stevens, 1977). The next chapter outlines the distinction between two types of verbal behavior and discusses the relevance and implications of making this distinction.

CHAPTER 3

VERBAL BEHAVIOR

Verbal behavior has been defined as behavior that is reinforced through the mediation of another person, a listener, who has been conditioned precisely in order to reinforce the behavior of the speaker (Skinner, 1957, p. 14 & p. 225). Skinner further distinguished between six elementary verbal operants: echoic, mand, tact, textual, transcription, and intraverbal behavior. For the purposes of the present analyses, an examination of the intraverbal operant will be necessary.

Intraverbal behavior (Skinner, 1957, p. 71) is further defined as a verbal operant evoked by a verbal discriminative stimulus and that does not have point-to-point correspondence with that verbal stimulus and that is followed by generalized conditioned reinforcement. Over time, intraverbal behaviors develop through both consistent and conflicting contingencies. That is, many different responses can be brought under the control of a particular stimulus word or phrase and many stimuli can control a single response. For example, a question such as “how are you feeling?” is likely to evoke very different responses depending on a person’s recent experience. On the other hand, questions such as “are you okay?”, “are you happy?”, and “are you sad?” might evoke the same response (e.g., “yes”) depending on a person’s recent experience.

Another factor to consider when dealing with intraverbal behavior is that through stimulus generalization, novel stimuli can come to evoke intraverbal responses due to their similarity to other stimuli. To build upon a previous example, the novel question “are you feeling okay?” might evoke the same “yes” response due to the similarity of the questions. The intraverbal unit can be as small as an individual sound such as a letter in the alphabet or may contain many words as seen in responses to questions. Skinner devoted only nine pages of his treatment of verbal behavior to the intraverbal operant (Skinnner, 1957, pp. 71-80) despite noting their importance in sustained speech. In this way, intraverbal behavior often functions as a response to a question and therefore plays an important role in the interview process.

Two Types of Verbal Behavior

Michael (1985) identified two types of verbal behavior: Selection-based (SB) and topography-based (TB). The former requires an effective scanning repertoire, a subsequent conditional discrimination between stimuli, and no point-to-point correspondence between the response form and the response product (e.g., choosing the correct answer during a multiple-choice examination). SB responses can be as simple as pointing to a stimulus or clicking a button on a computer screen. In comparison, the latter involves an increase in the strength of a distinguishable topography given some specific controlling variable, and point-to-point correspondence between the response form and the response product (e.g., providing the correct answer during an oral examination). TB responses are usually more complex in that they typically involve a larger degree of response effort and discrimination than SB responses. Since Michael's seminal paper on the topic, researchers have continued to clarify the distinction between SB and TB verbal behavior.

Bristow and Fristoe (1984) trained 20 typically developing children with an average age 8.2 years old to select a particular picture when presented with auditory nonsense words. Ten participants in the first group were required to emit manual signs for six words when sample stimuli were presented (TB condition) and later learned to select symbols from an array for six other words (SB condition). Ten participants in the second group received similar training except that the pictures used in each condition and the order of SB and TB training were counterbalanced. The authors report that TB responses were acquired slightly more readily and with higher accuracy on all tests.

Hodges and Schwethelm (1984) examined the difference between acquiring signs (TB) or matching-to-sample (SB) by 52 children with profound intellectual disabilities with an average age of 12 years. Participants were shown objects as sample stimuli. In both conditions, the researcher modeled the correct response but trained mands in the TB condition and tacts in the SB condition. The authors report that participants learned more responses and did so faster in the TB mand condition as compared to the SB tact condition. Unfortunately, it is unclear how the results were affected by training different verbal operants in each condition.

Sundberg and Sundberg (1990) examined the differences in acquisition and accuracy between the SB and TB verbal behavior of four adults (33 to 50 years of age) with mild to moderate intellectual disability. The SB condition involved matching-to-sample training while the TB condition involved manual sign training. The researchers reported faster acquisition and higher accuracy for TB tact and intraverbal responses with mediating TB responses during an equivalence test.

Wraikat (1990) taught five adults with mild/moderate developmental disabilities to select from an array of symbols (SB) or to emit a manual sign (TB) when presented with an object or nonsense syllable. Results suggested that participants acquired responses faster and more accurately in the TB condition. The authors also noted that participants were more attentive during the TB condition and sometimes engaged in vocalization prior to emitting a manual sign.

Wraikat, Sundberg and Michael (1991) used procedures similar to Sundberg and Sundberg (1990) and Wraikat (1990) studies with the addition of an equivalence test. Seven individuals (26 to 50 years of age) diagnosed with a developmental disability and moderate to profound intellectual disabilities participated. Results again indicated faster acquisition and more accurate responding on all tests in the TB condition. The researchers report that participants were more engaged in the TB conditions.

Stratton (1992) examined the effects of stimulus set size and SB or TB conditions in 28 college students. In the SB condition, participants were asked to select a written Japanese character after being presented with an English word on a computer screen by clicking on the appropriate character in an array of either five or twenty. In the TB condition, participants were instead required to say the matching Japanese word when shown an English word on the computer screen. Results indicated that the only difference between SB and TB conditions occurred when the stimulus set size was 20, in favor of the SB condition. However, it was reported that participants were likely engaging in covert TB responding during the SB task.

Wallender (1993) extended the research of Stratton (1992) by examining the effect of familiar and unfamiliar sample stimuli on SB matching-to-sample performance. Twenty college students were required to select the appropriate Japanese Kanji characters when presented with either an English animal name (familiar group) or a Japanese Katakana character (unfamiliar group). Results indicated much faster acquisition of responses when English words (familiar) were used as sample stimuli and no difference in reaction times between conditions. The authors suggested that familiar stimuli made the task easier but did not specify why such an effect might occur.

Cresson (1994) compared SB and TB response acquisition in 16 college students. The order of conditions was randomly assigned to each participant in order to control for sequence effects. In the SB condition, participants were required to select a Japanese Katakana character from an array in the presence of an auditory nonsense syllable or visual pattern. In the TB condition, participants were required to write the Katakana character which matched in the presence of a nonsense sound or visual pattern. An equivalence test was also conducted in which participants heard the nonsense sounds and were required to select from an array of the visual patterns. The results suggested better TB performance across all tests.

Tan, Bredin, Polson, Grabavac and Parsons (1995) required eight college students to provide SB and TB response in the presence of sample stimuli (French words). The SB condition required participants to select English words from an array while the TB condition required participants to type English words in response. The results suggested that responses were acquired in both conditions with no noticeable difference between the two. However, the TB condition employed by the researchers relied heavily upon a SB component (i.e., typing) which may have affected the findings to some degree because it was not an exclusively TB response.

Potter, Huber, and Michael (1997) found that participants preferred SB tasks which incorporated a TB component when taught relations between sample stimuli consisting of flag-like patterns and comparison stimuli consisting of dot patterns. These researchers found that participants engaged in consistent vocal-verbal responding (i.e., problem-solving) during both SB tasks and SB tasks with a TB component. This finding was seen as support for the notion that some SB conditional discriminations, and emergent equivalence relations, are promoted by TB vocal-verbal responding in individuals with extensive verbal repertoires. That is to say that overt problem solving strategies might accompany SB conditional discriminations.

In review of the aforementioned studies, Potter and Brown (1997) have suggested TB responses are acquired more readily than SB responses and that, in fact, TB responses might promote the acquisition of SB responses in some contexts, especially in participants with extensive verbal repertoires. These authors note that although SB responses appear easier at face value, the existing literature suggests that this assumption may not hold true. SB responses often depend on technological assistance (e.g., typing) or some sort of hardware (e.g., cards) at a minimum. It is possible that SB tasks are less likely to evoke the verbal behavior of talking to oneself than TB tasks but it is likely that typically functioning adults engage in covert TB responses during SB tasks (e.g., multiple-choice examinations).

Polson and Parsons (2000) commented on the concerns associated with ignoring the SB versus TB distinction and cautioned researchers on the use of SB matching-to-sample (MTS) tasks. Perhaps most important, is the potential for a unique property (e.g., a single word) of a complex stimulus (e.g., answers to questions) to acquire control over responding due to nature of SB responding. When this occurs, it is unlikely that generalized TB responses will have the necessary point-to-point correspondence with the targeted choice stimuli. For example, responses controlled by a unique property may suffice in providing an "accurate" answer during a multiple-choice examination but fall short during a short-answer examination because only that unique property would emerge as the response. It is therefore beneficial to take steps to ensure that responses come under the control of the appropriate variables.

Multiple Control of Verbal Behavior

Skinner (1957, p. 227) noted in a chapter on multiple control that the strength of a single verbal response may be a function of more than one variable and that a single variable can affect more than one response. Verbal stimuli can evoke many different intraverbal responses from different people as well as many different responses from the same person. For example, "where are you from?" will evoke various responses from different people and "What time is it?" will evoke various responses from the same person at different points in the day. These questions might also evoke different responses depending on the audience present. For example, responses in the presence of an English-speaking audience will differ than those in the presence of a French-speaking audience. Skinner notes that in attempting to predict or control intraverbal behavior, it is especially important to consider all relevant variables due to the influences of multiple control.

Michael, Palmer, and Sundberg (2011) have since defined two types of multiple control: convergent multiple control is the term used when the control of a single response is exerted by more than one variable (e.g., stimulus generalization). Divergent multiple control is the strengthening of more than one response by a single variable (e.g., response generalization). For example, divergent multiple control might occur when a single question comes to evoke multiple answers while convergent multiple control might occur when a single answer is evoked by multiple questions. See Figure 1 for a diagram of convergent and divergent multiple control.

The multiple control of verbal behavior can account for some aspects of behavioral variability by demonstrating that multiple variables can be brought to bear on a single response. In this case, some dimension of the response might vary depending on how many variables are involved. On the other hand, variability can emerge when a number of different responses are strengthened by a single variable. The next chapter outlines other sources of behavioral variability and discuss one method in particular that can be used to promote varied responses.

CHAPTER 4

CREATIVITY AND BEHAVIORAL VARIABILITY

Creativity as an attribute of employers is sought after in the workplace but attempts to identify and measure creative work-related behaviors are often met with difficulty. Torrance (1966) identified four components of creative thinking: (a) Fluency: the production of large numbers of ideas; (b) flexibility: the production of a large variety of ideas; (c) elaboration: the development, embellishment, or filling out of an idea; and (d) originality: the use of ideas that are not obvious or banal, or are statistically infrequent. In addition, Campbell (1960) has suggested that creativity necessitates random variation because a truly novel response cannot be anticipated.

Neuringer (2009) has suggested that variability is, in fact, a dimension of behavior similar to other "operant dimensions," such as topography, location, speed, and force. In other words, the degree of variability across a set of responses can be predicted and influenced through behavioral procedures. Neuringer (2003) identified three sources that influence behavioral variability: (a) Decreases through states of illness and well-being (e.g., stereotypy), (b) increases resulting from a sudden decrease in reinforcement (e.g., extinction bursts), and (c) increases resulting from direct reinforcement (e.g. response classes). One type of procedure is the direct reinforcement of variability through the lag *n* reinforcement schedule. In a lag reinforcement schedule, *n* represents the number of previous responses from which the current response must differ in order to contact reinforcement (Page & Neuringer, 1985). The aforementioned study demonstrated that pigeons could meet lag contingencies by distributing left (L) and right (R) pecking responses in an unpredictable manner. Each trial consisted of eight pecks (e.g., LRLRLRLR) and in order for reinforcement (food) to be delivered, the current pattern of eight responses across the two keys had to differ from the patterns of responses in a given number of previous trials. This study demonstrated that variable behavior can be reinforced to approach stochastic responding and that contingencies as high as lag 50 can be met, at least in pigeons. During lag 50 trials, the current eight response sequence (e.g., LLLLRRRR) would have to differ from the previous 50 sets of eight response sequences in order to contact reinforcement.

Prior to the introduction of lag reinforcement schedules, variability was evoked in human studies of behavior through the differential reinforcement of response topographies. A number of "creative" tasks were employed to demonstrate variability. For example, Goetz and Baer (1973) employed differential descriptive reinforcement for different block structures and reported increases within and across sessions for the response diversity of three typically functioning 4-year-old females. Parenthetically, Napolitano, Smith, Zarcone, Goodkin, and McAdam (2010) have since extended that study through the addition of a lag 1 reinforcement schedule, tangible reinforcement, modeling, and prompts to ''build differently''. Increased diversity of block-building responses was reported for one female and five males (ages 6 to 10) with an autism spectrum disorder.

Other researchers have demonstrated behavior variability through a task that is traditionally viewed as being inherently creative. Ryan and Winston (1978) demonstrated differential reinforcement of higher rates of drawing forms and colors in the responses of three 5-7 year-old females with high interests in drawing. Other researchers have suggested the utility of general and descriptive reinforcement in promoting "creative" drawing behavior (Goetz & Salmonson, 1972; Fallen & Goetz, 1975). It is important to note that we often assign a creative attribute to artists when their work exhibits an apparent departure from the popular style. However, careful examination of the artist's history will often unveil the contingencies and rules involved in the production of their work. Scientific inquiry is no different (Skinner, 1957). For these reasons, the variables involved in the production of “creative” behavior are often overlooked. The result of which is the development of tests for the creative attributes instead of studying the conditions under which creative behaviors develop.

Recent attempts to promote variability in responding have examined the effects of lag reinforcement schedules on verbal behavior. Lee, McComas, and Jawor (2002) compared differential reinforcement of appropriate responses (DRA) to a lag 1 reinforcement schedule plus DRA for responses to social questions (‘‘What do you like to do?” & “How are you?”). Participants were two 7-year-old males and one 27-year-old male with autism. The authors reported higher variability of appropriate verbal responding during the lag condition for two out of three participants. However, the authors noted that the presence of preferred stimuli was not controlled and may have influenced responding.

To address this limitation, Lee and Sturmey (2006) compared DRA to DRA plus lag 1 plus alternating percentages of preferred items with three 17-18 year-old adolescents with autism. The authors reported that the presence of preferred tangible stimuli alone was insufficient as an explanation for variable responding and suggested that the lag reinforcement schedule was necessary to evoke varied responses to a social question (“What do you like to do?”).

Esch, Esch, and Love (2009) employed a multiple baseline combined with a reversal design to demonstrate that lag reinforcement could be used to promote variable vocal responses in two nonverbal children (ages 2 & 7) diagnosed with autism. Vocal response variability was measured by the correspondence (or lack thereof) of a response to the response topography emitted in the preceding trial (i.e., lag 1). Results suggest that a lag 1 reinforcement schedule may be an effective tool for strengthening the variability of vocal repertoires in severely speech-impaired children.

Susa and Schlinger (2012) employed a changing criterion design to evoke varied responses to a social question. Prompts for varied responses were provided contingent upon incorrect responses and were faded during the first session of each lag condition. Results suggested increased variability in responding with each successive lag criterion (i.e., lag 1-3) and resulted in the acquisition of three novel responses to a social question (i.e., "How are you?") by a seven-year-old male with autism.

Heldt and Schlinger (2012) implemented a lag reinforcement schedule for the tact responses of two children (ages 4 & 13). One participant was diagnosed with autism and Fragile X Syndrome, the other with a mild intellectual disability. Results suggest that the frequency of novel tact responses increased with exposure to the lag 3 reinforcement schedule. Probes were conducted in order to assess for maintenance and indicated that novel tact responses were emitted at 3-week follow-up.

Koehler-Platten, Grow, Schulze, and Bertone (2013) extended the work of Esch, Esch, and Love (2009) by evaluating the effects of a lag 1 reinforcement schedule on the vocal variability across three children (2 to 6 years of age) diagnosed with autism. In this study, the authors narrowed the definition of variability to responses that included novel phonemes. Results suggest that cumulative number of novel phonemes, percentage of trials with variability, and the number of different phonemes emitted per session increased during the lag 1 intervention for two of the three participants.

Lee & Sturmey (2014) evaluated the use of a script-fading procedure and a lag 1 reinforcement schedule during brief conversations by three children diagnosed with autism using a multiple-baseline design. Scripting and script-fading involved audio taped models for participants to imitate in response to antecedents provided by the experimenter during conversations. Results suggest that participant's appropriate responding increased in variability when the lag 1 reinforcement schedule was in place and the experimenters report similar results for scripting. Generalization of varied responding to different settings, people, and conversations was not apparent.

These findings suggest that lag reinforcement schedules are effective in promoting varied verbal responses. However, the potential for lag reinforcement schedules to promote the emergence of variable verbal responses in adults has received little attention.

A Problem with Schedules of Reinforcement

In response to psychologists who asserted that all human behavior is rule-governed, Skinner (1966) distinguished between behavior in direct contact with environmental contingencies and behavior in contact with verbal descriptions of those contingencies (i.e., rules). Skinner asserted that rule-governed behavior may be established by the verbal communities precisely because it is insensitive to contingencies. It stands to reason that verbal responding in adults might be more likely to be labeled as unscripted or "creative" because the effects of schedules of reinforcement are clouded by rules.

In fact, Hayes, Brownstein, Haas, and Greenway (1986) have suggested that the specificity of a rule provided during an experiment can affect the degree of sensitivity to contingencies. The authors suggest that general instructions will typically promote sensitivity to contingencies while explicit instructions do not. In determining whether a behavior is contingency-shaped or rule-governed, the authors suggest that only behavior that is reliably sensitive to changes in contingencies should be considered solely contingency-shaped. In support, Shimoff, Matthews, and Catania (1986) have provided evidence that apparent contingency-shaped behavior in verbal adults may in fact be influenced by rules and exhibit pseudo-sensitivity. Rules are likely to play an important role in the development of variable behavior of verbal adults when lag reinforcement schedules are in effect. For example, the rule “I should provide a different answer this time” does not specify the number of responses to which the current response should differ. This lack of specificity may not interfere with a lag 1 reinforcement schedule is likely to interfere with a lag 2 or lag 3 reinforcement schedule. However, responses to interview questions might benefit from the interaction of rules and lag reinforcement schedules if responses contain various details which are not readily apparent through visual inspection of the person’s application materials.

Applied research has focused on manual arrangement of lag reinforcement schedules. In order to include lag reinforcement schedules when teaching responses to interview questions, the programming of stimuli and the delivery of consequences will need to be automated. The next chapter discusses how lag reinforcement schedules can be incorporated into a computer program using SB responding.

CHAPTER 5

COMPUTER TECHNOLOGY AND LEARNING

In recent decades, a shift in the prominent pedagogical paradigm has led to the development of evidence-based approaches which stray from the traditional instruction-based learning approaches. For example, learner-centered teaching (Weimer, 2002) has emphasized the role of teachers as guides, facilitators, and designers of learning experiences in order to improve learning outcomes. Flipped Learning (Bergmann & Sams, 2014) is an approach to teaching in which students typically view lectures via video recordings outside the classroom; this allows the instructor to spend less time lecturing during face-to-face time and focus more on activities that will enhance the students' knowledge and skill. Another popular approach is problem-based learning (PBL) (Barrows, 1996). In PBL, problems form the organizational focus and act as a vehicle for teachers to facilitate and guide learning. The common denominator of these contemporary approaches is a trend towards the role of the learner as an active and engaged participant in the instruction process. Another aspect of the pedagogical paradigm shift in higher education has been an increase in the accessibility of learning technologies which has led to the development of what might be termed technology-enabled learning.

Technology-enabled learning (Ertmera & Ottenbreit-Leftwichb, 2013) is a term for the pedagogical approach pioneered by Jonassen (1996) in which teachers are encouraged to use technologies beyond their typical functions in order to engage students. According to Jonassen and Reeves (1996), technology is best employed when students, not teachers, use it as a tool to access, analyze, interpret, and transform information so they might then share their knowledge with others. Technologies such as email, listservs, blogs, and a host of social networking tools can be used in this respect. Much can be accomplished in the present day by incorporating the latest technology and online education has become very popular, but there is still a need to identify the most effective mechanisms for producing learning outcomes.

The notion of a paradigm shift in an approach to learning is nothing new to behavior analysts. Skinner's (1958) teaching machines were an attempt to incorporate technology that could arrange the optimal conditions for self-instruction. Teaching machines functioned in much the same way that a private tutor might; by evoking specific forms of behavior, which were then differentially reinforced and brought under the control of specific stimuli. At their own pace, the learner worked through sets of interrelated "frames" for a particular concept with little to no errors in the process.

The personalized system of instruction (PSI) (Keller, 1968) was another departure from the traditional role of the student as a passive receiver of information to that of an active participant in the instructional process. The role of the teacher became that of a facilitator of learning in others through the management of instructional contingencies. In recent decades, research based on Keller's premise has led to the development of a computer-aided personalized system of instruction (CAPSI) (Pear & Martin, 2004) which combines classroom instruction with web-based learning. With an emphasis on discovering and controlling the variables of which learning is a function (Skinner), behavior analysts are poised to be involved in the evaluation of the optimal conditions under which technology-enabled learning occurs.

Technology-Enabled Applications of SB Responding

A common application of SB technology-enabled learning is often utilized by researchers of the stimulus equivalence paradigm. Stimulus equivalence is a behavioral strategy for teaching that involves direct training on certain relations among instructional stimuli which results in the emergence of untrained relations among those stimuli (Sidman, 1994). The procedure typically involves the programming of a sample stimulus and multiple comparison stimuli from which a selection is to be made. The earliest studies focused on the promotion of simple reading skills while recent research has demonstrated that equivalence procedures can be effective in teaching more complex skills. Among the many applications of stimulus equivalence, a handful of studies are dedicated to improving the methods employed in higher education. Rehfeldt (2011) has suggested that if the SB stimulus equivalence paradigm is to mature and have a lasting impression on educational practice, research on the development of complex behavior is warranted.

To that end, studies have demonstrated the success of instruction with SB stimulus equivalence protocols in the teaching of advanced mathematical functions (e.g., Fields et al., 2009; Ninness et al., 2005, 2006, 2009), brain region-behavior relations (Fienup, Covey, & Critchfield, 2010), and various other complex verbal skills.

Walker, Rehfeldt, and Ninness (2010) taught SB intraverbal (i.e., a verbal operant evoked by a verbal discriminative stimulus, does not have point-to-point correspondence or formal similarity with that verbal stimulus, and is followed by generalized conditioned reinforcement) relations to promote identification of disease-related terminology (i.e., disease names-definitions, disease names-primary causes, and primary causes-treatments) using multiple-choice worksheets and showed that untaught vocal intraverbal responses and untaught written intraverbal responses emerged during posttests.

Lovett, Rehfeldt, Garcia, and Dunning (2011) showed the emergence of untaught TB tact (i.e., a verbal operant evoked by a nonverbal discriminative stimulus and followed by generalized conditioned reinforcement) responses after SB training in the identification of single-subject experimental design concepts (i.e., design names-definitions, design names-design graphs, & design names-clinical vignettes).

Walker and Rehfeldt (2012) used a computerized equivalence protocol to teach similar relations to Lovett, Rehfeldt, Garcia, and Dunning (2011) and showed the emergence of written TB intraverbals and generalization of the relations to novel graphs and novel clinical vignettes. Together, these results suggest that emergent skills resulting from SB protocols may generalize to novel response topographies when such complex stimuli such as disease terminology and experimental designs are involved.

Another example is provided by O'Neill, Rehfeldt, Muñoz, Ninness, & Mellor (in press). The purpose was to compare the effect of a stimulus equivalence procedure to that of a traditional study method when learning Skinner's taxonomy of verbal behavior. Specifically, the SB stimulus equivalence paradigm was used to teach relations among elementary operant names, antecedents, consequences, and examples of each operant. A comparison group read a chapter from a popular first rate textbook. The authors tested for the emergence of SB and TB intraverbal responses as well as generalization to novel stimuli. On average, the Equivalence group performed at a level which was 10 percentage points (i.e., a full letter grade) above that of the Reading group suggesting that SB equivalence procedures might be a viable alternative to traditional study habits.

SB Responding to Interview Questions

O'Neill and Rehfeldt (2014) suggested that 1 h of exposure to a SB protocol was sufficient to promote TB intraverbal responses in two individuals with a learning disability. The program operated on a lag 1 reinforcement schedule which was incorporated in order to promote divergent multiple control of variable SB responses by each of three typical interview questions.

In other words, participants learned multiple TB responses to each interview question through practice facilitated by the SB protocol. The authors suggested that convergent multiple control was exerted by the components of the program, rendering the necessary and sufficient components unclear. The program consisted of a SB (i.e., multiple-choice), audio (i.e., recordings of questions and feedback), and TB (i.e., saying the multiple-choice selection out loud) component. The study reported some evidence of maintenance and generalization to a novel setting and interviewer.

In a follow-up analysis, O'Neill, Blowers, Henson, and Rehfeldt (2015) examined the additive effects of the SB, audio, and TB components of the same program. The authors concluded that a SB protocol for responses to interview questions should include a TB component and that lag reinforcement schedules can be useful in promoting variable responding during SB Instruction. An explanation for the increased effectiveness of the additive conditions is found in an analysis of the multiple control of verbal behavior. Similar to the findings of O'Neill and Rehfledt (2014), divergent multiple control was apparent in that each target question came to evoke multiple accurate responses promoted by the lag reinforcement schedule. The authors argue that during the SB only condition, convergent multiple control over SB responding was exerted by accurate response options, resulting in a narrowly-defined response class. In other words, multiple responses options were brought to bear on the SB response which resulted in varied TB responding.

This pair of studies reflect the effectiveness and efficiency of incorporating computer technology-enabled learning via a computerized SB instructional protocol for teaching interview skills. SB instructional protocols are similar to Skinner's (1958) teaching machines in that they are an attempt to incorporate technology that will arrange the optimal conditions for self-instruction. SB instruction functioned in much the same way that a vocational tutor might; by evoking specific forms of responses to interview questions, which were then differentially reinforced and brought under the control of specific instructional stimuli. At their own pace, the learners worked through sets of responses to a particular interview question with little to no errors in the process. The SB instruction for interview questions was also similar to the PSI outlined by Keller (1968) in that the role of learner was that of an active participant in the SB instructional process while the role of the instructor became that of a facilitator of learning through the management of instructional contingencies programmed into the SB instruction. In fact, the SB instructional for interview responses are most similar to the CAPSI designed by Pear and Martin (2004) in that both combined personalized instructional material with computer technology-enabled learning.

It is suggested that with such SB instructional protocols incorporated into existing vocational training programs, staff time and resources could be allocated to the more arduous task of fine-tuning a client's interviewing repertoire. The authors suggest that future research should continue to identify the optimal conditions under which SB learning occurs and that an evaluation of the effects of SB instruction, in the context of a CBST package for interview skills, will yield useful information for the development of computer technology-enabled learning tools.

CHAPTER 6

PURPOSE OF THE PRESENT STUDY

Experiment 1 replicated and extended the recent research which has suggested that SB instruction operating on a lag reinforcement schedule is an effective and efficient method for teaching responses to interview questions (O'Neill & Rehfeldt, 2014; O'Neill, Blowers, Henson, & Rehfeldt, 2015). SB instruction differed slightly from the previous studies with the addition of a video-recorded interviewer who asked interview questions and provided feedback to participants. The primary purpose is to identify the limits of SB instruction in this context by determining the optimal number of SB response options when attempting to promote varied TB intraverbal responses to interview questions. The secondary purpose was to evaluate the effects of teaching multiple SB responses on the emergence of novel (i.e., untaught) and recombinative (i.e., combinations of taught) TB intraverbal responses. For example, "I always finish my work" and "I pay attention to details" may be recombined as "I always pay attention." The effects were evaluated across three interview questions in a multiple probe design for each of two individuals diagnosed with a learning disability.

Experiment 2 evaluated the efficacy of the computerized behavioral skills training protocol while simultaneously comparing the basic package to an identical package plus the selection-based protocol from Experiment 1. It evaluated the additive effects of the SB instruction from Experiment 1 when included in a CBST package for teaching TB intraverbal responses to interview questions by young adults with learning disabilities. CBST was compared to CBST plus SB Instruction (CBST+). The former package consisted of four components: Video instruction, video modeling, rehearsal, and feedback. The latter package consisted of five components: Video instruction, video modeling, rehearsal, feedback, and the SB instruction from Experiment 1.

Interview questions were pseudo-randomly assigned to each condition and the effects of each were evaluated across five individuals diagnosed with a learning disability in a multiple probe design. The purpose was to determine the utility of including SB instruction and lag reinforcement schedules as a component of CBST in the context of learning responses to interview questions.

CHAPTER 7

METHOD

Experiment 1

Participants

Two participants were recruited from a local VDC. The VDC provides instruction for a wide variety of adaptive behaviors including the skills necessary to attain and maintain gainful employment. Participant 1 was a 20-year-old male diagnosed with a learning disability not otherwise specified and had a documented WISC III full scale IQ of 72. Participant 2 was a 22-year-old male diagnosed with a learning disability not otherwise specified and had a documented WISC III full scale IQ of 73. Verbal repertoires were sufficient to vocally communicate vocational interests and experience. Participants were identified by the director of the VDC as being literate in basic computer functions (i.e., operating a mouse) and having some exposure to formal interview instructional programs. Each was in need of additional instruction for interview questions as determined by the director of the program before the VDC would consider the participants ready for community interviews.

Setting and Stimuli

The experiment was conducted in a classroom at the VDC. There were multiple tables, chairs, and a laptop computer in the room during sessions. During TB pretests and posttests, the researcher and participant sat on opposite sides of the table such that they were facing one another. Sessions lasted from three to five minutes. Instructional sessions were of approximately equal duration and were conducted a maximum of ten times per week per participant in the same room. A maximum of two instructional sessions per participant were completed in one day with a short break in between sessions. During these sessions the experimenter sat behind the participant so that the computer screen was visible to both. Visual Studio Express 2013© was used to conduct instruction on a laptop computer in program mode. The program consisted of one form which can be loaded with 3 to 5 response options. Response options were randomly assigned their position on screen for each trial by the Visual Studio program. Question 1 had three response options, Question 2 had four response options, and Questions 3 had five response options. Figure 2 provides an example of the on-screen program loaded with five response options.

Design

A multiple-probe design (Horner & Baer, 1978) across a set of three questions for each of two participants was employed in Experiment 1. Pretest data were collected for all questions until stability was evident through visual inspection. Question 1 then moved to instruction. When posttest data for Question 1 meet criterion, Question 2 then moved to instruction. This process was repeated for Question 3. This design allowed for staggered exposure to the intervention across three behaviors (i.e., responding to three different questions) while controlling for major threats to internal validity. Specifically, the design was chosen for its strengths in controlling for history, maturation, repeated testing, and diffusion of the intervention.

Variables

The primary dependent measures were accurate and inaccurate responses to interview questions. Accurate responses were defined as vocal-verbal responses related to the work place environment and participant history of employment. Accurate responses were then further discriminated into three subtypes as (a) exact, those with point-to-point correspondence with programmed response options; (b) recombinative, those with partial point-to-point correspondence with one or more programmed response options; or (c) novel, those with no point-to-point correspondence with any programmed response options. Inaccurate responses were defined as vocal-verbal responses unrelated to the work environment and the participant's employment history. Non-response was defined as the vocal-verbal response "no" or other functionally equivalent response (e.g., not at this time). Non-vocal responses (e.g., shaking head) in the absence of a vocal-verbal response were not anticipated and did not occur. All sessions were video-recorded so that interobserver agreement (IOA) could be scored. IOA was scored for 100% of pre- and posttest mock-interviews by two independent observers. Exact count-per-session IOA was calculated by dividing the smaller number by the larger number within sessions. The number sessions with 100% agreement was then divided by the total number of sessions and multiplied by 100 to acquire a percentage. An acceptable level of IOA was 80%. Resulting IOA was 81%. Interobserver agreement was scored using Appendix A.

Procedure

TB pretests. Pre-session consisted of the experimenter instructing the participant that "I am going to ask you a series of questions and I would like you to answer these questions as you would in a job interview. Are you ready to begin?" This statement signaled the start of the test session. An experimenter sat at a table, facing the participant, and asked eight interview questions, one at a time. The director of the VDC identified each of the eight questions as being particularly crucial to the interview process. Variations of six of the eight questions are listed on the NCLD website as "questions employers might ask at the job interview" and can be found on the National Center for Learning Disabilities website at http://ncld.org/adults-learning-disabilities/jobs-employment-ld/job-interview. The eight questions were as follows: (1) What can you tell me about yourself? (2) Why would you like to work here? (3) What are your strengths? (4) What are your weaknesses? (5) How do you handle pressure and stress? (6) What motivates you? (7) How do you work in a team? (8) Do you have any questions? Examples of accurate and inaccurate responses to each question can be found in Table 2. After each response, a general acknowledgement (e.g., "*okay*" or "*alright*") was provided immediately after the participant's initial response to each question. No other feedback was provided during pretest. When the participant has responded to the eighth question, the experimenter signaled the end of the test session with "Alright, thanks for your time."

When performance on pretest probes was deemed visually stable, accurate and inaccurate answers were identified by the director of the VDC. The Interview Questionnaire (Appendix B) were scored for all TB tests. Three questions to which the participant provided: a) any inaccurate answers, or b) a non-response, were selected for intervention. Some accurate responses provided during pretest (i.e., familiar stimuli) were retained for inclusion in the SB instructional protocol but no more than one was retained for any particular question. The order of program during instruction will differ per participant in order to control for potential diffusion of the intervention.

SB Instruction. Upon start-up, a box appeared at the top-center of the screen and contained the relevant interview question. Approximately 3 s after the question box appears, three to five response options appeared below the question box. Accurate response options appeared simultaneously arranged so that each response appears under the above response approximately 17.5 mm apart from one another. All text used was sizes 28-30 and displayed in Ariel font. The instructional protocol operated on a lag 1 reinforcement schedule for accurate answers. This required participants to select a different response than the immediately preceding response in order to contact affirmative feedback at the end of each trial. In addition, the program provided: (a) Video/audio recordings of a single interview question when the play button is pressed; (b) video/audio feedback (e.g., "great answer", "very interesting", etc.) for accurate selections which also met the lag 1 reinforcement schedule; c) textual redirection to the previous screen ("Button text *is a good answer but press here to try again*" on an orange background) in response to accurate selections which do not meet the lag 1 criterion; and d) textual feedback plus redirection to the previous screen ("Button text *is not appropriate, press here to try again*" on a red background) for inaccurate selections. No audio feedback was provided during redirection to a previous screen.

Participants sat at the table with the laptop computer in front of them. Before the start of each session, participants were instructed to complete the following steps for every trial: (a) Press play on the video at the top of the screen and wait for the video/audio recording to play, (b) state aloud the answer you have chosen (i.e., a textual response), (c) press on the answer button you have chosen, and (d) read or listen to any feedback the program provides. Step (a) indicates the onset of a trial and step (d) indicates the offset. Twenty trials of an individual question were completed during each session with three to five response options available for selection, depending on the question. Mastery stipulated that a lag 1 criterion be met on 90% of trials (i.e., 18 out of 20 trial responses criteria were different than the immediately preceding trial's response). Lag 2 or higher criteria may be implemented if the lag 1 criterion is not sufficient to promote selection of three to five available accurate response options for a particular question. For example, a lag 2 reinforcement schedule required the selection of a different response than the last two immediately preceding responses in order to contact reinforcement. In addition, participants were required to complete three consecutive instructional sessions at or above the 90% lag criterion before moving to posttest for any particular question. These mastery criteria ensured that two requirements are met: (a) All accurate responses were selected multiple times during a session, and (b) inaccurate responses were not be selected more than twice per session before moving to posttest. The SB Instruction program automatically wrote and saved the text associated with each button press to a text file and closed the program when twenty trials occurred.

TB posttests, generalization, and follow-up probes. Posttest sessions were identical to pretest sessions. The criteria for moving from posttest to intervention for the next question were a) zero inaccurate TB vocal-verbal responses, b) emergence of all accurate TB vocal-verbal responses based on the number of SB options, and c) stable patterns of TB vocal-verbal responding to all questions remaining in pretest. Follow-up probes were identical to pretest and were conducted at one week.

Experiment 2

Participants

Three additional participants were recruited from a local VDC. The VDC provides instruction for a wide variety of adaptive behaviors including the skills necessary to attain and maintain gainful employment. Participant 1 was a 20-year-old male diagnosed with a learning disability not otherwise specified and had a documented WISC III full scale IQ of 60. Participant 2 was a 20-year-old female diagnosed with a learning disability not otherwise specified. IQ scores were not available. Participant 3 was a 21-year-old female diagnosed with a learning disability not otherwise specified. IQ scores were not available. Participant 4 was a 19-year-old female diagnosed with a learning disability not otherwise specified and had a documented WAIS IV IQ of 64. Participant 5 was a 22-year-old female diagnosed with a learning disability not otherwise specified and had a documented WISC III full scale IQ of 66. Verbal repertoires were sufficient to communicate vocational interests and experience. Participants were identified by the director of the VDC as computer literate and having some exposure to formal interview instructional programs. Each was in need of additional instruction for interview questions, as determined by the director of the program before the VDC would consider the participants ready for community interviews.

Setting

The experiment was conducted in a classroom at the VDC. There were multiple tables, chairs, and a laptop computer in the room during sessions. During mock interviews, the researcher and participant sat on opposite sides of the table such that they were facing one another. Instructional sessions were conducted every other day in the same room with no more than two per day with a break in between sessions. During these sessions the experimenter sat behind the participant so that the computer screen was visible to both.

Design

A multiple-probe design (Horner & Baer, 1978) across a set of two to four questions for each of five participants was employed. A multi-element design was incorporated within each tier of the multiple-probe design such that each question was pseudo-randomly assigned to either the CBST condition or the CBST+ condition. Pretest data was collected for all questions until stability was evident through visual inspection. Participant 1-3 then moved to randomly assigned CBST for two questions and CBST+ for two questions Posttests were completed while pretest data collection continued for the remaining participants. When posttest data for Participant 1-3 met criterion, Participant 4 moved to CBST for one question and CBST+ for one question. And when Participant 4 met criterion, Participant 5 was moved to CBST for one question and CBST+ for one question. This design allowed for exposure to the intervention across five participants at three staggered time points while controlling for major threats to internal validity. Specifically, the combined design was chosen for its strengths in controlling for history, maturation, repeated testing, sequence effects, and diffusion of the intervention. The general sequence of conditions was as follows: Pretest, CBST for one to two questions, TB posttest, CBST+ for one to two questions, TB posttest, optimal treatment, and then follow-up tests. However, the sequence of CBST and CBST plus SB intruction was pseudo-randomized in order to ensure that each condition occur during a given four session sequence. See Figure 3 for a diagram of the general sequence for Experiment 2. Once the instructional sequence of questions had been established for each participant's sessions (e.g., Question 5-Question 8-Question 7-Question 6), that sequence was maintained during subsequent sessions in order to avoid sequence affects due to back-to-back instructional sessions for any particular question.

Variables

The primary dependent measures were accurate and inaccurate responses to interview questions. Accurate responses were defined as vocal-verbal responses related to the work place environment and participant history of employment. However, accurate responses were further discriminated as (a) exact, those with point-to-point correspondence with programmed response options; (b) recombinative, those with partial point-to-point correspondence with one or more programmed response options; and (c) novel, those with no point-to-point correspondence with any programmed response options. Inaccurate responses were defined as vocal-verbal responses unrelated to the work environment and the participant's employment history. Non-response was defined as the vocal-verbal response "no" or other functionally equivalent response (e.g., not at this time). Non-vocal responses (e.g., shaking head) in the absence of a vocal-verbal response was not anticipated and did not occur. All sessions were video-recorded so that interobserver agreement (IOA) could be scored. IOA was scored for 100% of pre- and posttest mock-interviews by two independent observers. Exact count-per-session IOA was calculated by dividing the smaller number by the larger number within sessions. The number sessions with 100% agreement was then divided by the total number of sessions and multiplied by 100 to acquire a percentage. An acceptable level of IOA was 80%. Resulting IOA was 86%. Interobserver agreement was scored using Appendix A.

Procedure

TB pretests. Pre-session consisted of the experimenter instructing the participant that "I am going to ask you a series of questions and I would like you to answer these questions as you would in a job interview. Are you ready to begin?" This statement signaled the start of the test session. An experimenter will sit at a table, facing the participant, and asked eight interview questions, one at a time. The director of the VDC has identified each of the eight questions as being particularly crucial to the interview process. The eight questions were as follows: (1) What can you tell me about yourself? (2) Why would you like to work here? (3) What are your strengths? (4) What are your weaknesses? (5) How do you handle pressure and stress? (6) What motivates you? (7) How do you work in a team? (8) Do you have any questions? After each response, a general acknowledgement (e.g., "*okay*" or "*alright*") was provided immediately after the participant's response to each question. No other feedback was provided during pretest. When the participant has responded to the eighth question, the experimenter signaled the end of the test session with "Alright, thanks for your time." Accurate and inaccurate answers were identified by the director of the VDC when responding during pretest probes is deemed visually stable. The Interview Questionnaire (Appendix B) was scored for all TB tests.

Computerized behavioral skills training. Following TB pretests, two to four questions to which the participant (a) provided no accurate responses, or (b) more inaccurate than accurate responses, were assigned to either the CBST condition or the CBST+ condition. The entire protocol was facilitated through Visual Studio Express 2013© on a touch-screen laptop computer in “tent mode.” Figure 4 provides screenshots of the control menus.

Video instruction. The program consisted of one video per question, each video containing the topic title and a two to three minute instructional video featuring a scripted peer actor. Each video provided rules and supporting rationale for responding to the relevant interview question asked during TB pre- and posttests. The video for question 1 (What can you tell me about yourself?) contained instruction for the participant to talk about where they have worked before, their education, volunteer work, and vocational interests. This video also contained instruction to refrain from talking about personal issues such as relationships and money. The video for question 2 (Why would you like to work here?) contained instruction for the participant to talk about how they are qualified for the position, what they like about the company, and what they hope to achieve while working for the company. The video for question 3 (What are your strengths?) contained instruction for the participant to talk about what work skills they are good at, how they have used their strengths in the past, and how their strengths will benefit the employer. The video for question 4 (What are your weaknesses?) contained instruction for the participant to talk about their work skills that need improvement, how their weaknesses might affect performance, and steps they have taken to compensate for their weaknesses. The video for question 5 (How do you handle pressure and stress?) contained instruction for the participant to talk about specific methods of coping in the moment and to avoid statements such as “I don’t let it get to me.” The video for question 6 (What motivates you?) contained instruction for the participant to talk about their goals and what they find enjoyable about their work while refraining from statements about personal issues and money. The video for question 7 (How do you work in a team?) contained instruction for the participant to talk about helping others and completing tasks in conjunction with other employees. This video also contained instruction to refrain from talking about individual accomplishments. The video for question 8 (Do you have any questions?) contained instruction for the participant to ask questions related to follow-up, hiring date, work hours, and employer expectations. This video also contained instruction to refrain from asking about pay and vacation or sick days. Figure 5 provides an example of the on-screen video-instruction.

Video modeling. The program consisted of one video per question, each video containing the topic title and a three to five minute video model featuring three scripted peer-aged actors. The videos modeled responding to the relevant interview question asked during TB pre- and posttests. The video for question 1 (What can you tell me about yourself?) contained examples of actors talking about where they have worked before, their education, volunteer work, and vocational interests. This video also contained non-examples of actors refraining from talking about personal issues such as relationships and money. The video for question 2 (Why would you like to work here?) contained examples of actors talking about how they are qualified for the position, what they like about the company, and what they hope to achieve while working for the company. The video for question 3 (What are your strengths?) contained examples of actors talking about what work skills they are good at, how they have used their strengths in the past, and how their strengths will benefit the employer. The video for question 4 (What are your weaknesses?) contained examples of actors talking about their work skills that need improvement, how their weaknesses might affect performance, and steps they have taken to compensate for their weaknesses. This video also contained non-examples of actors avoiding blaming others for their weaknesses. The video for question 5 (How do you handle pressure and stress?) contained examples of actors talking about specific methods of coping in the moment and non-examples of actors avoiding statements such as "I don't let it get to me." The video for question 6 (What motivates you?) contained examples of actors talking about their goals and what they find enjoyable about their work non-examples of actors refraining from statements about personal issues and money. The video for question 7 (How do you work in a team?) contained examples of actors talking about helping others and completing tasks in conjunction with other employees. This video also contained non-examples of actors refraining from talking about individual accomplishments. The video for question 8 (Do you have any questions?) contained examples of actors asking questions related to follow-up, hiring date, work hours, and employer expectations. This video also contained non-examples of actors refraining from asking about pay and vacation or sick days. Figure 6 provides an example of the on-screen video-modeling.

Rehearsal. Before each session, participants were instructed to respond to the single question asked by the experimenter during the session. Participant responses were recorded using Appendix B and scored by the experimenter as well as video-recorded. No feedback was provided during this condition.

Feedback. Feedback occurred directly following Rehearsal conditions and consisted of the experimenter providing a brief evaluation of each participant response provided during the last Rehearsal condition (e.g., "that's a good answer" or "that's a bad answer"). No other feedback occurred due to the potential for confounds related to SB instruction. If the question receiving the intervention had been assigned to the CBST condition then the session ended and a TB posttest for the question was performed. If the question was assigned to the CBST+ condition the session proceeded to SB Instruction.

SB Instruction. The instructional protocol operated on a lag 1 reinforcement schedule for accurate answers. This required participants to select a different response than the immediately preceding response in order to contact affirmative feedback at the end of each trial. In addition, the program provided: (a) Video/audio recordings of a single interview question when the play button is pressed; (b) video/audio feedback (e.g., "great answer", "very interesting", etc.) for accurate selections which also met the lag 1 reinforcement schedule; c) textual redirection to the previous screen ("Button text *is a good answer but press here to try again*" on an orange background) in response to accurate selections which do not meet the lag 1 criterion; and d) textual feedback plus redirection to the previous screen ("Button text *is not appropriate, press here to try again*" on a red background) for inaccurate selections. No audio feedback was provided during redirection to a previous screen.

Participants sat at the table with the laptop computer in front of them. Before the start of each session, participants were instructed to complete the following steps for every trial: (a) Press the play button and wait for the video/audio recording to play, (b) state aloud the answer you have chosen (i.e., a textual response), (c) press the answer button you have chosen, and (d) read or listen to any feedback the program provides. Step (a) indicates the onset of a trial and step (d) indicates the offset. Twenty trials of an individual question were completed per session. Mastery criteria stipulated that a lag 1 criterion be met on 90% of trials (i.e., 18 out of 20 trial responses were different than the immediately preceding trial's response). Lag 2 or 3 criteria could be implemented if the lag 1 criterion was not sufficient to promote selection of all available accurate response options for the question. For example, a lag 2 reinforcement schedule would require the selection of a different response than the last two immediately preceding responses in order to contact reinforcement. This mastery criteria ensured that two requirements were met: (a) All accurate responses were selected multiple times during a session, and (b) inaccurate responses were not selected more than once per session. The SB Instruction program automatically wrote and saved the text associated with each button press to a text file and closed the program when twenty trials had occurred. No feedback was provided. A TB posttest for questions assigned to the CBST+ was performed at the end of the session.

TB posttests, generalization, and follow-up probes. Posttest sessions were identical to pretest sessions except that only question asked was that assigned to the current condition. Follow-up probes were identical to pretest and were conducted at one and approximately four weeks.

CHAPTER 8

RESULTS

Experiment 1

Increases in accurate TB intraverbal responding and decreases to zero or near zero levels in inaccurate TB responding by both participants were observed across interview questions at posttest as compared to pretest. Accurate TB responses were further discriminated into exact, recombinative, and novel subtypes. Increases in the number of recombinative accurate TB responses were observed for both participants and increases in exact accurate TB responses were observed for one participant. Novel accurate TB responses by either participant were not observed at posttest.

Participant 1

All accurate responses provided by Participant 1 were of the recombinative subtype during both pretest and posttest across all three questions. Neither exact nor novel accurate responses occurred.

As shown in Figure 7, Participant 1 provided a low level of accurate responses during pretest (Range: 0-2) with a decreasing trend on Question 1, a slightly increasing trend on Question 5, and a flat trend on Question 8. A higher level of inaccurate responses (Range: 0-3) was observed with an increasing trend for Question 1, a decreasing trend on Question 5, and a flat trend on Question 8.

During SB instruction (Lag 1), Participant 1 met or exceeded the lag criterion during the first session for each question and maintained criterion-level performance across three sessions.

At posttest, an immediate increase in accurate responses (Range: 2-4) was observed on Question 1 and Question 8 with no increase observed on Question 5. An immediate decrease in the level of inaccurate responses (Range: 0-2) was observed on Question 1 and Question 8 with no decrease observed on Question 5.

Participant 2

Accurate responses provided by Participant 2 were of the recombinative subtype at pretest and of the exact and recombinative subtypes at posttest across all three questions. Novel accurate responding was observed only during the first pretest session.

As shown in Figure 8, Participant 2 provided a low level of both exact (Range: 0-1) and recombinative (Range: 0-1) accurate responses during pretest with a flat trend on Question 6 and Question 8 for both subtypes of accurate responses. A flat trend in recombinative responses with a decreasing trend in exact responses was observed on Question 5. A higher level of inaccurate responses (Range: 0-3) was observed with an increasing trend on Question 6 and decreasing trends on Question 5 and Question 8.

During SB instruction (Lag 1), Participant 2 met or exceeded the lag criterion during the first SB instructional session for each question and maintained criterion-level performance across three-four sessions.

At posttest, an immediate increase in accurate responses (Range: 1-4) was observed across all questions. A higher level of exact responses than recombinative was observed on Question 5 (3 exact, 1 recombinative) and Question 6 (3 exact, 0 recombinative) while a higher level of recombinative responses was observed on Question 8 (1 exact, 3 recombinative). An immediate decrease to zero inaccurate responses was observed on Question 6 while inaccurate responses to Question 5 and Question 8 remained stable at zero. A gradual decrease in accurate responses across all three questions was observed during follow-up probes. Accurate responses were of the exact and recombinative subtype during pretest while both exact and recombinative responses were provided at posttest across all three questions. For example, Participant 2 provided three exact responses ("Take a few breathes", "Talk to my supervisor", & "Do one thing at a time") and one recombinative response ("Talk to my coworker") for a total of four accurate TB responses at initial posttest for Question 5.

Experiment 2

Pretest and posttest participant responses.to questions assigned to both conditions (CBST and CBST+) are shown in Figure 9. Increases in accurate TB responding, as compared to pretest, along with decreases to zero or near zero levels in inaccurate responding were observed at posttest across all participants, questions, and conditions. The CBST condition promoted faster acquisition of accurate TB responses for one participant (Participant 3) while the CBST+ condition promoted faster acquisition of accurate TB responses for the remaining four participants (Participant 1, Participant 2, Participant 4, & Participant 5).

Participant 1

As shown in the first tier of Figure 6, Participant 1 provided zero accurate responses to any question during pretest. Inaccurate responses (Range: 0-1) were observed with a slightly increasing trend on Question 7 and flat trends on the remaining questions (Question 5, Question 6, & Question 8). At posttest, immediate increases in accurate responses (Range: 1-4) with increasing trends were observed for both questions assigned to CBST (Question 6 & Question 8) and CBST+ (Question 5 & Question 7) conditions with a slightly higher level of accurate responses occurring in the CBST+ condition for Question 7. An immediate decrease in level to zero inaccurate responses with a flat trend was observed for Question 5, Question 7, and Question 8 with a stable zero inaccurate responses observed for Question 6. These data suggested that the CBST+ condition might be slightly more optimal than CBST for Participant 1.

Some support was provided by an increase in accurate responses to Question 6 but not Question 8 when switched to the Optimal CBST+ condition. No changes were observed for the remaining questions. A decrease in accurate responses was observed during 1-week follow-up probes for Question 6, Question 7, and Question 8 with an increase observed for Question 5. Inaccurate responses remained stable at zero for all questions.

Participant 2

As shown in the second tier of Figure 6, Participant 2 provided low levels of accurate (Range: 0-1) and inaccurate (Range: 0-1) responses with flat trends to all questions during pretest. At posttest, immediate increases in accurate responses (Range: 1-4) with relatively flat trends were observed for both questions assigned to CBST (Question 6 & Question 8) and CBST+ (Question 5 & Question 7) conditions with larger increases observed during the first posttest for questions assigned to CBST+ (Range 3-4) as compared to those assigned to CBST (Range: 1-2). An immediate decrease in level to zero inaccurate responses with a flat trend was observed for Question 8 with a stable zero inaccurate responses observed for Question 5, Question 6, and Question 7. These data suggested that the CBST+ condition might be more optimal than CBST for Participant 2. No changes were observed for any question when switched to the Optimal CBST+ condition. Decreases in accurate responses were observed during 1-week follow-up probes for all questions with one inaccurate response reemerging for Question 8 with responses to all other questions remaining stable at zero.

Participant 3

As shown in the third tier of Figure 6, Participant 3 provided zero accurate responses to Question 6, Question 7, and Question 8 and two accurate responses (Range: 0-2) to Question 5 during pretest. Inaccurate responses (Range: 0-1) were observed with a slightly increasing trend on Question 5 and Question 7 with flat trends on Question 6 and zero inaccurate responses to Question 8. At posttest, immediate increases in accurate responses (Range: 2-4) with increasing trends were observed for both questions assigned to CBST (Question 5 & Question 6) and CBST+ (Question 7 & Question 8) conditions with a higher level of accurate responses to questions assigned to the CBST condition. An immediate decrease in level to zero inaccurate responses with a flat trend was observed for all questions. These data suggested that the CBST condition might be more optimal than CBST+ for Participant 3. Some support was provided by an increase in accurate responses to Question 7 when switched to the Optimal CBST condition. A slight decrease in accurate responses was observed for Question 5. No changes were observed for the remaining questions. Decrease in accurate responses were observed during 1-week follow-up probes for all but Question 8. Inaccurate responses remained stable at zero for all questions.

Participant 4

As shown in the fourth tier of Figure 6, Participant 4 provided zero accurate responses to either question during pretest. Inaccurate responses (Range: 0-3) were observed with a slightly increasing trend on Question 5 with a flat trend at zero inaccurate responses to Question 8. At posttest, immediate increases in accurate responses (Range: 1-4) with an increasing trend was observed for the question assigned to CBST+ (Question 8) and a relatively stable trend for the question assigned to CBST (Question 5) with a higher level of accurate responses occurring in the CBST+ condition for Question 8. An immediate decrease in level to zero inaccurate responses with a flat trend was observed for Question 8 with a more gradual decrease to zero observed for Question 5. These data suggested that the CBST+ condition might be more optimal than CBST for Participant 4. Support was provided by an increase in accurate responses to

Question 5 when switched to the Optimal CBST+ condition. No further increase were observed for Question 8. A decrease in accurate responses was observed during 1-week follow-up probes for both questions with inaccurate responses remaining stable at zero.

Participant 5

As shown in the fifth tier of Figure 6, Participant 5 provided a low level of accurate responses (Range: 0-2) with a decreasing trend to both question during pretest. Inaccurate responses (Range: 0-2) were observed with a slightly increasing trend on Question 5 and a flat trend at zero inaccurate responses to Question 8. At posttest, immediate increases in accurate responses (Range: 2-4) with increasing trends were observed for the question assigned to CBST+ (Question 5) and the question assigned to CBST (Question 8) with a higher level of accurate responses occurring in the CBST+ condition for Question 5. An immediate decrease in level to zero inaccurate responses with a flat trend was observed for both questions. These data suggested that the CBST+ condition might be more optimal than CBST for Participant 5. However, Participant 5 withdrew from the VDC for reasons unrelated to the study and was unable to continue.

CHAPTER 9

DISCUSSION

Experiment 1

Increases in accurate TB intraverbal responding and decreases in inaccurate TB responding to zero or near zero levels were observed for both participants after SB instruction. Recombinative and exact accurate but not inaccurate TB responses during some sessions suggest response generalization from SB to TB and discrimination between accurate and inaccurate responses. Follow-up probes provided some evidence of maintenance at one week. These data support the existing research involving SB instruction for interview questions and suggest that the revised protocol used in this study is of comparable utility to that of O'Neill, Blowers, Henson, & Rehfeldt, 2015; O'Neill & Rehfeldt, 2014), The present protocol was very similar to the previous but differed in that it incorporated video recordings of the interviewer asking questions/providing feedback and was programmed in Visual Studio Express 2013©.

An interesting observation was that Participant 1 not only stated aloud the answer he had chosen during SB instruction (as instructed) but elaborated upon the programmed responses without any prompt to do so. This type of responding did not occur with Participant 2 nor any of the five participants in the previous studies. As a result, Participant 1 did not provide any exact accurate TB responses. For example, having chosen the response option "I have volunteer experience", Participant 1 elaborated by specifying his work experience through a TB response such as "I volunteered at the horse stables" without any instruction to include personal information. This was an interesting finding because responses such as this are less likely to sound scripted than the more generic exact accurate responses during an interview. Future research might examine the effects of an experimenter-provided or programmed prompt to elaborate upon the on-screen response options during SB instruction. This might result in more personalized and less rote-sounding responses without having to program personalized response options for each participant.

Another interesting observation was that although Participant 1 did not provide an increased number of recombinative accurate TB responses to Question 5 (How do you handle pressure and stress?) at posttest, responses were more complex than those provided at pretest in that they included partial point-to-point correspondence with not only one but two programmed response options. In other words, Participant 1 combined two SB response options into one TB response at posttest. During pretest for example, Participant 1 responded with the recombinative response “Talk to my boss” and at posttest provided the recombinative response “Go to my boss or coworker and ask if they can help me.” The latter has partial point-to-point correspondence with two programmed response options (“I ask my coworker for help” & “I talk with my supervisor”) and the existing recombinative response from pretest. The posttest response is more complex and therefore less likely to sound scripted during an interview.

Unlike Participant 1, the majority of Participant 2's accurate responses were of the exact subtype. Those recombinative responses that did occur contained little elaboration and were more similar to the programmed response options than the elaborative responses provided by Participant 1. Participant 2’s responses would likely sound more scripted in an interview. This difference might be attributed in part to the behavior of elaborating upon response options during SB instruction by Participant 1 but not Participant 2. Participant 2 might benefit from the aforementioned suggestion that future research explore experimenter-provided prompts to elaborate upon the programmed response options. Participant 2’s responding was more reminiscent of participant responding in the previous studies in that they were primarily of the exact accurate subtype.

Response Options

The number of response options available on-screen during SB instruction was systematically varied across questions for each participant. This manipulation did not have a discernable effect on the production of either recombinative or novel TB responses. Similar to the previous research on SB instruction for interview questions (O'Neill, Blowers, Henson, & Rehfeldt, 2015; O'Neill & Rehfeldt, 2014), accurate responses began to decrease and inaccurate responses reemerged during follow-up probes for both participants. This provides further support for the necessity of booster sessions for individuals with learning disabilities when learning responses to interview questions through SB instruction. The novel accurate response subtype did not occur during posttests so future research might attempt to isolate conditions which promote novel accurate TB intravebal responses to interview questions using SB instruction. For example, SB procedures based on the equivalence paradigm have been shown as effective in promoting some novel generative TB intraverbal responses (e.g., O'Neill, Rehfeldt, Muñoz, Ninness, & Mellor, in press) and might also prove useful in the context of interview questions.

Lag Reinforcement Schedule

Similar to O'Neill and Rehfeldt (2014), data did not indicate the necessity of a lag reinforcement schedule to promote variable SB responding. Both participants met lag criterion during the first session, across all three questions, regardless of the differing number of response options available. This suggests that variable responding may have occurred in the absence of a lag reinforcement schedule. Regardless, the lag schedule was in place to promote variability should responding become repetitive at any point during the experiment. One explanation for this phenomenon is provided by Shimoff, Matthews, and Catania (1986) who suggest that apparent contingency-shaped behavior in verbal adults may in fact be influenced by rules and exhibit pseudo-sensitivity. In this case, it is possible that participants were operating under self-generated rules about how to respond during SB instruction. Rules are likely to play an important role in the development of responses to interview questions, particularly when lag reinforcement schedules are in effect. For example, the rule "I should provide a different answer this time" would not have interfered with the lag 1 reinforcement schedule used in this study but would be likely to interfere with a lag 2 or lag 3 reinforcement schedule. This alleged interaction of rules and lag reinforcement schedules would nonetheless serve to ensure the lag 1 criterion was met quickly and consistently in the present analysis. The interaction is unverifiable given the present experimental arrangements but future research might utilize a protocol analysis of verbal reports (Ericsson & Simon, 1993) during SB instruction to assess whether or not participant's overt verbal report of a rule is functionally equivalent to the covert rule. A number of precautions would be necessary to do so. The verbal report would need to be guided by the proper instructions, relevant to the SB task, subordinate to the SB task, and occur during the SB task. Three controls would be necessary to rule out alternative explanations. First, performance on the SB task with a concurrent talk-aloud procedure must be shown to be functionally equivalent to performance without a talk-aloud procedure and only the lag reinforcement schedule. Second, changes to the talk-aloud instructions must be functionally related to the talk-aloud reports. Third, the verbal report produced in the first control must alter the task performance of other participants. (Hayes, 1986; Hayes, White, & Bissett, 1998). If all controls were accounted for in future research, support would be provided for the notion that self-rules developed during SB instruction are functionally related to performance.

Number of Sessions

The number of sessions required to promote TB responding did not differ substantially across questions for either participant regardless of the differing numbers of response options available on-screen (Range: 3-5) for each question. However, the maximum number of accurate responses at posttest for either participant on any individual question was four. This finding suggests that in order to produce more than four accurate responses to an interview question, participants may need additional SB instructional sessions or the introduction of thinner lag schedules. Both participants did rotate SB responses across all available response options regardless of the amount present so support for the latter is not provided by this study. Future research should examine conditions that might promote five or more accurate responses to an individual interview question. Such research might also examine the production of exact, recombinative, and novel accurate response subtypes. The maximum number of accurate TB responses provided by either participant (4) was determined to be the optimal number of response options for the SB instruction component in Experiment 2 and approximately reflected the amount of information provided in video instruction and video modeling componets.

Convergent and Divergent Control

These data provide further support for Michael, Palmer, and Sundberg's (2011) discrimination between convergent and divergent multiple control of verbal behavior. As noted in the existing research (O'Neill, Blowers, Henson, & Rehfeldt, 2015), convergent multiple control over SB responses was exerted by response options and resulted in a narrowly defined response class. In other words, multiple stimuli (i.e., response options) converged on a single response. In the previous studies, that response was a mouse click whereas in the present study, the response was a finger touch to the computer screen. Meanwhile, divergent multiple control over varied TB responses was exerted by individual questions. That is to say, any individual question came to evoke multiple TB responses.

At least two aspects of the SB instruction may have enhanced convergent and divergent control. The first was the auditory stimuli generated by the instructional protocol (i.e., audio/video-recorded questions & audio/video feedback) which functioned as extra-stimulus prompts and may have had some effect on response acquisition. The second was the requirement of participants to provide a TB response immediately before each SB response during instruction. O'Neill, Blowers, Henson, and Rehfeldt (2015) have suggested that the TB response might be a critical component of SB instruction for some individuals with learning disabilities. As was suggested in the previous research, audio//video-recorded questions may have set the occasion for covertly produced stimuli (e.g., self-generated rules or problem solving) that had some control over participant's SB responses. For example, "I chose option A last time so I should choose a different option this time." This notion is supported by an observation by Potter et al. (1997) that tasks can be mediated through vocal-verbal responding such as problem-solving. Potter and Brown (1997) have discussed the potential of TB responses to promote SB responses and in this case, self-generated covert rules about responding may have occurred with the potential to affect the likelihood of a particular SB response. For example, "I selected response A last time and B the time before that so I can't select response A or B this time" as a self-generated covert rule might promote the selection of a different response than that of the previous two trials. This seems plausible given that both participants met or exceeded the lag criterion immediately without any instruction to select varied responses from trial to trial. Again, future research might utilize a protocol analysis of verbal reports (Ericsson & Simon, 1993) to assess the impact of self-generated rules and incorporate the precautions and control conditions outlined by Hayes (1986) and Hayes, White, and Bissett (1998).

Computer Technology

The existing literature on lag reinforcement schedules has focused almost exclusively on the manual arrangement of contingencies to promote variable intraverbal responses to social questions by children and adolescents with autism (e.g., Lee, McComas, & Jawor, 2002; Lee & Sturmey, 2006; Susa & Schlinger, 2012). The findings of Experiment 1, along with those of the existing literature on SB instruction for interview questions (O'Neill, Blowers, Henson, and Rehfeldt, 2015; O'Neill & Rehfeldt, 2014) suggest that automated arrangement of lag reinforcement schedules can be effective in promoting varied verbal responses to interview questions by individuals with learning disabilities. This is an important point because the manual arrangement of lag reinforcement schedules would not be conducive to a CBST package, the programming of stimuli and the delivery of consequences had to be automated.

SB instructional protocols are similar to Skinner's (1958) teaching machines in that they are an attempt to incorporate technology that will arrange the optimal conditions for self-instruction. SB instruction functioned in much the same way that a vocational tutor might; by evoking specific forms of responses to interview questions, which were then differentially reinforced and brought under the control of specific instructional stimuli. At their own pace, the learners worked through sets of responses to a particular interview question with little to no errors in the process. The SB instruction for interview questions was also similar to the PSI outlined by Keller (1968) in that the role of learner was that of an active participant in the SB instructional process while the role of the instructor became that of a facilitator of learning through the management of instructional contingencies programmed into the SB instruction. In fact, the SB instructional for interview responses are most similar to the CAPSI designed by Pear and Martin (2004) in that both combined personalized instructional material with computer technology-enabled learning.

It is suggested that with such SB instructional protocols incorporated into existing vocational training programs, staff time and resources could be allocated to the more arduous task of fine-tuning a client's interviewing repertoire. The authors suggest that future research should continue to identify the optimal conditions under which SB learning occurs and that an evaluation of the effects of SB instruction, in the context of a CBST package for interview skills, will yield useful information for the development of computer technology-enabled learning tools.

Limitations

The primary purpose of Experiment 1 was to identify the limits of SB instruction in this context by determining the optimal number of SB response options when attempting to promote varied TB intraverbal responses to interview questions. Results suggest that the optimal number of response options was four when each response option consisted of approximately five words. The effect of response option length was not analyzed and was likely to have some effect on the results. Future research might examine this effect with regards to the number of sessions to lag criterion and the promotion of TB intraverbal responses. For example, it may be the case that as the number of response options increases, the length of those responses must be decreased in order to maintain accurate TB responding. The secondary purpose was to evaluate the effects of teaching multiple SB responses on the emergence of novel and recombinative TB intraverbal responses. Again, response option length likely played a role in promoting recombinative responses and future research might attempt to isolate this effect and determine the conditions necessary to promote novel responses. Analyses such as these will help to identify the limits of and optimal conditions for SB instruction of individuals with learning disabilities.

Social validity was addressed in the current study by consulting the director of the VDC during the design of the instructional material and by incorporating variations of interview questions recommended by the National Center for Learning Disabilities. However, it is not clear whether or not participants would provide the learned responses during a job interview. In-situ interview assessments would provide a superior measure of social validity and address this limitation. If a participant fails to demonstrate a skill during an in situ assessment. In-situ training might be effective in promoting generalization (Gatheridge et al., 2004; Himle et al.; Johnson et al., 2005, 2006; Miltenberger et al., 1999, 2004) and may increase skill maintenance (Johnson et al., 2006).

Experiment 1 reflects the effectiveness and efficiency of incorporating computer technology-enabled learning via a computerized SB instructional protocol for teaching interview skills. Experiment 2 was designed with the intent of analyzing the effects of incorporating SB instruction with CBST for responses to interview questions by individuals with learning disabilities.

Experiment 2

Results suggest that the present CBST protocol is effective in promoting accurate TB responses to interview questions regardless of whether SB instruction was included (CBST+). Visual inspection confirms that increases in accurate TB intraverbal responses and decreases in inaccurate responses were apparent across all participants and questions after a single session regardless of assignment to the CBST or CBST+ condition. This suggests discrimination between accurate and inaccurate responses in both conditions and follow-up probes provided some evidence of maintenance. These findings demonstrate the effectiveness and efficiency of CBST in teaching responses to interview questions by young adults with learning disability. They also exemplify the utility of including SB instruction in such a protocol. These findings are promising but not surprising given the proven effectiveness of the behavioral approach to skills training.

Given the demonstrated effectiveness of SB instruction with a TB component in Experiment 1 and previous studies (O'Neill & Rehfeldt, 2014; O'Neill, Blowers, Henson, & Rehfeldt, 2015). Unlike the previous studies, only one session of SB instruction was incorporated into the CBST+ condition in order to approximate the duration of each component of the CBST condition. Future research might compare SB instruction directly to CBST. In fact, SB instruction could be easily programmed to provide video instruction and video modelling. A SB protocol such as this would incorporate all of the traditional BST components in one fully automated program.

There may be some clinical significance to the difference between CBST and CBST+ conditions. Four of the five participants acquired more accurate TB responses in less sessions during the CBST+ condition as compared to the CBST condition. This difference is at least in part due to SB instruction as an additional component but to what extent cannot be determined by the present analysis. Future research might also evaluate the effects of replacing the traditional BST components of rehearsal and feedback with that of SB instruction or adding an additional rehearsal and feedback component to the CBST condition in order to balance and control for the addition of SB instruction in the CBST+ condition. Such analyses might clarify the individual contribution of SB instruction and rule out alternative explanations for the increased performance of four participants in this experiment.

Similar to Experiment 1 and the previous research involving SB instruction for interview questions (O'Neill, Blowers, Henson, & Rehfeldt, 2015; O'Neill & Rehfeldt, 2014), the overall trend was a decrease in accurate responding observed during follow-up probes, regardless of the assigned condition, for all but Participant 1 on Question 5. The reemergence of inaccurate responses was observed for only Participant 2 but these data again indicate the necessity of booster sessions for individuals with learning disabilities when learning responses to interview questions.

Convergent and Divergent Control

Supported can be found in Michael, Palmer, and Sundberg's (2011) discrimination between convergent and divergent multiple control of verbal behavior. As noted in Experiment 1, convergent multiple control over SB responses was exerted by on-screen response options and resulted in a narrowly defined response class. Without the programmed response options of SB instruction available in the CBST+ condition, the response class may be even more narrowly defined in the CBST condition. In any case, divergent multiple control over varied TB responses was exerted by individual questions regardless of CBST condition. The components of the SB instruction that may have enhanced convergent and divergent control are discussed in Experiment 1. At least two possible factor remain when SB instruction is removed and those are the audio recorded and on-screen questions presented during instructional and modeling videos. Similar to Experiment 1, these stimuli may have set the occasion for covertly produced stimuli (e.g., self-generated rules or problem solving) that had some control over participant's SB responses. This notion is also supported by Potter et al.'s (1997) observation that people mediate tasks through problem-solving. In the case of Experiment 1, self-generated covert rules about responding may have affected SB responding. The same applies to the CBST+ (which included

SB instruction) but not the CBST (did not include SB instruction) condition of Experiment 2. However, in both the CBST and CBST+ condition, self-generated covert rules about responding may have occurred with the potential to affect the likelihood of a particular TB response. For example, “I should talk about A, B, and C but not D when asked Question 5” as a self-generated covert rule might promote a different response than that of a trial completed prior to the rule. A discussion of the potential interaction between rules and lag reinforcement is to follow.

Lag Reinforcement Schedule

Similar to Experiment 1, data did not indicate the necessity of a lag reinforcement schedule to promote variable responding in the CBST+ condition during SB instruction. Participant performance with regards to the lag criterion are not displayed. However, all participants met lag criterion during the first session, across all questions. This suggests that variable responding may have been rule-governed. As in Experiment 1, the lag schedule served to promote variable responding should the need arise.

An explanation for this phenomenon is provided by Shimoff, Matthews, and Catania (1986) who suggest that apparent contingency-shaped behavior in verbal adults may in fact be influenced by rules and exhibit pseudo-sensitivity. In this case, it is possible that participants were operating under self-generated rules about how to respond during SB instruction. Rules are likely to play an important role in the development of responses to interview questions, particularly when lag reinforcement schedules are in effect. For example, the rule “I should provide a different answer this time” would not have interfered with the lag 1 reinforcement schedule used in this study but would be likely to interfere with a lag 2 or lag 3 reinforcement schedule. This alleged interaction of rules and lag reinforcement schedules would nonetheless serve to ensure the lag 1 criterion was met quickly and consistently in the present analysis. The interaction is unverifiable given the present experimental arrangements but future research might utilize a protocol analysis of verbal reports (Ericsson & Simon, 1993) during SB instruction to assess whether or not participant's overt verbal report of a rule is functionally equivalent to the covert rule. A number of precautions would be necessary to do so. The verbal report should be guided by instructions, relevant to the SB task, subordinate to the SB task, and occur during the SB task. Three controls would be necessary to rule out alternative explanations. First, performance on the SB task with a concurrent talk-aloud procedure must be shown to be functionally equivalent to performance without a talk-aloud procedure (i.e., lag reinforcement schedule only). Second, changes to the talk-aloud instructions must be functionally related to the talk-aloud reports. Third, the verbal report produced in the first control must be shown to alter the task performance of other participants (Hayes, 1986; Hayes, White, & Bissett, 1998). If all controls were accounted for, support would be provided for the notion that self-rules developed during SB instruction are functionally related to performance.

Computer Technology

The CBST+ protocol was similar to Skinner's (1958) conception of the teaching machine. It was an attempt to incorporate technology that will arrange the optimal conditions for self-instruction. CBST functioned in much the same way that a vocational tutor might; by providing instruction, modeling, opportunities for rehearsal, and corrective feedback. CBST+ went one step further by evoking specific forms of responses to interview questions through SB instruction. These responses were then differentially reinforced and brought under the control of specific instructional stimuli. At their own pace, learners worked through sets of responses to a particular interview question with little to no errors in the process. CBST+ was also similar to the PSI outlined by Keller (1968) in that the role of learner was that of an active participant in the

SB instructional process while the role of the instructor became that of a facilitator of learning through the management of instructional contingencies (i.e., lag reinforcement schedules) programmed into the SB instruction. In fact, CBST+ is closely related to the CAPSI designed by Pear and Martin (2004) in that both combined personalized instructional material with computer technology-enabled learning.

Given the existing research suggesting that the instruction (Feldman, Case, Rincover, Towns, & Betel, 1989; Hudson, 1982; Krumhus & Malott, 1980) and rehearsal (Ward-Horner & Sturmey, 2012) components of BST may not be effective alone, future research might examine the effects of replacing face-to-face instruction, rehearsal, and feedback with computerized SB instruction (which includes rehearsal & feedback components). This modification would result in an entirely automated protocol that would be practical in regards to the effort and time spent by staff when teaching responses to interview questions.

This experiment also provides support for the recommended use of video-modeling to teach skills when used in conjunction with other BST components (Beck & Miltenberger, 2009; Carroll-Rowan & Miltenberger, 1994; Catania, Almeida, Liu-Constant, & DiGennaro-Reed, 2009; Poche et al., 1988). Video models were three peer-aged individuals who provided examples of both accurate and inaccurate responses to interview questions.

Schloss et al. (1988) recognized that few studies have attempted to validate effective strategies for teaching interview skills to individuals with disabilities. Even fewer have attempted to validate the use of computer technology in this arena. This experiment was an attempt to do just that. In support of Vanselow and Hanley (2014), these results suggest that CBST and CBST+ for interview questions may be an acceptable substitute for the more traditional delivery of BST in some cases and that SB instruction might further enhance such protocols and allow for further staff resources to be reallocated by VDCs.

Limitations

The primary purpose of Experiment 2 was to evaluate the efficacy of the computerized behavioral skills training protocol while simultaneously comparing the basic package to an identical package plus the selection-based protocol from Experiment 1. CBST was only implemented for questions to which participants provided less than satisfactory answers. Questions to which the participant (a) provided no accurate responses, or (b) more inaccurate than accurate responses, were assigned to either the CBST condition or the CBST+ condition. It is possible that responses to the remaining questions would benefit from CBST or CBST+. Future research might evaluate the use of CBST for all potential interview questions in order to provide a more complete training protocol.

The CBST+ condition appears to have been more optimal for four out of five participants with CBST being the more optimal condition for Participant 3. This finding lends some support to Kornacki, Ringdahl, Sjostrom, and Nuernberger's (2013) suggestion that the necessary BST components may differ across individuals when teaching conversation skills. Although similar in content, programmed response options in SB instruction did not have point-to-point correspondence with the stimuli associated with video instruction and video modeling. It is possible that SB instruction interfered with the acquisition of accurate TB responses in the CBST+ condition for Participant 3.

Exact, recombinative, and novel accurate responses were not the focus of this study as they were in Experiment 1. An analysis of the three accurate response subtypes (i.e., exact, recombnative, & novel) could potentially provide clarification on Participant 3's superior performance during the CBST condition. Future research might include accurate response subtypes to determine whether a particular subtype is promoted by CBST versus CBST+. It is hypothesized that CBST+ would promote exact and recombinative accurate TB responses due to the programmed response options and evidence provided by Experiment 1. CBST would likely promote recombinative and novel accurate responses because individual responses were not targeted during video instruction or video modeling. In addition, participants rehearsed non-programmed responses only once during a CBST session. In contrast, rehearsal during CBST+ involved programmed responses and twenty trials per session.

The entire protocol was facilitated through Visual Studio Express 2013© on a touch-screen laptop computer in "tent mode." This use of technology might be seen as a limitation in that it may not be readily accessible to staff at VDCs and requires more sophisticated programming skills than alternative modes of delivery such as PowerPoint© and digital video discs. Although the protocol required more effort to program on the front end, the result was a user-friendly interface with perfect procedural integrity. The use of Visual Studio Express 2013© also allowed the experimenters to modify SB instructional stimuli with ease.

Social validity was addressed in the current study by consulting the director of the VDC during the design of the instructional material and by incorporating variations of interview questions recommended by the National Center for Learning Disabilities. However, it is not clear whether or not participants would provide the learned responses during a job interview. In-situ interview assessments would provide a superior measure of social validity and address this limitation. If a participant fails to demonstrate a skill during an in situ assessment. In-situ training might be effective in promoting generalization (Gatheridge et al., 2004; Himle et al.;

Johnson et al., 2005, 2006; Miltenberger et al., 1999, 2004) and may increase skill maintenance (Johnson et al., 2006).

General Discussion

One common application of SB instruction utilized by behavioral researchers has involved procedures outlined by the stimulus equivalence paradigm. Stimulus equivalence typically involves direct training by MTS which results in the emergence of untrained relations among those stimuli (Sidman, 1994). The present procedures are similar to those of stimulus equivalence and MTS in that both involve the programming of a sample stimulus (in this case and interview question) and multiple comparison stimuli (accurate interview response options) from which a selection is to be made. While the earliest studies on equivalence relations focused on the promotion of simple reading skills, behavioral researchers have demonstrated that SB equivalence procedures can be effective in teaching complex verbal behavior (Walker, Rehfeldt, & Ninness, 2010; Lovett, Rehfeldt, Garcia, & Dunning, 2011; Walker & Rehfeldt, 2012; O'Neill, Rehfeldt, Muñoz, Ninness, & Mellor, in press). SB instruction for interview questions has emerged as a viable alternative (O'Neill & Rehfeldt, 2014) to the traditional delivery of interview skills training with a follow-up analysis investigating the necessary and sufficient components of SB instruction for interview questions (O'Neill, Blowers, Henson, & Rehfeldt, 2015). The authors argue that this type of instruction can promote a narrowly-defined SB response class that results in varied TB responding to interview questions.

Variability

In a discussion of the present experiments, three sources of variability warrant mention. Convergent multiple control, divergent multiple control, and lag reinforcement schedules. The multiple control of verbal behavior has been discussed as related to each of the experiments and so a brief review follows. As mentioned in the previous discussion sections, the multiple control of verbal behavior can account for some aspects of behavioral variability. With convergent multiple control, multiple variables were brought to bear on a single response to interview questions. In this case, responses to interview questions might have changed depending on the arrangement of variables during videos and SB instruction. Variability also emerged in both experiments due to divergent multiple control when a number of different interview responses were strengthened by a single variable. Each interview question came to evoke multiple and varied responses from the participants. The third source of variability in each experiment was the lag reinforcement schedules which required participants to select a different response from the last during each trial of SB instruction. As noted previously, the lag schedule may not have been entirely necessary as participants tended to respond variably from the beginning of their first session for each question. There was no requirement for operant variability so it is possible that some level of stereotypy occurred. For example, participants could rotate through response options in a repetitive pattern across multiple trials while still meeting the lag criterion. However, the lag reinforcement schedules ensured that when participants responding became repetitive from trial to trial, a consequence (an on-screen prompt to try a different response) was provided in order to promote a return to variable responding. In this way, the lag reinforcement schedules functioned as a precautionary measure that could be adjusted (i.e., lag 1-3) if responses excluded any of the available options. One example of this is provided by O'Neill, Blowers, Henson, and Rehfeldt (2015) in which one participant met the lag 1 criterion during SB instruction but did so by simply rotating back and forth between only two of the available response options. By adjusting the lag reinforcement schedule to lag 2, the schedule then required that responses include at least three of the available response options. Such adjustments were not necessary in the present experiments but were programmed and available to the experimenters nonetheless.

The existing literature has focused almost exclusively on the manual arrangement of lag reinforcement schedules to promote variable intraverbal responses to social questions by children and adolescents with autism (e.g., Lee, McComas, & Jawor, 2002; Lee & Sturmey, 2006; Susa & Schlinger, 2012). The findings suggest that lag reinforcement schedules are effective in promoting varied verbal responses. However, manual arrangement of lag reinforcement schedules would not be conducive to a CBST package, the programming of stimuli and the delivery of consequences had to be automated. The present line of research expands the scope of that literature in three ways: by demonstrating lag reinforcement procedures with young adults diagnosed with a learning disability, through an automated SB medium, and with more complex intraverbal responses to interview questions. These expansions suggest that lag reinforcement procedures might be used in a variety of educational settings where variability is desirable. For example, problem-solving and creativity often involve a trail-and-error strategy that, by definition, entails some aspects of a lag reinforcement schedule (i.e., we try one approach to solving a problem and if that doesn't work, we try a different approach, and then perhaps we try an approach that we have never tried before). Lag reinforcement schedules could be used, and likely occur outside experimental settings, in the development of problem-solving and creativity. In other words, if behavior is to be variable, then the contingencies must be arranged in order to promote such behavior. In the current interview setting, lag reinforcement procedures were utilized in order to teach multiple verbal responses to a single question during each session. The focus was not on the degree of variability per se but on ensuring that each accurate response option was rehearsed multiple times during each session. In this way, lag reinforcement procedures can be used to facilitate memorization.

Conclusion

O'Neill, Blowers, Henson, and Rehfeldt (2015), O'Neill and Rehfeldt (2014), and the present studies reflect the efficiency and effectiveness of CBST and SB instructional protocols in teaching interview skills to young adults with a learning disability. CBST and SB instructional protocols are not unlike what Skinner (1958) envisioned as teaching machines. The technology is an attempt to incorporate automated contingencies that will arrange the optimal conditions for self-instruction. SB instruction functions in much the same way that a vocational tutor might; by evoking specific forms of responses to interview questions, which are then differentially reinforced and brought under the control of specific instructional stimuli. At their own pace, the learners worked through sets of responses to a particular interview question with little to no errors in the process. The SB instruction for interview questions was also similar to the PSI outlined by Keller (1968) in that the role of learner was that of an active participant in the SB instructional process while the role of the instructor became that of a facilitator of learning through the management of instructional contingencies programmed into the SB instruction. In fact, the SB instructional for interview responses are most similar to the CAPSI designed by Pear and Martin (2004) in that both combined personalized instructional material with technology-enabled learning in the form of CBST.

It is suggested that with CBST and SB instructional protocols incorporated into existing vocational training programs, staff time and resources could be allocated to the more arduous task of fine-tuning a client's interviewing repertoire. It is suggested that future research should continue to identify the optimal conditions under which both CBST and SB instruction promote learning. Further evaluation of the effects of SB instruction, in the context of a CBST package for interview skills, will yield useful information for the development of computer technology-enabled learning tools. These tools may well enhance services and treatment outcomes for individuals with learning disabilities who wish to acquire the social skills necessary to gain employment. Appropriate responses to interview questions will be an important and potentially crucial aspect of that endeavor that can be taught using CBST and SB instruction. Learning to communicate during an interview and present oneself appropriately will be requisite to the independent living transition made by people similar to those of this study.

REFERENCES

American Psychiatric Association. (2013). *Diagnostic and statistical manual of mental disorders* (5th ed). Washington, DC: Author.

Barrows, H. S. (1996) Problem-Based Learning in medicine and beyond: A brief overview. *New Direction for Teaching and Learning, 68,* 3-12. doi: 10.1002/tl.37219966804

Beck, K., & Miltenberger, R. (2009). Evaluation of a commercially-available abduction prevention program and in situ training by parents to teach abduction prevention skills to children. *Journal of Applied Behavior Analysis, 42*, 761-772.

Bergmann, J. & Sams, A. (2014) Flipped Learning: Maximizing face time. *Learning and Development, 68,* 28-31.

Braukmann, C. J., Maloney, D. M., Fixsen, D. L., Phillips. E. L., & Wolf. M. M. (1974). An analysis of a selection interview training package for predelinquents at Achievement Place. *Criminal Justice and Behavior, 1*, 30-42. doi: 10.1177/009385487400100105

Bristow, D., & Fristoe, M. (1984). Learning of blissymbols and manual signs. *Journal of Speech and Hearing Disorders, 49*, 145-151.

Campbell, D. T. (1960). Blind variation and selective retention in creative thought as in other knowledge processes. *Psychological Review, 67*, 380–400.

Catania, C. N., Almeida, D., Liu-Constant, B., & DiGennaro-Reed, F. D. (2009). Video-modeling to train staff to implement discrete-trial instruction. *Journal of Applied Behavior Analysis, 42*, 387–392

Cresson, 0. (1994). *The writing response in studies of topography-based and selection-based verbal behavior.* Unpublished doctoral dissertation, Western Michigan University, Kalamazoo, MI.

Ericsson, K. A., & Simon, H. A. (1993). *Protocol analysis: Verbal reports as data*. Cambridge, MA: MIT Press.

Ertmera, P. A. & Ottenbreit-Leftwichb, A. (2013). Removing obstacles to the pedagogical changes required by Jonassen's vision of authentic technology-enabled learning. *Computers & Education, 64,* 175–182.

Esch, J. W., Esch, B. E., & Love, J. R. (2009). Increasing vocal variability in children with autism using a lag schedule of reinforcement. *The Analysis of Verbal Behavior*, *25,* 73–78.

Fallen, M. P. & Goetz, E. M. (1975). The creative teacher: Effects of descriptive-social reinforcement upon the drawing behavior of three preschool children. *School Applications of Learning Theory, 7*, 27-45.

Feldman, M. A., Case, L., Rincover, A., Towns, F., & Betel, J. (1989). Parent Education Project III: Increasing affection and responsivity in developmentally handicapped mothers: Component analysis, generalization, and effects on child language. *Journal of Applied Behavior Analysis, 22*, 211-222.

Fields, L., Travis, R., Yadlovker, E. D., Roy, D., Aguiar-Rocha, L., & Sturmey, P. (2009). Equivalence class formation: A method for teaching statistical interactions. *Journal of Applied Behavior Analysis, 42*, 575–593.

Fienup, D. M., Covey, D. P., & Critchfield, T. S. (2010). Teaching brain–behavior relations economically with stimulus equivalence technology. *Journal of Applied Behavior Analysis*, *43*, 19–33.

Furman. W., Geller. M., Simon. S, J., & Kelly, J. A. (1979). The use of a behavior rehearsal procedure for teaching job-interview skills to psychiatric patients. *Behavior Therapy, 10*, 157-167. doi:10.1016/S0005-7894(79)80033-7

Gatheridge, B. J., Miltenberger, R. G., Huneke, D. F., Satterlund, M. J., Mattern, A. R., Johnson, B. M., et al. (2004). Comparison of two programs to teach firearm injury prevention skills to 6- and 7-year-old children. *Pediatrics, 114* (3), 294–299.

Goetz, E. M., & Baer, D. M. (1973). Social control of form diversity and emergence of new forms in children's blockbuilding. *Journal of Applied Behavior Analysis, 6*, 209–217.

Goetz, E. M., & Salmonson, M. M. (1972). The effect of general and descriptive reinforcement on "creativity" in easel painting. In G. Semb (Ed.), *Behavior analysis in education.* Lawrence: University of Kansas.

Hall, C., Sheldon-Wildgen, J., & Sherman, J.A. (1980). Teaching job interview skills to retarded participants. *Journal of Applied Behavior Analysis, 13*(3), 433-442. doi:10.1901/jaba.1980.13-433

Hayes, S. C. (1986). The case of the silent dog-verbal reports and the analysis of rules: A review of Ericsson and Simon's protocol analysis: Verbal reports as data. *Journal of the Experimental Analysis of Behavior, 45*, 351-363. doi: 10.1901/jeab.1986.45-351

Hayes, S. C., Brownstein, A. J., Haas, J. R. & Greenway, D. E. (1986) Instructions, multiple schedules, and extinction: Distinguishing rule-governed from schedule-controlled behavior. *Journal of the Experimental Analysis of Behavior, 46*, 137-147.

Hayes, S. C., White, D., & Bissett, R. T. (1998). Protocol analysis and the "silent dog" method of analyzing the impact of self-generated rules. *The Analysis of Verbal Behavior, 15*, 57-63.

Heldt, J. & Schlinger, H. D. (2012). Increased variability in tacting under a lag 3 schedule of reinforcement. *The Analysis of Verbal Behavior, 28*, 131–136.

Himle, M. B., & Miltenberger, R. G. (2004). Preventing unintentional firearm injury in children: The need for behavioral skills training. *Education and Treatment of Children, 27*, 161–177.

Hodges, P., & Schwethelm, B. (1984). A comparison of the effectiveness of graphic symbol and manual sign training with profoundly retarded children. *Applied Psycholinguistics, 5,* 223-253.

Horner, R. D. & Baer, D. M. (1978). Multiple-probe technique: a variation of the multiple pretest. *Journal of Applied Behavior Analysis, 11* (1), 189-196. doi: 10.1901/jaba.1978.11-189

Hudson, A. M. (1982). Training parents of developmentally handicapped children: A component analysis. *Behavior Therapy, 13*, 325–333.

Iwata, B. A., Wallace, M. D., Kahng, S., Lindberg, J. S., Roscoe, E. M., Conners, J., et al. (2000). Skill acquisition in the implementation of functional analysis methodology. *Journal of Applied Behavior Analysis, 33*, 181–194

Johnson, B. M., Miltenberger, R. G., Egemo-Helm, K., Jostad, C. M., Flessner, C., & Gatheridge, B. (2005). Evaluation of behavioral skills training for teaching abduction-prevention skills to young children. *Journal of Applied Behavior Analysis, 38,* 67–78.

Jonassen, D.H., (1996). Computers in the classroom: Mindtools for critical thinking. Merrill/Prentice Hall, Columbus, OH.

Jonassen, D.H. & Reeves, T.C. (1996). Learning with technology: using computers as cognitive tools. In D.H. Jonassen (Ed.), *Handbook of research for educational communications and technology* (pp. 693–719). Bloomington, IN: Association for Communications and Technology.

Keller, F. S. (1968). Good-bye Teacher . . . *Journal of Applied Behavior Analysis, 1,* 79–89.

Kelly, J. A., Laughlin, C., Claiborne, M., & Patterson, J. (1979). A group procedure for teaching job interviewing skills to formerly hospitalized psychiatric patients. *Behavior Therapy, 10,* 299-310. doi:10.1016/S0005-7894(79)80020-9

Kelly, J.A., Wildman, B.G., & Berler, E.S. (1980). Small group behavioral training to improve the job interview skills repertoire of mildly retarded adolescents. *Journal of Applied Behavior Analysis, 13*(3), 461-471. doi:10.1901/jaba.1980.13-461

Koehler-Platten, K., Grow, L. L., Schulze, K. A., Bertone, T. (2013). Using a lag reinforcement schedule to increase phonemic variability in children with autism spectrum disorders. *The Analysis of Verbal Behavior, 29,* 71–83.

Kornacki, L. T., Ringdahl, J. E., Sjostrom, A., & Nuernberger, J. E. (2013). A component analysis of a behavioral skills training package used to teach conversation skills to young adults with autism spectrum and other developmental disorders. *Research in autism Spectrum Disorders, 7* (11), 1370–1376. doi: 10.1016/j.rasd.2013.07.012

Krumhus, K. M., & Malott, R. W. (1980). The effects of modeling and immediate and delayed feedback in staff training. *Journal of Organizational Behavior Management, 2,* 279–293.

Lee, R., McComas, J. J., & Jawor, J. (2002). The effects of differential and lag reinforcement schedules on varied verbal responding by individuals with autism. *Journal of Applied Behavior Analysis, 35,* 391–402.

Lee, R., & Sturmey, P. (2006). The effects of lag schedules and preferred materials on variable responding in students with autism. *Journal of autism and Developmental Disorders, 36,* 421–428.

Lovett, S., Rehfeldt, R. A., Garcia, Y., & Dunning, J. (2011). Comparison of a stimulus equivalence protocol and traditional lecture for teaching single-subject designs. Journal of Applied Behavior Analysis, 44, 819–833. doi: 10.1901/jaba.2011.44-819

Maloney, D. M., Harper, T. M., Braukmann, C. J., Fixsen, D. L., Phillips, E. L., & Wolf, M. M. (1976). Teaching conversation-related skills to predelinquent girls. *Journal of Applied Behavior Analysis, 9*(3), 371. 10.1901/jaba.1976.9-371

Matthews & Fawcett (1984). Building the capacities of job candidates through behavioral instruction. *Journal of Community Psychology, 12*, 123-129.

Michael, J. (1985). Two kinds of verbal behavior plus a possible third. *The Analysis of Verbal Behavior, 3,* 2-5.

Michael, J. Palmer, D. C., Sundberg, M. L. (2011) The Multiple Control of Verbal Behavior. *The Analysis of Verbal Behavior, 27*, 3–22.

Miles, N. I., & Wilder, D. A. (2009). The effects of behavioral skills training on caregiver implementation of guided compliance. *Journal of Applied Behavior Analysis, 42*(2), 405-410. doi:10.1901/jaba.2009.42-405

Miltenberger, R. G., Flessner, C., Gatheridge, B., Johnson, B., Satterlund, M., & Egemo, K. (2004). Evaluation of behavioral skills training to prevent gun play in children. *Journal of Applied Behavior Analysis, 37*, 513–516.

Miltenberger, R. G., Roberts, J. A., Ellingson, S., Galensky, T., Rapp, J. T., Long, E. S., et al. (1999). Training and generalization of sexual abuse prevention skills for women with mental retardation. *Journal of Applied Behavior Analysis, 32*, 385–388.

Minkin, N., Braukmann, C. J., Minkin, B. L., Timbers, G. D., Timbers, B. J., Fixsen, D. L., et al. (1976). The social validation and training of conversational skills. *Journal of Applied Behavior Analysis, 9*(2), 127–139.

Mozingo, D., Ackley, G. B., & Bailey, J. S. (1994). Training quality job interviews with adults with developmental disabilities. *Research in Developmental Disabilities, 15(5),* 389-410.

Napolitano, D. A., Smith, T., Zarcone, J. R., Goodkin, K., & Mcadam, D. B. (2010) Increasing Response Diversity in Children with autism, *Journal of Applied Behavior Analysis, 43*, 265-271.

Neuringer, A. (2003). Creativity and reinforced variability. In K. A. Lattal, & P. N. Chase (eds.), *Behavior Theory and Philosophy* (pp. 323-338). US: Springer. doi: 10.1007/978-1-4757-4590-0_17

Neuringer, A. (2009) Operant variability and the power of reinforcement. The Behavior Analyst Today, 10, 319-343.

Ninness, C., Barnes-Holmes, D., Rumph, R., McCuller, G., Ford, A. M., Payne, R., et al. (2006). Transformations of mathematical and stimulus functions. *Journal of Applied Behavior Analysis, 39*, 299–321.

Ninness, C., Dixon, M., Barnes-Holmes, D., Rehfeldt, R. A., Rumph, R., McCuller, G., et al. (2009). Constructing and deriving reciprocal trigonometric relations: A functional analytic approach. *Journal of Applied Behavior Analysis, 42*, 191–208.

Ninness, C., Rumph, R., McCuller, G., Harrison, C., Ford, A. M., & Ninness, S. K. (2005). A functional analytic approach to computer-interactive mathematics. *Journal of Applied Behavior Analysis, 38*, 1–22.

Nuernberger, J. E., Ringdahl, J. E., Vargo, K. K. Crumpecker, A. C., & Gunnarsson, K. F. (2013). Using a behavioral skills training package to teach conversation skills to young adults with autism spectrum disorders. *Research in autism Spectrum Disorders, 7* (2), 411–417. doi: 10.1016/j.rasd.2012.09.004

O'Neill, J., Blowers, A. P., Henson, L., & Rehfeldt, R. A. (2015). Further analysis of Selection-based instruction, lag reinforcement schedules, and the emergence of topography-based responses to interview questions. *The Analysis of Verbal Behavior*. doi: 10.1007/s40616-015-0031-5

O'Neill, J. & Rehfeldt, R. A. (2014). Selection-based responding and the emergence of Topography-based responses to interview questions. *The Analysis of Verbal Behavior, 30* (2), 178-183. doi: 10.1007/s40616-014-0013-z

O'Neill, J., Rehfeldt, R. A., Muñoz, B. E., Ninness, C., & Mellor, J. (in press). Comparison of a stimulus equivalence protocol and traditional study in learning skinner's verbal operants. *The Analysis of Verbal Behavior*.

Page, S., & Neuringer, A. (1985). Variability is an operant. *Journal of Experimental Psychology: Animal Behavior Processes, 11*, 429–452.

Pear, J. J., & Martin, T. L. (2004). Making the most of PSI with computer technology. In D. Moran J., & Malott, R. W. (n.d) *Evidence-based educational methods* (pp. 223-243). San Diego, CA: Elsevier & Academic Press.

Polson, D. A. D. & Parsons, J. A. (2000) Selection-based versus topography-based responding: An important distinction for stimulus equivalence? *The Analysis of Verbal Behavior 2000, 17*, 105-128

Potter, B., & Brown, D. L. (1997). A review of studies examining the nature of selection-based and topography-based verbal behavior. *The Analysis of Verbal Behavior, 14,* 85-104

Potter, B., Huber, S., & Michael, J. (1997). The role of mediating verbal behavior in selection-ased responding. *The Analysis of Verbal Behavior, 14*, 41-56.

Rehfeldt, R. A. (2011). Toward a technology of derived stimulus relations: An analysis of articles published in the Journal of Applied Behavior Analysis, 1992–2009. *Journal of Applied Behavior Analysis, 44*, 109–119. doi: 10.1901/jaba.2011.44-109

Rosales, R., Stone, K., & Rehfeldt, R. A. (2009). The effects of behavioral skills training on implementation of the picture exchange communication system. *Journal of Applied Behavior Analysis, 42*(3), 541-549. doi:10.1901/jaba.2009.42-541

Sarokoff, R. A., & Sturmey, P. (2004). The effects of behavioral skills training on staff implementation of discrete-trial teaching. *Journal of Applied Behavior Analysis, 37*(4), 535-538. doi:10.1901/jaba.2004.37-535

Schloss, P.J., Santoro, C., Wood, C.E., & Bedner, M.J. (1988). A comparison of peer-directed and teacher-directed employment interview training for mentally retarded adults. *Journal of Applied Behavior Analysis, 21*(1), 97-102. doi:10.1901/jaba.1988.21-97

Seiverling, L., Pantelides, M., Ruiz, H. H., & Sturmey, P. (2010). The effect of behavioral skills training with general-case training on staff chaining of child vocalizations within natural language paradigm. *Behavioral Interventions, 25,* 53-75. doi:10.1002/bin.293

Shimoff, E., Matthews, B. A., & Catania, A. C. (1986) Human operant performance: Sensitivity and pseudosensitivity to contingencies. *Journal of the Experimental Analysis of Behavior, 46*, 149–157.

Sidman, M. (1994). Equivalence relations and behavior: A research story. Boston: Authors Cooperative.

Skinner, B. F (1957). *Verbal behavior*. New York: Appleton-Century-Crofts.

Skinner, B. F. (1958). Teaching Machines. *Science, 129*, 969–977.

Skinner, B. F. (1984). An operant analysis of problem solving. *Behavioral and Brain Sciences, 7*(4), 583-613.

Stratton, M. A. (1992). *Comparing selection-based and topography-based language systems with verbal adults learning Japanese words*. Unpublished master's thesis, Western Michigan University, Kalamazoo, MI.

Sundberg, C. T., & Sundberg, M. L. (1990). Comparing topography-based verbal behavior with stimulus selection-based verbal behavior. *The Analysis of Verbal Behavior, 8*, 31-41.

Susa, C. & Schlinger, H. D. (2012) Using a Lag Schedule to Increase Variability of Verbal Responding in an Individual with autism. *The Analysis of Verbal Behavior, 28*, 125–130.

Tan, K., Bredin, J., Polson, D., Grabavac, D., & Parsons, J. (1995, May). *The effects of topography-and selection-based training and testing on the emergence of symmetry.* Poster presented at the Association for Behavior Analysis, 21st Annual Convention, Washington, DC.

Torrance, E. P. (1966) *Torrance tests of creative thinking*. Princeton, New Jersey: Personnel Press, 1966.

Tufenk, T. A., Rehfeldt, R. A. DeMattei, R. R., & O'Neill. J. (in press). The effects of behavioral skills training in teaching basic behavior analytic skills to dental hygiene students. *International Journal of Behavior Analysis & autism Spectrum Disorders.*

Vanselow, N. R. & Hanley, G. P. (2014). An evaluation of computerized behavioral skills training to teach safety skills to young children. *Journal of Applied Behavior Analysis, 47*, 51–69. doi: 10.1002/jaba.105

Walker, B. D., & Rehfeldt, R. A. (2012). An evaluation of the stimulus equivalence paradigm to teach single-subject design to distance education students via Blackboard. J*ournal of Applied Behavior Analysis. 45*, 329–344. doi: 10.1901/jaba.2012.45-329

Walker, B. D., Rehfeldt, R. A., & Ninness, C. (2010). Using the stimulus equivalence paradigm to teach course material in an undergraduate rehabilitation course. *Journal of Applied Behavior Analysis, 43*, 615–633. doi: 10.1901/jaba.2010.43-615

Wallander, R. J. (1993). *Effects of familiarity with a sample stimulus in selection-based learning of verbal behavior.* Unpublished master's thesis, Western Michigan University, Kalamazoo, MI.

Ward-Horner, J., & Sturmey, P. (2012). Component analysis of behavior skills training in functional analysis. *Behavioral Interventions, 27*(2), 75-92. doi: 10.1002/bin.1339

Weimer, M. (2002). *Learner-centered teaching: Five key changes to practice*. San Fransisco, CA: Jossey-Bass.

Wraikat, R. M. (1990). *Teaching tact and intraverbal behavior to developmentally disabled adults: A comparison of topography-based and selection-based paradigms.* Unpublished project, Western Michigan University, Kalamazoo, MI.

Wraikat, R. M., Sundberg, C. T., & Michael, J. (1991). Topography-based and selection-based verbal behavior: A further comparison. *The Analysis of Verbal Behavior, 9*, 1-18.

APPENDICES

APPENDIX A

Interobserver Agreement and Treatment Integrity: TB Tests

Participant: Date: Phase: Filename:

<u>Response Key</u>

"+" = Step or component presented/occurred "-" = Step or component did not present/occur

Question	Correct question presented?	Accurate Responses			Inaccurate Responses			Affirmative consequence provided?
		Exact	Novel	Recomb.	Exact	Novel	Recomb.	
1								
2								
3								
4								
Totals:								

APPENDIX B

Interview Questionnaire (IQ)

Participant: Date: Phase: Filename:

1. What can you tell me about yourself?
   Responses:
2. Why would you like to work here?
   Responses:
3. What are your strengths?
   Responses:
4. What are your weaknesses?
   Responses:
5. How do you handle pressure and stress?
   Responses:
6. What motivates you?
   Responses:
7. How do you work in a team?
   Responses:
8. Do you have any questions?
   Responses:

APPENDIX C

Instructional Video Scripts (IVS)

(1) What can you tell me about yourself?

"When an interviewer asks you tell them about yourself, they want to know about your work history and other work-related information. You should talk about where you have worked before, your education, any volunteer work you might have completed, and your work-related interests. The interviewer does not want you to focus on personal issues such as your disability. They do not want to hear about your boyfriend or girlfriend, your family, or money issues. Remember, interviewers want to know about where you have worked in the past, where you went to school, where you have volunteered, and any other work-related information you can give them."

(2) Why would you like to work here?

"When an interviewer asks you why you want to work here, they want to know why you think you should get the job. You can talk about how you past experience has prepared you for the job. You can also talk about the things you like about the company and what your goals would be while working for the company. The interviewer does not want to hear about money or things your parents will do for you if you have a job. Remember, interviewers want to know why you are interested in the job and why you would be a good fit. They also want to know why you want to work for them in particular. Most of all, the interviewer wants to know that you want to use your skills at work and learn new skills."

(3) What are your strengths?

"When an interviewer asks you what your strengths are, they want to know that you are good at general work skills. You should talk about the things you feel confident doing and give examples of how you have used your strengths in the past. You should also talk about how your strengths will be good for the company. The interviewer does not want to hear about personal issues or relationships. Remember, interviewers want to know that you are good at general work skills like being on time, doing your work, and wanting to learn."

(4) What are your weaknesses?

"When an interviewer asks you what your weaknesses are, they want to know that you are working to get better at things you are not good at. They want to hear that you are trying to get better. Any time you tell an interviewer about your weakness, you should tell them how you are trying to get better at that skill. Remember, interviewers don't want to know what you are bad at, they want to know how you are trying to improve the skills you are not good at."

(5) How do you handle pressure and stress?

“When an interviewer asks you how you handle pressure and stress, they want you to talk about specific ways that you can deal with pressure and stress. Saying I don’t let it get to me is not good enough. They want to know exactly what you will do when you are under pressure and stress at work. They do not want to know what you will do after work on your free time and do not want to hear that you will listen to music, watch TV, or play video games because these are not allowed in the workplace. Remember, interviewers want to know that you will tell your boss when you feel overwhelmed and not just walk away. They want to know that you have a plan for dealing with pressure and stress when it happens at work.”

(6) What motivates you?

“When an interviewer asks you what motivates you, they want to know what keeps you going at work. You should talk about what you like about work, what you find enjoyable about work, and what you look forward to doing at work. The interviewer does not want to hear about money, the paycheck, or things your parents or family will

do for you if you have a job. Remember, interviewers want to hear that you want to help customers and do a good job, that you want to be part of a team, and that you want to learn new skills.”

(7) How do you work in a team?

“When an interviewer asks how you work in a team, they want to know if you are able to work well with other people. You should focus on the positives of working with other people. Talk about helping others and completing tasks with other employees. You should talk about how people working in a team can help each other and get things done quicker and better than just one person. The interviewer does not want to hear about how you can get the job done by yourself or that you would rather work alone. Remember, you are expected to work as part of a team without your boss asking you to do so. The interviewer wants to know that you can help others with their work without being asked and that you will allow others to help you with your work.”

(8) Do you have any questions?

“When an interviewer asks you if you have any questions, they want to know that you have thought about the job and want to know more about it. You should ask questions about when you can follow-up or check-in to see if a decision has been made. This shows the interviewer than you are very interested and really want the job. You should also ask about the number of hours available each week and what the company expects from a good worker. The interviewer does not want to hear questions about pay, time off, or vacations. Remember, the interviewer wants to know that you are serious about the job and that you are interested in learning more about it. You should always have at least one question ready for the interviewer.”

APPENDIX D

Modeling Video Scripts (MVS)

(1) What can you tell me about yourself?

Accurate: "I went to _____ high school and graduated in _____. I also attended _____ college/university where I studied _____. I worked at a company called _____ where my job was to _____. I have also volunteered at _____ because I really enjoy working with _____.

Inaccurate: "I am __ years old and I have _ brothers and _ sisters. My mom is a _____ and my dad is a _____. I'm a _____ person and really like going to _____ movies with my boyfriend/girlfriend. On the weekends I like to play _____ with my friends. Right now I am saving up for _____.

(2) Why would you like to work here? (Kroger, McDonald's, & Wal-Mart)

Accurate: "I'd like to work here because I really enjoy _____ and would really like the experience of working with _____. I'm interested in learning about _____ so I think I would be a good fit here and nice addition to your team of _____. Also, I've heard from a few people that _____ is a great place to work."

Inaccurate: "I need a job so I have money to buy _____ and my parents said they will buy me a _____ if I get a job. I really only want to work a few hours each so that I can _____. Also, I heard you were hiring and heard the job is easy."

(3) What are your strengths?

Accurate: "Some of my strengths are that I am always on time, I always finish my work, and I pay attention to details. I think these strengths will be good for your company because (*company name*) needs _____ to keep their customers happy. I am also ready to learn new skills like _____."

Inaccurate: "I'm not really sure. I'm pretty smart because I know a lot about ____ and I'm really fast at _____ but people don't want me to _____ because it's not the way they do it. I usually do things my own way because I know how to get things done.

(4) What are your weaknesses?

Accurate: "I've had some difficulty with _____ in the past but I have been working to get better at it by _____. I always try to do my best at _____ and then ask for help if I can't do it on my own. Usually, the people that help me with _____ have something that they are not so good at too and I try to help them in return.

Inaccurate: "I don't have any weaknesses, I'm really good at everything. I never need help because I always do things right and usually I have to help other people who aren't as good at doing something as I am."

(5) How do you handle pressure and stress?

Accurate: "I like to have a plan for dealing with pressure and stress. I usually try to take things one step at a time and then ask a coworker for help if that doesn't work. If I'm still feeling pressure or stress then I will talk to my supervisor to see if there is a better way to deal with it."

Inaccurate: "I don't let pressure or stress get to me. I just deal with it and keep doing what I'm doing." "I don't do well under pressure and usually need to walk away and take a break. Sometimes people get upset that I'm not working but that's the only way I can calm down." "I deal with pressure and stress by listening to music, watching TV, or play video games."

(6) What motivates you?

Accurate: "I really look forward to and enjoy helping people and working towards finishing a task or getting to my goal. I feel good knowing that I've done my job and was able to help others." It's nice to see the finished product or a smile on the customers face and I like to learn new skills"

Inaccurate: "My main motivation is money. I look forward to getting my paycheck so I can do the things I really enjoy. There aren't many things that I like about working but my parents said they will buy me a _____ if I can get a job. Mondays are usually pretty rough but I look forward to the weekend when I can _____."

(7) How do you work in a team?

Accurate: "I work well with other people and enjoy working in a team. I like helping others and completing tasks with other employees. Working in a team means helping each other and getting things done quicker and better than trying to do something by yourself."

Inaccurate: "I don't like working in teams and prefer to work by myself because I can get my work done and go home. If I work in a team I usually have to tell other people what to do because they aren't doing things right."

(8) Do you have any questions?

Accurate: "Yes, I'd like to know what you look for in a good employee. I'd like to know how many hours and what days I would work. Would it be okay to follow-up or check-in to see if a decision has been made in about a week?

Inaccurate: "No." "How much does the job pay and when can I get a raise? Do I get paid for time off? How much vacation time do I get because _____?"

Table 1

Examples of Responses to Interview Questions

	Question	Accurate	Inaccurate
(1)	What can you tell me about yourself?	I graduated high school I went to junior college I have work experience	I used to play football I am a quiet person I like to play video games
(2)	Why would you like to work here?	I want the experience I like this company I think it would be a good fit	I need the money My parents will buy me a car I heard you need help
(3)	What are your strengths?	I am always on time I always finish my work I pay attention to details	I'm smart I'm fast I don't know
(4)	What are your weaknesses?	Sometimes I need extra time Sometimes I get frustrated Sometimes I get overwhelmed	I give up easily People annoy me I don't have any
(5)	How do you handle pressure and stress?	I ask a coworker for help I talk with my supervisor I do one thing at a time	I don't let it get to me I'll help you in a minute Try to deal with it
(6)	What motivates you?	Helping people Finishing the task Knowing I've done my job I like to learn new skills	Money My parents will buy me a car The weekend
(7)	How do you work in a team?	By helping other employees By letting others help me By sharing the workload	By only doing my work By telling others what to do By working alone
(8)	Do you have any questions?"	What will you expect of me? What are the hours? Can I follow up in a week?	Are you going to hire me? When do I get a raise? No

Figure 1

Diagram of convergent and divergent multiple control.

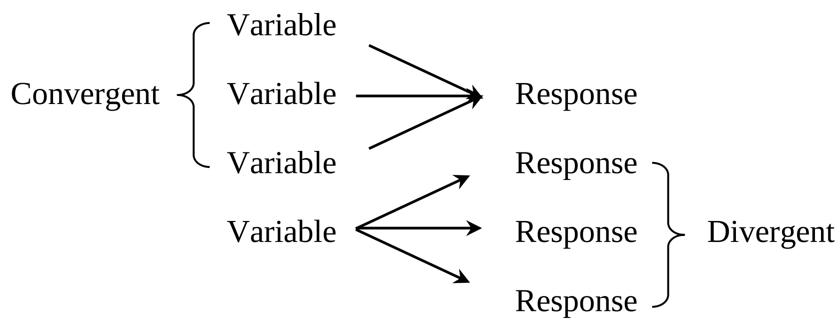


Figure 2

Example of on-screen SB Instruction with five response options.

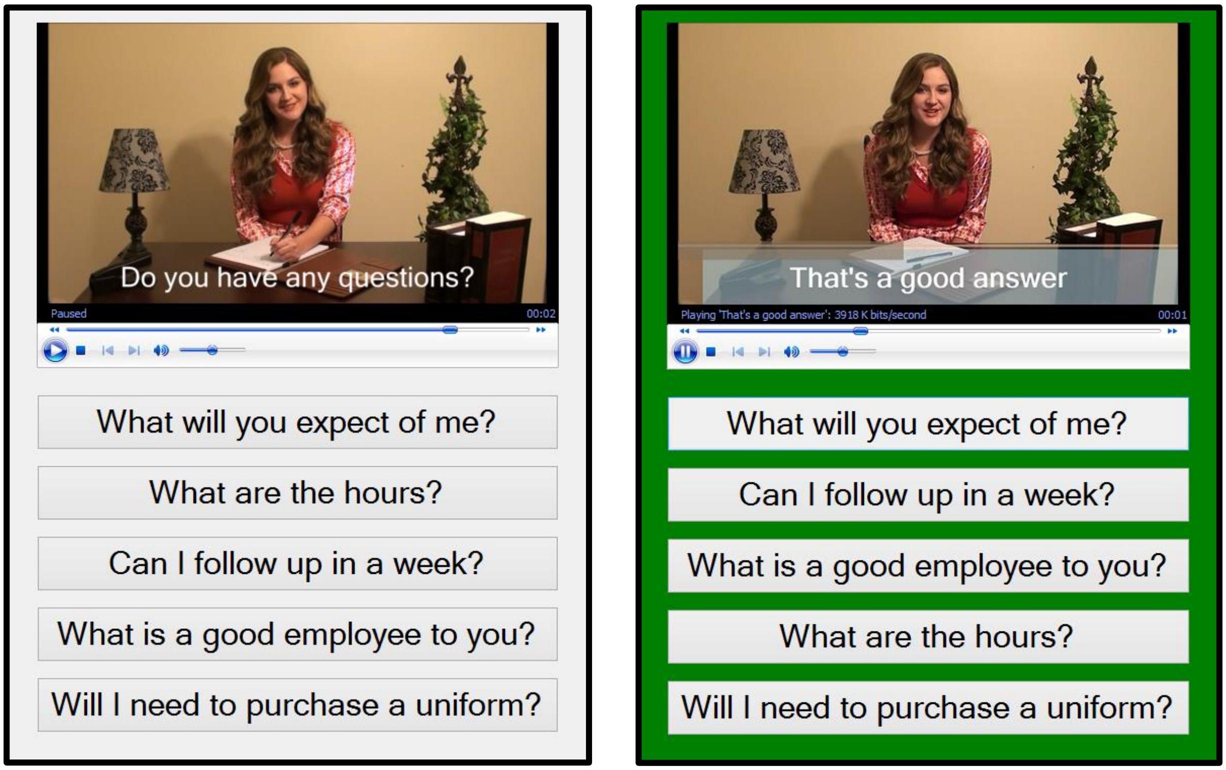


Figure 3

Diagram of the general sequence for Experiment 2

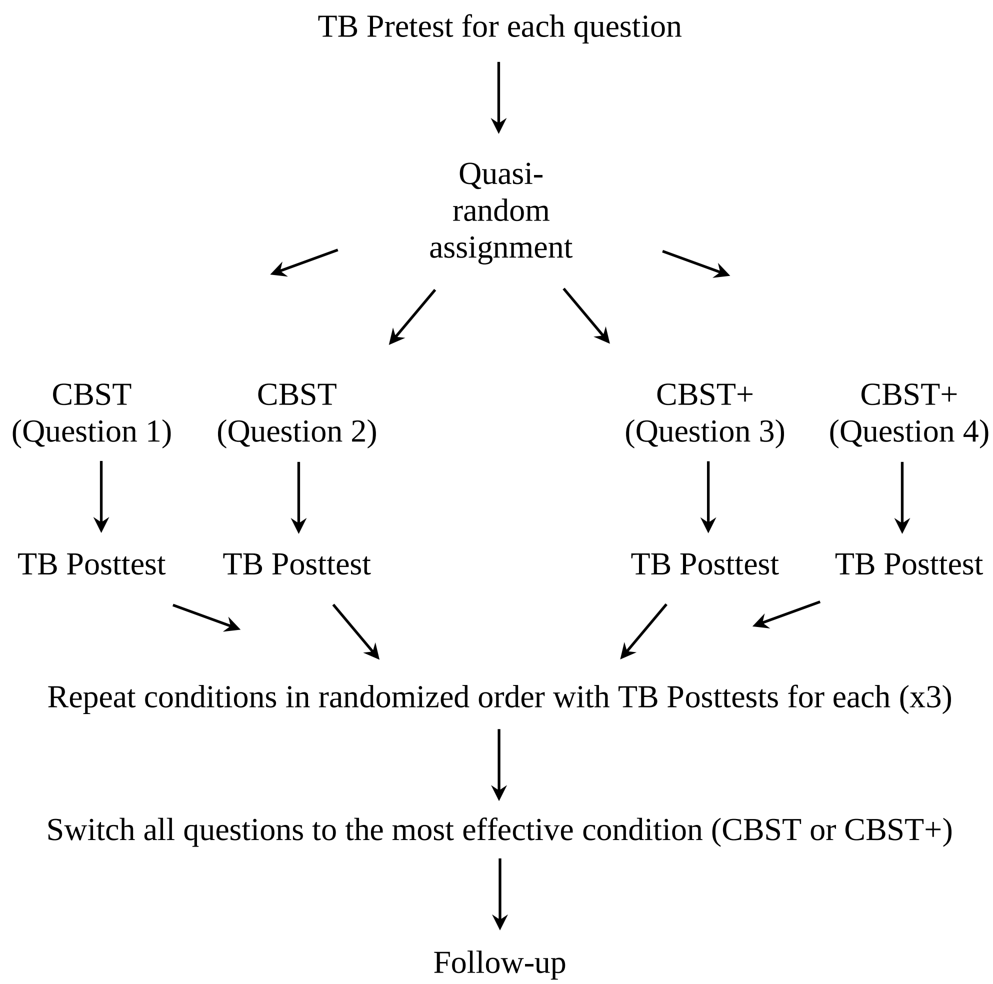


Figure 4

Screenshots of CBST control menus.

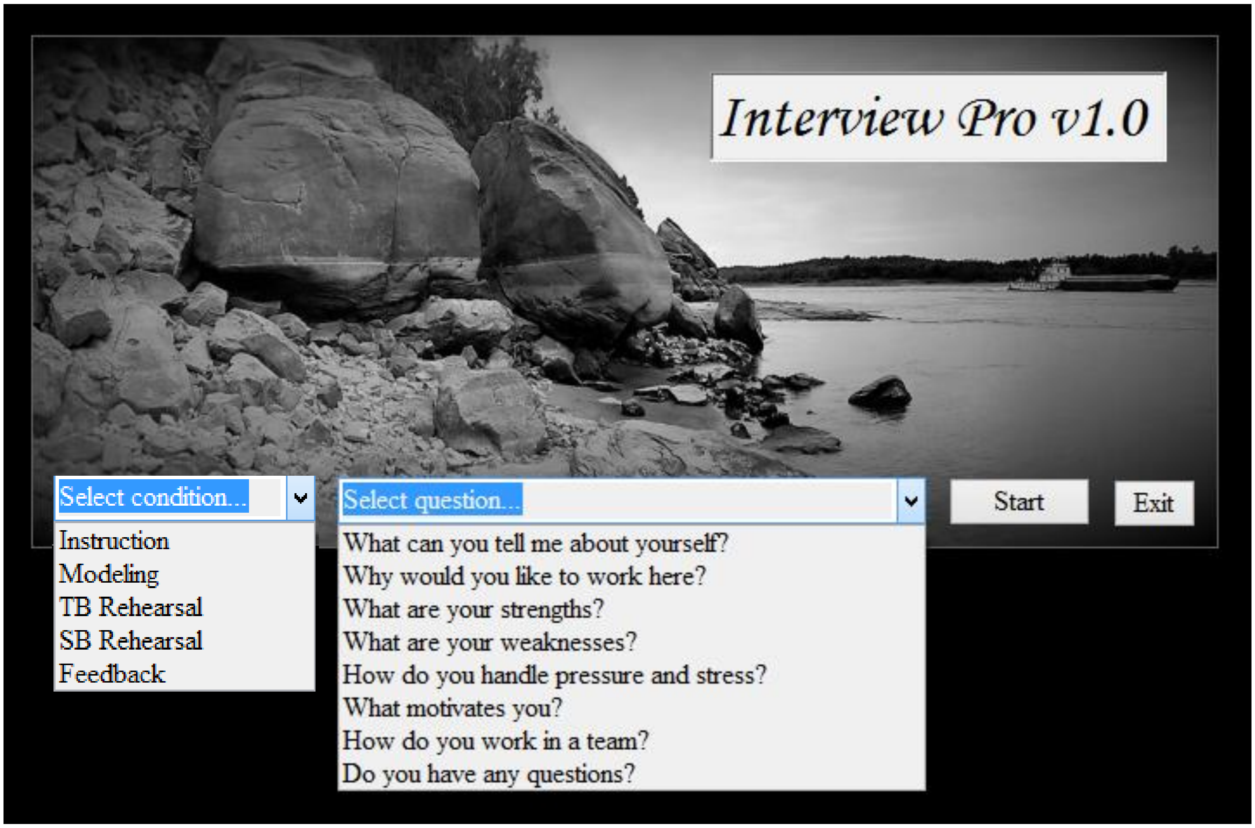


Figure 5

Example of on-screen video-instruction.

Figure 6

Example of on-screen video-modeling.

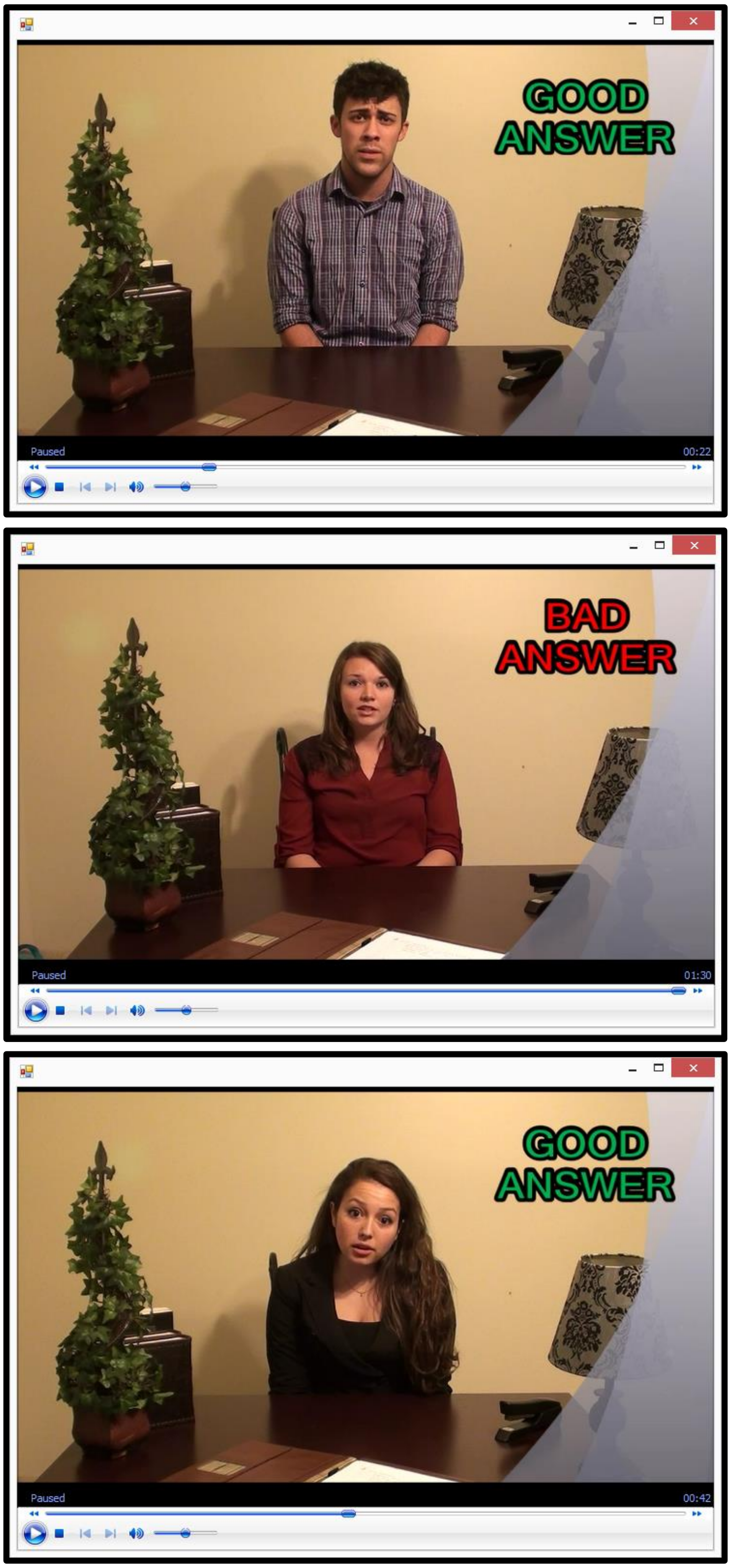


Figure 7

Experiment 1: Participant 1 data.

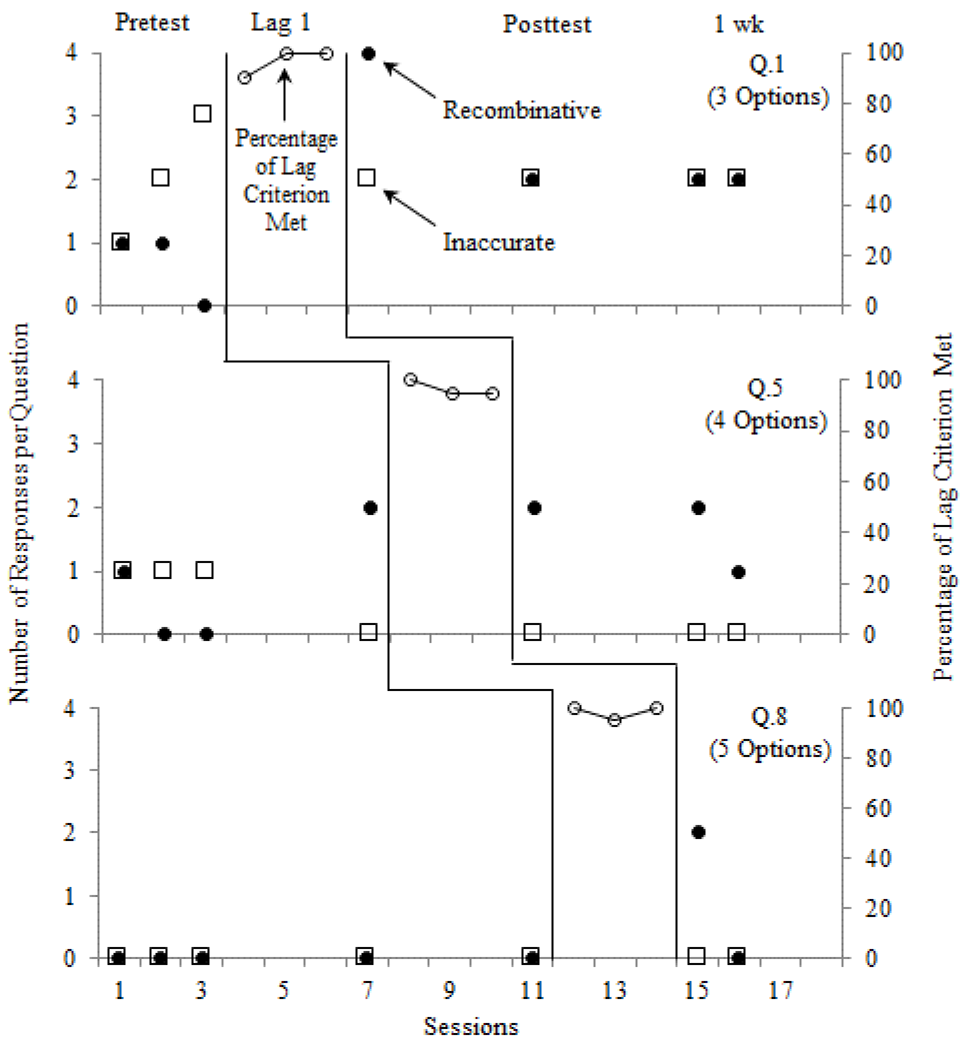


Figure 8

Experiment 1: Participant 2 data.

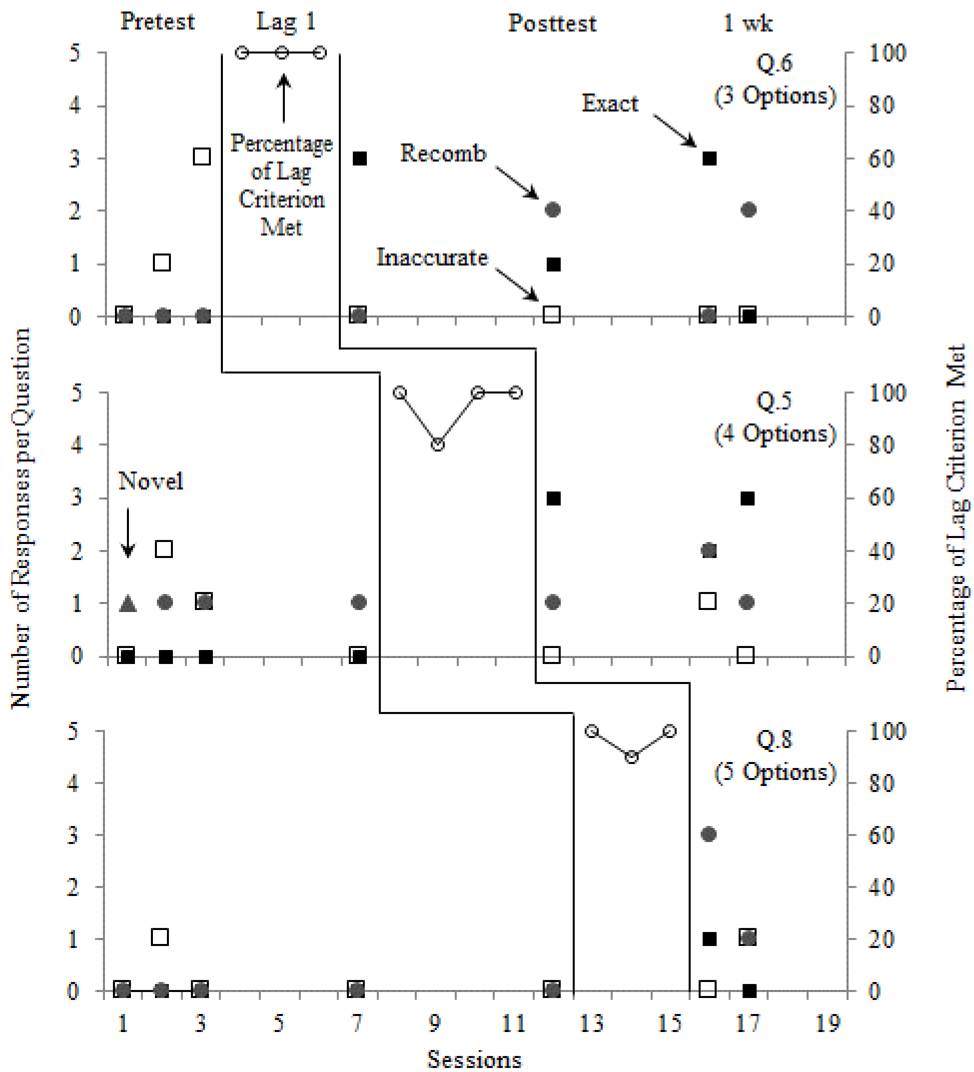
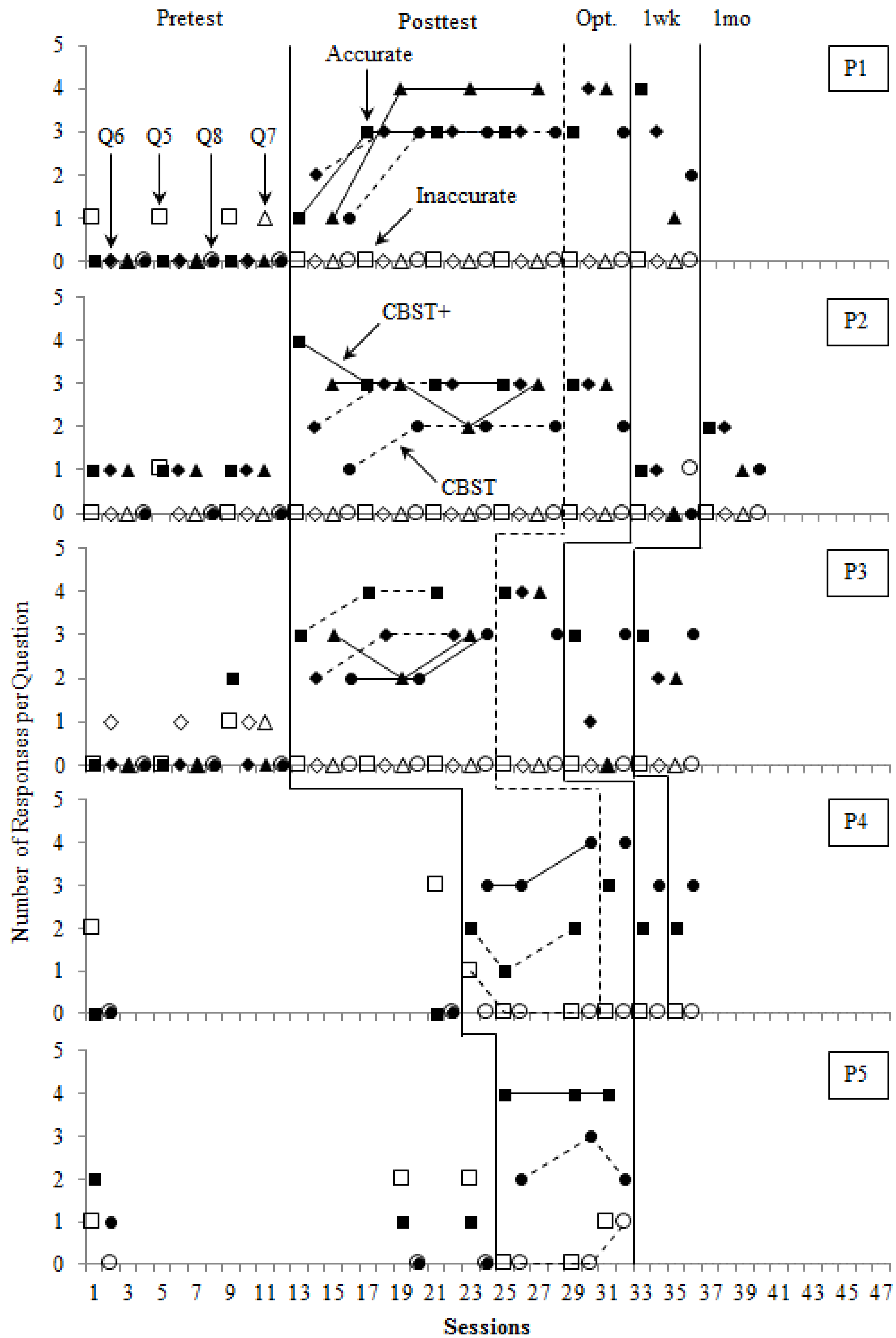


Figure 9

Experiment 2: Participants 1-5 data.



VITA

Graduate School
Southern Illinois University Carbondale

John O’Neill

joneill@siu.edu

University of South Florida St. Petersburg
Bachelor of Arts in Psychology, May 2007

University of South Florida
Master of Arts in Applied Behavior Analysis, May 2012

Special Honors and Awards:

Dissertation Research Award, Southern Illinois University	August 2014
Janet and David Stover Scholarship, Southern Illinois University	April 2014
Behavioralis Junkus #28.6M, University of South Florida	May 2012
Chancellor’s List, University of South Florida St. Petersburg	May 2007
Member, Psi Chi National Honor Society in Psychology	June 2006
Member, Golden Key International Honour Society	June 2006
Dean’s List, University of South Florida St Petersburg	May 2006
Transfer Student Achievement Scholarship, University of South Florida	January 2006

Thesis Title:

Training Deictic Relational Responding in People Diagnosed with Schizophrenia.

Dissertation Title:

Computerized Behavioral Skills Training, Selection-Based Instruction, Lag Reinforcement Schedules, and the Emergence of Topography-Based Responses to Interview Questions.

Major Professor: Ruth Anne Rehfeldt

Publications:

Aguirre, A., O’Neill, J., Rehfeldt, R. A., & Boyer, V. (2014). Behavioral Interventions for Complex Communication and Social Skills in Adults with autism Spectrum Disorders. In Tincani & Bondy (Eds.), *Autism Spectrum Disorders in Adolescents and Adults Evidence-Based and Promising Interventions* (pp.139-177). New York: Guilford Publications, Inc.

Johnson, M. L. & O’Neill, J. (in press). Computer assisted apparatuses. In Dixon (Ed.), *Handbook of Invertibrate Operant Conditioning* (pp.63-71). Carbondale: Shawnee Scientific Press, LLC.

O'Neill, J. & Aguirre, A. (in press). Schedules of reinforcement. In Dixon (Ed.), *Handbook of Invertibrate Operant Conditioning* (pp.50-62). Carbondale: Shawnee Scientific Press, LLC.

O'Neill, J., Blowers, A. P. Henson, L. & Rehfeldt, R. A. (2015). Further analysis of selection-based instruction and the emergence of topography-based responses to interview questions. *The Analysis of Verbal Behavior, 31,* 126–136. doi: 10.1007/s40616-015-0031-5

O'Neill, J. & Henson, L. (2014). Helping people with disabilities acquire a job. *Journeys, 1,* 8. Retrieved from http://ehs.siu.edu/_common/documents/journeys-May14.pdf

O'Neill, J. & Rehfeldt, R. A. (2014). Selection-based responding and the emergence of topography-based responses to interview questions. *The Analysis of Verbal Behavior, 30* (2), 178-183. doi: 10.1007/s40616-014-0013-z

O'Neill, J., Rehfeldt, R. A., Muñoz, B. E., Ninness, C., & Mellor, J. (in press). Comparison of a stimulus equivalence protocol and traditional study in learning skinner's verbal operants. *The Analysis of Verbal Behavior.*

O'Neill, J. & Weil, T. M. (2014). Training deictic relational responding in people diagnosed with schizophrenia. *The Psychological Record, 64,* 301-310. doi: 10.1007/s40732-014-0005-3

Tufenk, T. A., Rehfeldt, R. A., DeMattei, R. R., & O'Neill. J. (2015). The effects of behavioral skills training in teaching basic behavior analytic skills to dental hygiene students. *International Journal of Behavior Analysis & autism Spectrum Disorders, 1,* 122-134.