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Assessing the Effects of Interactive Video Modeling on the Fidelity of Implementation of Skill-Acquisition Procedures

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ASSESSING THE EFFECTS OF INTERACTIVE VIDEO MODELING
ON THE FIDELITY OF IMPLEMENTATION OF
SKILL-ACQUISITION PROCEDURES

by

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Behavior-analytic study has led to many advances in staff training over the last several decades. The effectiveness of modeling, role-play, and video modeling are well demonstrated in scientific literature but these techniques are often time consuming for those conducting the training which often leads to their being quite costly. Interactive video modeling is an alternative that is potentially more cost and time efficient. This type of modeling consists of embedding response opportunities in traditional video models that require the trainee to answer questions in order to complete the video. Being required to answer the embedded questions causes the trainee to attend to specific information depicted in each video, thus making pertinent information more salient, and perhaps leading to faster mastery without the need for trainers to be present. The current study compared the effects of training when using two types of video modeling, interactive and traditional, when training new tutors to implement specific procedures common in early intensive behavioral intervention centers. The results were fairly inconclusive, two participants mastered the skill taught using interactive video modeling one session faster, but this was too small of an effect to draw firm conclusions.

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INTRODUCTION

Over the years, powerful behavior analytic technology has been designed to teach new skills to people diagnosed with a variety of different developmental disabilities. Unfortunately, the effectiveness of these procedures depends on accurate and consistent implementation by family members and direct-care staff who may not have formal training in behavior analysis. Thus, the development of effective training strategies is necessary (Ducharme & Feldman, 1992).

One of the earliest examples of using behavioral techniques to train staff was at a mental health facility (Ayllon & Michael, 1959). While the field of behavior analysis has advanced significantly since this study, there is an ongoing opportunity to improve staff-training techniques as technology continues to evolve.

Implementing an intervention accurately and consistently in a manner that reflects how it was originally designed is referred to as treatment integrity or treatment fidelity (DiGennaro-Reed, Codding, Catania, Maguire, 2010; Gresham, 1989). Treatment integrity needs to be directly measured because interventions conducted with high integrity tend to produce better results (DiGennaro, Reed et al. 2010; DiGennaro, Martens, & Kleinmann, 2007; DiGennaro, Martens, & McIntyre, 2005). Measuring treatment integrity is also helpful because if an intervention is implemented with high fidelity and is still ineffective it will suggest the need to modify the intervention (Arkoosh, Derby, Wacker, Berg, McLaughlin, & Barretto, 2007; DiGennaro-Reed et al. 2010).

Many different training techniques have been developed in an attempt to increase treatment fidelity over the last 60 years. Written instructions (Neef, Parrish, Egel, and

Sloan, 1986), modeling and role-play (Ducharme & Feldmen, 1992; Sarokoff & Sturmey, 2004), and video modeling (Catania, Almeida, Liu-Constant. & Reed, 2009; Collins et al., 2009; Moore & Fisher, 2007) are among the most widely studied staff-training techniques. Additionally, feedback has been extensively examined both as a primary training tool (Alavosius & Sulzer-Azaroff, 1990) and as part of a training package where it is used in addition to these other training interventions (DiGennaro-Reed et al., 2010; Ducharme & Feldman, 1992; Sarokoff & Sturmey, 2004).

Written instructions alone are relatively ineffective. For example, Neef et al. (1986) conducted a series of four experiments in an attempt to increase the reliability with which respite workers implemented tasks with developmentally disabled clients. The interventions demonstrated effectiveness, but only when combined with remedial training in the form of modeling and rehearsal. It is noted specifically in the second of these experiments that all the participants received remedial training. However, in the other experiments conducted in this investigation, the number of participants requiring remedial training was not discussed other than mentioning that such training was typically necessary to reach mastery criteria. Thus, it is not possible to discern whether or not any of the participants were able to reach mastery criteria using the manual alone. Other studies that have measured the effects of written instructions have warranted even less impressive results often leading to the use of the written instructions as a baseline condition prior to the implementation of another staff training technique (Alavosius & Sulzer-Azaroff, 1990; Collins et al., 2009; Ducharme & Feldmen, 1992; Sarokoff & Sturmey, 2004).

Feedback alone has also been insufficient in training staff to conduct tasks with high fidelity. There has been much debate in the field of behavior analysis as to what constitutes feedback. For this study, feedback will be defined as “information provided to individuals about the quantity or quality of their past performance” (Balcazar, Hopkins, & Suarez, 1985, p.65). Feedback can be delivered in many forms including, but not limited, to vocal verbal feedback, written feedback, video feedback, and graphic feedback. Balcazar et al. (1985) conducted a thorough, critical review of the effects of performance feedback in industry as well as human service settings and in sum examined 126 feedback applications. Of the 47 studies that used feedback alone only 28% achieved the desired mean effects of increasing or decreasing target behavior for all subjects, settings, and/or behaviors while only 57% reached the desired mean increases or decreases in behavior for some but not all subjects, settings, and/or behaviors. Finally, no effects occurred for 15% of the studies. Outcomes were improved in studies in which behavioral consequences were added to the feedback but fewer than 60% were able to attain the desired mean effects of increasing or decreasing target behavior for all subjects, settings, and/or behaviors. Though feedback is widely used as a performance management technique, this analysis shows that when used alone, it is often not effective. The studies that have evaluated feedback alone since the Balcazar et al. review have demonstrated similar results.

One investigation (Alavosius & Sulzer-Azaroff, 1990) did achieve mastery criteria for all staff following both patient positioning task analyses and mealtime procedure task analyses in a residential facility but feedback had to be delivered between 12 and 17 times taking up to 25 workdays. The cost of having a trainer attend a single staff member’s shift 25 times would be an obvious limitation of this training strategy although the authors noted that this cost is still less than the cost of the workers’ compensation if the staff person did get injured.

Modeling and role-play have been shown to be quite successful in training staff that work with developmentally disabled clients compared to written instructions and feedback alone. Sarokoff and Sturmey (2004) used a training package that included modeling and role-play along with written instructions and both verbal as well as graphic feedback. The intervention was successful in training teachers to implement discrete trial training procedures but the specific component responsible for the desired change cannot be determined due to the fact that a training package was used. Additionally, the amount of training necessary to reach mastery criteria was not discussed. Ducharme and Feldmen (1992) compared different staff training strategies to determine which training strategies lead to greater generalization. Three groups of caregivers were taught to provide training, treatment, and custodial care to adults and adolescents with developmentally disabled diagnoses using different variations of modeling and role-play. Staff members who were exposed to a wider range of client programs more reliably achieved mastery criteria and were the only group to show adequate transfer of training to other clients and settings. While results of investigations using both modeling and role-play are robust, it is not clear if this technique would be effective without providing multiple training sessions, subsequent training in the natural environment with the client, and/or more in-depth training on multiple skills. Without such evidence, the efficiency of such training in terms of the amount of time and resources needed to conduct this type of training is quite high.

Video modeling and video modeling with role-play have been shown to be as, if not more effective, than modeling and role-play in training staff to work with clients with developmental disabilities. Collins, Higbee, and Salzberg (2009) compared the use of role-play alone to role-play along with video modeling while training staff how to perform a new problem solving intervention at a group home for adults with developmental disabilities. Results indicated that during role-play alone participants only responded correctly 38% of the time but when video modeling was added performance increased to an average of 91%. Participants took between three and seven sessions after the addition of video modeling to reach mastery and all participants maintained performance when introduced to a novel situation to implement the intervention. The performance for four of the six participants transferred from the training environment to the group home with actual clients without any supplemental training. The two remaining staff members were shown videos before sessions in the home. After everyone met mastery criteria, probes indicated that skills maintained for at least two to four weeks after the study had concluded. These results suggest that transfer of training to the natural environment, and response maintenance might be more readily achieved using video modeling and role-play compared to live modeling and role-play.

Catania et al. (2009) taught direct care staff to implement discrete trial training using a video model that was eight minutes in duration with no role-playing. Two of the three participants achieved mastery criteria after their first video modeling session, while the third participant required three sessions. During one-week follow up probes, mastery criteria had maintained. Vladescu, Carroll, Paden, and Kodak (2012) replicated this study and found similar results. These studies suggest that video modeling might lead to more generalization and transfer of training than modeling and role-play. More importantly these results provide evidence for the possibility that these skills can be acquired faster using video modeling compared to other techniques.

Moore and Fisher (2007) also used video modeling without role-play to teach participants to conduct functional analyses using either full, which depicted 100% of potential therapist behaviors or partial video models, which depicted 50% of all potential therapist behaviors. Partial video modeling failed to bring about mastery in any of the nine functional analysis condition implementations. Full video modeling succeeded in bringing implementation to mastery criteria in eight out of nine conditions which supports the fact that more thorough training techniques might be most effective in training staff to implement interventions than those that are brief. Video modeling, when all of the component responses are represented, seems to produce the most consistent results and is widely accepted as an effective training technique (as is modeling and role-play) but still failed to train one of the participants in the study by Moore and Fisher (2007) to mastery criteria.

Thus far, the interventions implemented to train staff have been quite time consuming, costing a home or staffing agency money that could be spent otherwise to improve the quality of life of the client. According to a survey conducted by the Association of Professional Behavior Analysts in 2014, Board Certified Behavior Analysts (BCBA) were paid between $30 and $200 per hour with the greatest distribution of BCBAs charging between $60 and $90 per hour (APBA, 2014). In their 1992 study Ducharme and Feldmen found that their modeling and role-play intervention needed an average of just over seven sessions to achieve the mastery criteria that was used for the behaviors being specifically trained. According to the authors, the average training session lasted three hours meaning that it could cost more than $4,000 to train a single staff person. Collins et al. (2009) took an average of five sessions to train staff to implement a problem-solving protocol using video modeling. The authors did not discuss how long sessions were but assuming they were at least an hour long it could cost more than $1000 to train a single staff person. Collins et al. (2009) also mentioned that their interventions might have achieved mastery criteria sooner than in other applications of this training because the behaviors being taught were fairly simple. Based on the possible cost exemplified by these two studies, it is evident that a staff training technique that is more cost effective in terms of money and time spent on training needs to be developed. One potential solution is interactive video modeling.

Interactive video modeling could potentially be more cost effective because staff being trained are required to actively respond in the form of answering questions related to the videos being shown. Staff being trained also receive feedback in the form of having to watch videos and answer questions again if they do not answer correctly the first time. This feedback could reduce the duration of training overall and potentially amount of time that a BCBA needs to interact with the staff being trained due to feedback occurring in another form. Very little behavior analytic research has been conducted on the effectiveness of interactive video modeling. In fact, only one peer-reviewed article was found during this literature review and the technology being used was quite primitive. In 1987 Roger Bass published an article on his use of a combination of a personal computer and VCR to create a computer assisted training procedure to train college students to record data. Participants were asked to record the occurrence of target behaviors using a computer keyboard. No baseline data were reported but high levels of correct responding occurred immediately after training and mastery criteria was achieved after observing between nine and 14 videos. Other interactive instruction programs do exist but no articles supporting their use was found during the current review.

The purpose of the present study was to determine the efficacy of interactive video modeling and to determine its effectiveness in comparison to a traditional video modeling technique, for training staff whose responsibility it would be to implement interventions for clients with developmental disabilities

METHOD

Participants and Setting

Four participants (one male and three females) participated in this study. Participants were undergraduate students recruited from an undergraduate pre-practicum class offered by the psychology department at a public university in the mid-western United States. The purpose of this class was to learn how to work with children with an autism spectrum disorder (ASD) diagnosis so they could take part in an autism practicum the following semester. None of the participants were discontinued from the study for any reason other than reaching mastery criteria, although they were told they could end their participation at any time without it affecting their grade in the class.

Training and testing sessions took place in a small clinical therapy room at the university measuring three meters by three meters. The room contained a table, two chairs, a camera to record testing, materials pertinent to the skill being trained (e.g., reinforcers, data collection sheets, pencils), and a confederate playing the role of the client. During training, the video models were displayed on a computer that was removed before the testing sessions commenced. Video observations and ratings took place in a small lab space located in the same building as the small clinical therapy room.

Participants were allowed to schedule sessions at their convenience because the duration of the class was fairly short (seven weeks). Some participants chose to complete multiple sessions in the same day while others would wait for several days in between sessions.

Procedures

Each participant was trained to implement two skills, least to most prompting and the Picture Exchange Communication System (PECS) error correction; both of which they were likely to use in their work with clients at the practicum site (see Appendices B & C) and were requested by the practicum supervisor specifically. A video model was used to train one skill, and a second skill was trained using an interactive video model.

Experimental Design. An adapted alternating treatments design (Sindelar et al. 1985) was used to examine the effects of video modeling and interactive video modeling on the acquisition of early intensive behavior intervention protocols by new tutors. This design is appropriate for studies that compare interventions that are intended to increase and maintain behavior (Grow, Carr, Gunby, Charania, & Gonsalves, 2009). In this case, the purpose of the study was to teach novel skills to tutors who do not have any previous experience in an early intensive behavioral intervention (EIBI) setting; so, a baseline condition would not have led to in any results. Instead of exposing the same behavior to multiple interventions as would be seen in a standard alternating treatment design, multiple behaviors that are considered to be equivalent are exposed to different interventions that are meant to produce the same increase in behavior (Grow et al. 2009).

In the current study, each participant was taught the two skills mentioned above using different interventions. This was counter balanced by having the participants receive different interventions (i.e., training strategies) from one another for each particular skill. With four participants taking part in the study, participants one and three learned the least-to-most prompting procedure through traditional video modeling, and the PECS error correction procedure using interactive video modeling. Participants two and four learned the least to most prompting procedure through interactive video modeling, and the PECS correction procedure using traditional video modeling. The order in which the participants received the trainings during each session was randomly selected using a computer based number randomizer.

Interobserver Agreement. IOA was collected by the researcher and research assistants on 32% of all sessions using video recordings of the sessions. Total count IOA was calculated by dividing the number of agreements of the occurrence of correct responding by the number of opportunities to respond and then multiplying the product by 100% (Cooper et al., 2007). Whether a response was correct and the number of opportunities to respond will be based on behaviors described on the task analysis for the skill being demonstrated.

Independent Variables. Traditional video models using components that are often used in training procedures (Collins, Higbee, & Salzberg, 2009; Moore & Fisher, 2007), as well as interactive video models were applied.

Traditional video modeling. Videos showing trainers correctly conducting the skill being taught with confederate clients was shown to participants. Videos were 10 minutes in duration. Participants were then asked to demonstrate the skill they had just observed with a researcher acting as confederate client. Video recordings of the sessions were reviewed to obtain data and IOA. Training continued until the trainee exhibited the responses outlined by the task analysis with at least 90% accuracy for three consecutive sessions. Sessions lasted as long as necessary for the participant to complete 10 trials. Feedback was not delivered during video modeling or during skill implementation in order to isolate the effects of the video model. This is consistent with other studies assessing the efficacy of video modeling as a staff training method (Moore & Fisher, 2007; Collins et al. 2009).

Interactive video modeling. The interactive video modeling sessions were identical to the traditional video models except the trainee was required to actively respond during the videos in order to keep progressing and to reach the end of the video model. These videos were also 10 minutes in duration, but the training session usually lasted longer than traditional video modeling sessions due to the embedded response requirements at an average of 13 min and 24 sec with a range of 10 min 59 sec to 22 min 51 sec. The embedded response opportunities consisted of the participant watching a section of the whole video, often a single trial exhibiting the skill being implemented, and then answering questions about the details of what they just observed. For example, if a participant was watching the video of least to most prompting, the participant viewed a video of the investigator showing the confederate client three items and stating, "touch ______." After this clip finished playing, the participant was asked a multiple-choice question about what they just observed such as "Which icon is the child being asked to touch?" If the participant answered correctly, he/she proceeded to the next clip of the video model, if he/she answered incorrectly, the clip played again and he/she was required to answer the question again before proceeding. This process continued until the participant answered all questions independently; no prompting towards the correct answer was provided. Once the entire video model was observed and the participant had answered the corresponding questions correctly, he/she was asked to demonstrate the observed skill with researchers or research assistants acting as clients. Both interactive videos had the same number of questions evenly spaced throughout. The interaction between the trainee and trainer was recorded using a video camera, data were recorded during the session, and IOA was obtained from the recording. Training continued until the trainee reached at least 90% correct responding for three consecutive sessions. Other than having to re-watch the videos contingent on incorrect responses, no additional programmed feedback was delivered either during interactive video modeling or when the participants demonstrated the skill in order to isolate variables and to stay consistent with other research (Moore & Fisher, 2007; Collins et al. 2009).

Dependent Variables. The primary dependent variable was the percentage of responses the participant performed in accordance with the task analysis of the corresponding skill being trained. The participants were asked to demonstrate the skill ten times after the training session was completed. The percentage of correct responding was calculated by dividing the number of correct responses occurring in a session by the number of correct and incorrect responses and multiplying by 100.

A three-month follow-up session was conducted to determine if the skills taught generalized to the natural environment and whether or not these skills maintained over time. Sessions were conducted in an early intervention center. One participant was not working at the center at the time the follow-up but sessions were conducted for the other three participants. Least to most prompting sessions were conducted with the participants working with children who had previously been diagnosed with autism. Sessions consisted of the participants being asked to implement the intervention to the best of their ability without any other instruction or feedback. None of the students at the center were learning PECS at the time of the follow-up, so the PECS error correction sessions were conducted in an empty classroom at the center with the experimenter playing the role of the child with autism. IOA was not collected during the three-month follow-up.

Social Acceptability. Social acceptability was measured by asking participants to complete an anonymous questionnaire after mastery had been achieved (See Appendix A) using a Likert type scale, This questionnaire asked the participants to rate interactive video modeling compared to other training methods they had encountered A Likert type scale was also used to ask participants a series of questions related to the effectiveness of each of the training methods, the helpfulness of the different training methods, and overall satisfaction with participation in the study. The participants were also given an opportunity to list any suggestions and/or concerns. Completion of this questionnaire was voluntary.

RESULTS

Figure 1 depicts the percentage of correct responding for each participant following each training session. Participant one reached mastery criteria (three consecutive sessions of at least 90% correct responding) for the PECS error correction procedure which was taught using the interactive video modeling in six sessions. Participant one reached the 90% responding criteria after the first PECS error correction training and responding stayed stable except for session three where responding dipped just below 90% (i.e., 89.2%). Participant one's mean correct responding for the PECS error correction procedure was 97.7% (range, 89.23%-100%). Participant one mastered the least to most prompting, which was taught using traditional video modeling, after seven sessions, and did not achieve the 90% mark until the fifth session. After the first session, the participant's performance was immediately at 80% correct responding after which a slight increasing trend was observed, until mastery criteria were met. There was also a slight level change after session four. Participant one's mean correct responding for least to most prompting was 88.9% (range, 81.25%-100%). During the three-month follow-up, participant one responded with 100% accuracy for both skills. (see Figure 1).

Participant two mastered the least to most prompting procedure, taught using interactive video modeling, in the minimum three sessions with no score under 97% correct, responding was stable for all three sessions. The participant's mean correct responding for the least to most prompting was 99.3% (range, 97.92%-100%). Responding during the first session for the PECS error correction was below mastery criteria at 81.7% but a level change occurred after the second training session and responding stabilized above the 90% mastery criteria. Participant two's mean correct responding for the PECS error correction was 93% (range, 81.69%-97.14%). Participant two completed the initial training but chose not to take the practicum once the pre-practicum course had concluded so follow-up data is not available (see Figure 1).

Participant three mastered both skills after the same number of sessions (six) and did not perform over the 90% threshold until session four regardless of skill or training method. Other than session three, where there was a slight decrease in responding for the PECS error correction

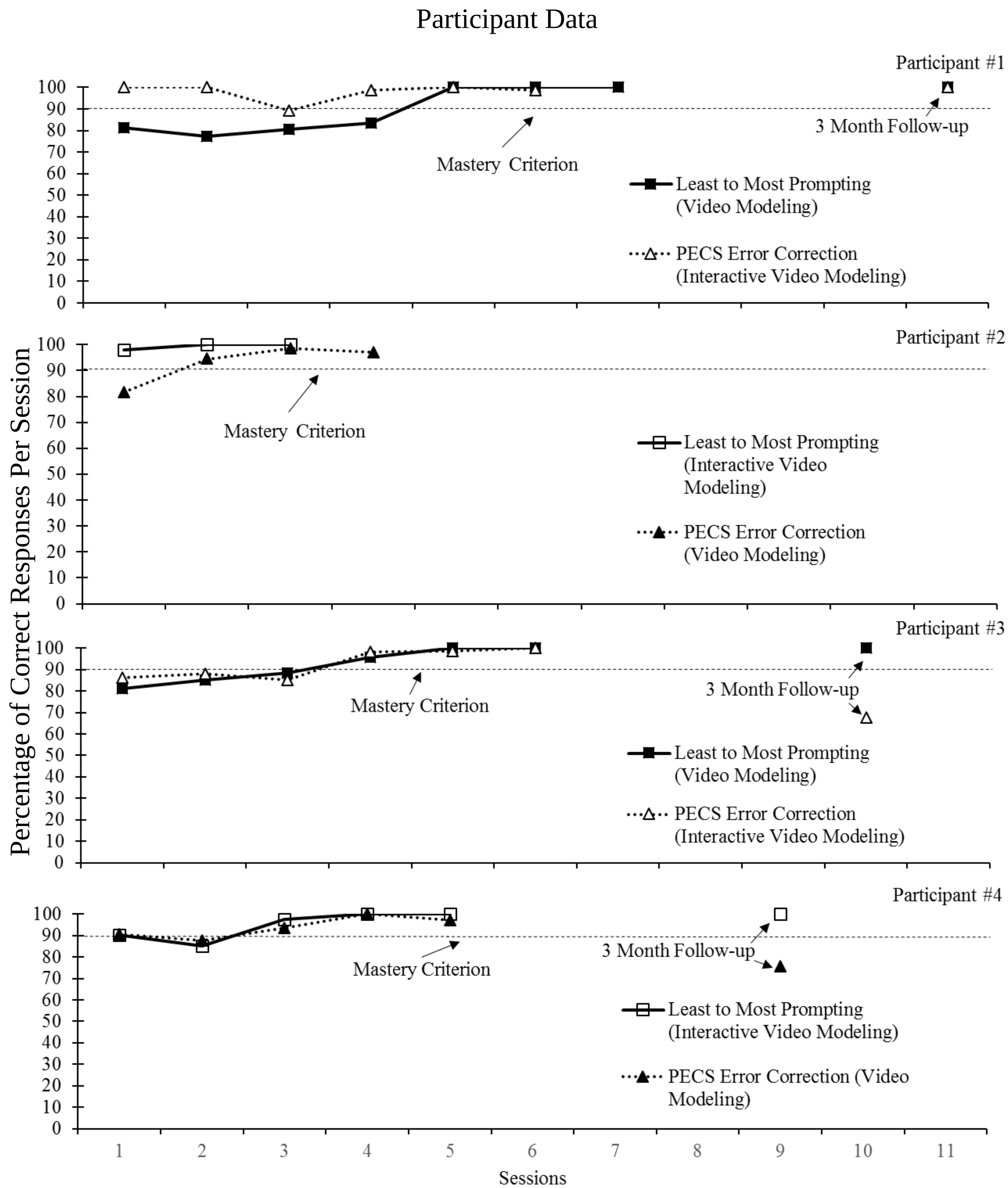

Figure 1. Percentage of correct responses per session for all four participants. The closed squares represent video models used to teach least to most prompting, open squares represent interactive video models used to teach least to most prompting, closed triangles represent video models used to teach the PECS error correction, and open triangles represent interactive video models used to teach the PECS error correction.

which was being taught by the interactive video modeling, participant three's acquisition curves were almost identical across all six sessions with a consistent increasing trend. Participant three's mean correct responding was 91.7% (range, 81.25%-100%) and 92.7% (range, 85.29%-100%) for least to most prompting and the PECS error correction respectively. Participant three responded with 100% accuracy while implementing the least to most prompting procedure during the three-month follow-up Participant three responded with 67.7% accuracy when implementing the PECS correction procedure during follow-up (see Figure 1).

The same number of sessions to master both skills (five) were required for participant four. Participant four's acquisition curves were similar across individual sessions and even more interestingly, the participant only tested under the 90% threshold during the second session. This occurred for both skills being trained suggesting that outside influences, or an unintentional change might have occurred during this session. Other than being a different time of day than the other sessions for that participant, no other environmental differences were observed. Participant four's mean correct responding was 94.7% (range, 85.37%-100%) and 93.9% (range, 87.88%-100%) for least to most prompting and the PECS error correction respectively (see Figure 1). Participant four, like participant one and participant three, responded with 100% accuracy while implementing least to most prompting during the three-month follow-up. Participant four responded with 75.7% accuracy while implementing the PECS correction procedure during follow-up. Failing to wait for the confederate student to make eye contact and not delivering the reinforcer for 20-30 seconds, were the two steps that participants missed the most (see Table 1).

Table 1. Participant Data Table

Session	Data as presented	Data without specifying eye contact	Data with strict 20-30 second reinforcer delivery
Participant 1			
PECS error correction			
Session 1	100%	100%	96.4%
Session 2	100%	100%	100%
Session 3	89.2%	100%	86.2%
Session 4	98.6%	100%	97.1%
Session 5	100%	100%	95.7%
Session 6	98.5%	100%	98.5%
Least to most prompting			
Session 1	81.3%	100%	79.2%
Session 2	77.3%	100%	72.7%
Session 3	80.4%	100%	69.6%
Session 4	83.3%	100%	76.2%
Session 5	100%	100%	84.4%
Session 6	100%	100%	84.8%
Session 7	100%	100%	80.9%
Participant 2			
PECS error correction			
Session 1	81.7%	90.1%	81.7%
Session 2	94.4%	100%	90.1%
Session 3	98.7%	100%	95.9%
Session 4	97.1%	100%	92.9%
Least to most prompting			
Session 1	97.9%	100%	77.1%
Session 2	100%	100%	76.1%
Session 3	100%	100%	77.8%
Participant 3			
PECS error correction			
Session 1	86.2%	96.9%	83.1%
Session 2	88.1%	98.5%	85.1%
Session 3	85.3%	100%	82.4%
Session 4	98.3%	100%	98.3%
Session 5	98.6%	100%	98.6%
Session 6	100%	100%	98.6%
Least to most prompting			
Session 1	81.3%	100%	60.4%
Session 2	85.1%	100%	72.3%
Session 3	88.4%	100%	76.7%
Session 4	95.7%	100%	91.5%
Session 5	100%	100%	97.9%
Session 6	100%	100%	100%

Table 1 – continued

Participant 4			
PECS error correction			
Session 1	90.8%	100%	84.6%
Session 2	87.9%	100%	83.3%
Session 3	93.8%	93.8%	90.6%
Session 4	100%	100%	100%
Session 5	97.1%	100%	95.7%
Least to most prompting			
Session 1	90.2%	100%	65.9%
Session 2	85.4%	100%	68.3%
Session 3	97.7%	100%	90.9%
Session 4	100%	100%	78.3%
Session 5	100%	100%	92.9%

Note: The percentage of correct responding per participant, per session, including what data would have looked like had eye contact not been specified and what data would have looked like had researchers been strict with the 20-30 second reinforcer delivery duration.

IOA was collected for 32% of all sessions with an overall average agreement of 89.8%. There was a single outlier session where agreement was 71.8%. The low agreement was due to not being able to determine if eye contact was being made because of glare from the confederate's glasses. Other than this session the lowest agreement for a single session was 86% and the highest was 98.6% (range, 71.8%-98.6%).

Three of the four participants chose to complete the social acceptability surveys (see Appendix A and Figure 2). In order to allow the participants to respond freely, all questionnaire responses were anonymous. When discussing the questionnaire, the participants will be referred to as respondents one, two, and three, but these numbers do not correspond to their participant number. Two of the three respondents (two and three) responded favorably to interactive video modeling. Respondent two rated all questions

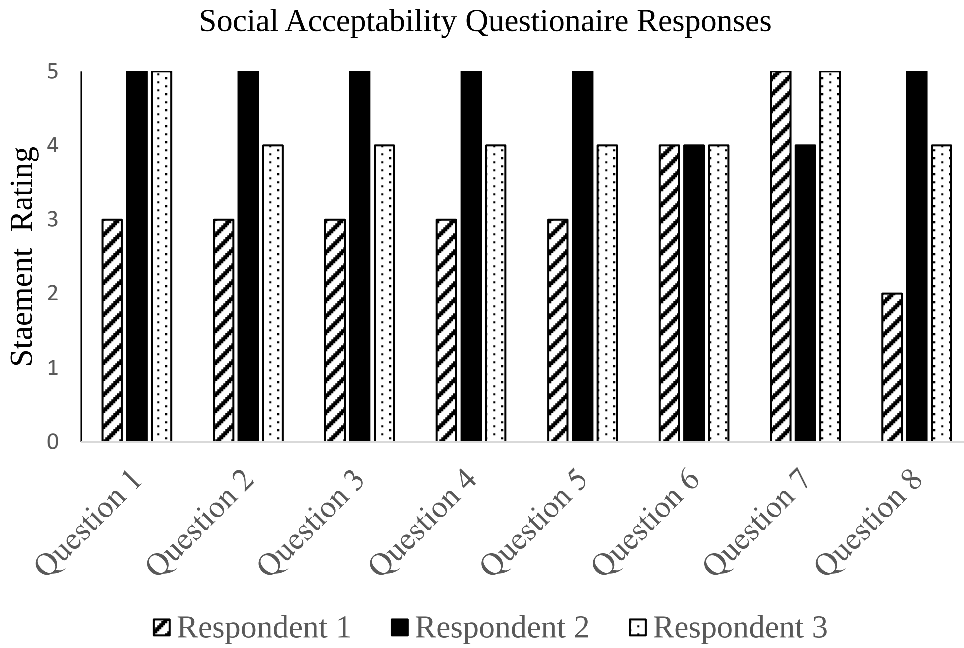

Figure 2. The social acceptability questionnaire (Appendix C) ratings by the study participants were given using a Likert-type scale, with five being the highest rating and 1 being the lowest. Respondent one's ratings are represented by a striped bar, respondent two's ratings are represented by a solid bar, and respondent three's ratings are represented by a dotted bar.

pertaining to preference of interactive video modeling as all fives (strongly agree). The only questions this respondent did not answer with a five, were questions six and seven that asked about the comfort level with implementing the skills that were learned using each learning method in which this participant responded with fours. Respondent two also commented that the interactive video modeling was the most effective training technique and felt well prepared for the upcoming practicum. Respondent three answered with fours on every question except questions one and seven that were answered with fives. Respondent one's answers varied considerably from the other two respondents as evidenced by neutral ratings (a three) to the first five questions. The respondent highly on the question regarding confidence in the skills learned in this training (four and five on questions six and seven respectively), and rated the experience in the study (question eight) as a two thus corresponding to somewhat negative. Respondent one also commented that the training should not have included the child playing with the reinforcer so long because it made him/her forget what happened before, making the questions more difficult.

DISCUSSION

Both traditional video modeling and interactive video modeling were successfully used to teach participants how to implement both the least to most prompting protocol and the PECS error correction protocol. Skill acquisition for participants three and four was close to identical across skills and training methods; participant three learned the least to most prompting error correction protocol through interactive video modeling, whereas participant four learned the PECS error correction procedure through interactive video modeling (see Figure 1). Participant one and two each mastered the skill taught using interactive video modeling (PECS error correction procedure for participant one and the least to most prompting procedure for participant two) in one less session than the skill taught using traditional video modeling (see Figure 1). Interactive video modeling resulted in the skill being taught being mastered in fewer sessions for two of the four participants, but the difference was too small to say that there was a reliable or significant difference compared to traditional video modeling. The skills taught during this study were relatively simple as demonstrated by the fact that both training methods were successful in just a few sessions. The entire training that a new employee would need to undergo would be much more involved and most likely could not be mastered by watching between 30 minutes to an hour of video. Future studies should attempt to teach more complex skills in order to determine if there is a significant difference between training strategies.

It is possible that the questions embedded in the interactive video model played a larger role than originally hypothesized. The questions were assumed to increase attending to the video clips, but it is also possible that these questions functioned as learning opportunities in that the participants might have learned something about how to implement the skill being taught correctly rather than the question only testing whether or not they were attending to the video clips. For example, some of the questions furthered skill mastery, such as asking about a step in the task analysis, while other questions referred to something in the video that would have been missed had the participant not been attending. Because questions specific to mastery, for example “when should you wait for eye contact?” might also function as a learning opportunity, compared to questions about general knowledge of the observed skills such as asking “what object was the child asked to point to?”, future studies should determine if question content (the type of information being requested) will lead to faster skill mastery. Of the embedded questions for the least to most prompting interactive video model, questions 1, 2, 3, 4, 7, 8, 12,13,14, and 16 are examples of questions that can be considered learning opportunities, whereas questions 5, 6, 9, 10, 11, and 15 are examples of questions which only serve to ensure attending (see Appendix D). Of the embedded questions for the PECS error correction interactive video model, questions two, three, six, seven, eight, nine, 10, 13, and 14 can be considered learning opportunities because they lead to greater knowledge of the skill. Questions one, four, five, 11, and 12 require the trainee to pay attention but do not provide any additional information to improve performance.

Further evidence that future replications are necessary before the effectiveness of interactive video modeling can be determined is the fact that the majority of incorrect responses involved either not waiting for the confederate to make eye contact, or the participant failing to delivering the reinforcer for at least 20 seconds, and no more than 30 seconds (see Figure 1). Because students in EIBI settings (who the confederates were portraying) are often taught to wait for eye contact, the researchers were strict when collecting these data. Had the researchers not specified making eye contact, all participants would have achieved mastery for both skills in the minimum three sessions (see Table 1). Between 20 and 30 seconds of reinforcer access was held consistent across both skills being taught because it was specified in the PECS error correction protocol at this particular autism center and it was hypothesized that participants might be confused if different reinforcement durations were required. The data presented for skill mastery does not discriminate whether the participant met the goal duration of reinforcer access because only participant three would have achieved mastery on the least to most prompting protocol if it had. All participants still would have reached mastery criteria for the PECS correction procedure had the researchers been strict with the 20 to 30 second duration window (see Table 2).

Other than having to answer questions again during the interactive video modeling, if participants responded incorrectly, no additional programmed feedback was implemented. Again, this was done in order to isolate the effects of the training methods; however, when told that they had not achieved the 90% threshold, participants would often overtly attempt (e.g., “What could I have missed?”, “I know I remembered to entice this time.”) to identify where they had responded incorrectly (researchers and research assistants were instructed to not respond to this behavior). With specific feedback, the participants would have been able to pinpoint which step in the task analysis they were consistently missing, and it is possible that the participants would have altered their performance accordingly and reached mastery criteria in fewer sessions.

It is also possible that participants intended to deliver the reinforcer for the correct duration but were unable to judge time accurately without some time keeping device. Future replications could benefit from testing the relationship between these training methods and feedback, and whether or not having a clock or watch available would have increased accuracy.

Further replications are necessary to determine the extent to which interactive video modeling contributes to skill generalization to the target environment and to the extent that it contributes to maintenance. Follow-up probes were conducted, but it is possible that the high percentage of correct responding during the least to most prompting protocol was related to the large amount of supervision and feedback that the participants receive at the autism center at which they were working as well as the effects of repeated practice. Performance during the PECS error correction protocol were lower on average and much more variable. Participant one responded the highest (i.e., 100%) and when asked, reported that she had implemented the protocol since she started working at the autism center. Participant three exhibited the least accuracy (i.e., 67.7%) during the PECS error correction protocol and when asked, stated that she had not had the opportunity to implement the protocol outside of the initial training. Participant four responded with 75.7% accuracy when implementing the PECS error correction protocol during the follow-up probe. She also reported that she has not had an opportunity to implement the protocol since the pre-practicum training but that she had implemented it in a previous practicum placement. Based on this information, it is likely that continued practice implementing the procedures, and continued feedback are necessary to maintain mastery level responding.

Several potential issues arose during the study. The most critical issue might have been that participant four had prior experience with both of these procedures. Because all participants were enrolled in a pre-practicum class that was meant to prepare them to deliver instruction in an early intensive behavioral intervention (EIBI) setting, it was believed at the outset of the study that the skills being taught were novel to the participants. Participant four had previously worked in (EIBI) clinic and had specifically implemented these interventions before. A baseline condition could have prevented this confound from occurring but one was not included because if the skills were novel to the participants, as they were thought to be, the participants would not have been able to respond when they were asked to implement it. Because it was expected that there would be either zero or only responses with errors during a baseline condition, it was decided that it would be better to not include these sessions because practicing errors could have led to an increase in exhibited future errors (Robinson & Storm, 1978) and because these conditions might have been aversive to the participants which would have resulted in unnecessary and uncomfortable conditions (Ader & Tatum, 1961). Once this information was discovered, the researchers contemplated discontinuing her from the study, but it was decided that all data was informative so her participation continued. Strangely enough, participant four's data was unremarkable as she had just as much trouble with the eye contact and reinforcer delivery duration as the others, and everyone mastered the other components immediately. It is possible that participant four’s history was as much of a hindrance as an advantage. She would often make statements about the procedures being different than she had previously been taught, at times even implying that the study was teaching the techniques incorrectly. The participant also seemed quite distressed when she did not reach mastery in the minimum number of sessions. The other three participants were interviewed after this discovery and the skills being taught were novel to all three.

The pre-practicum class from which the participants were recruited was a seven-week class. Because of this relatively short training period, participants were allowed to schedule training sessions at their convenience. This included back-to-back sessions if they preferred. Previous research (Alavosius & Sulzer-Azaroff, 1990) provided evidence that the amount of training (in their case, number of feedback messages), rather than the frequency of training, is the variable of interest when teaching to mastery. Though this previous research suggests otherwise, more frequent training could possibly result in faster mastery. Training for participant one was spread across 21 days and required the most sessions (seven), whereas participant two chose to complete all of the training in a single day and required the fewest sessions (four). Others who have studied learning agree that training should occur within a smaller temporal relation; Johnson and Layng (1996) have suggested that training should be massed at first in order to solidify performance and lead to greater fluency. Although there is insufficient research to come to any firm conclusions, it is possible that allowing trainees to make as many choices as possible during training might increase task engagement, and reduce any aversiveness encountered as has been observed in other populations (Dunlap et al., 1994).

It is unclear if interactive video modeling is more cost effective than video modeling, and will result in mastery being reached in fewer sessions than traditional video modeling, and should be studied further to come to a firm conclusion. It is also possible that employees will prefer interactive video modeling as did two of the three participants who filled out the social acceptability questionnaire in this study, but a larger sample size is necessary to determine that as well.

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Appendix A

HSIRB Approval Letter

Human Subjects Institutional Review Board

Date: November 5, 2015

To: Jessica Frieder, Principal Investigator
Steven Sparks, Student Investigator for dissertation

From: Amy Naugle, Ph.D., Chair Amy Naugle

Re: HSIRB Project Number 15-10-48

This letter will serve as confirmation that your research project titled "Assessing the Effects of Interactive Video Modeling on the Fidelity of Implementation of Skill Acquisition Procedures" has been **approved** under the **exempt** category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

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

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

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

Approval Termination: **November 4, 2016**

1903 W. Michigan Ave., Kalamazoo, MI 49008-5456
PHONE: (269) 387-8293 FAX: (269) 387-8276
CAMPUS SITE: 251 W. Walwood Hall

Appendix B

Social Acceptability Questionnaire

Please rate your agreement of the following statements from 1 (strongly disagree) to 5 (strongly agree).

1. Interactive video modeling training is an acceptable training method.

   1 2 3 4 5
   Strongly Disagree Strongly Agree

2. Interactive video modeling training is an effective training method.

   1 2 3 4 5
   Strongly Disagree Strongly Agree

3. I would like to engage in interactive video modeling when I am trained in the future.

   1 2 3 4 5
   Strongly Disagree Strongly Agree

4. I found the questions intermixed with the video model to be helpful.

   1 2 3 4 5
   Strongly Disagree Strongly Agree

5. I preferred interactive video modeling to traditional video modeling.

   1 2 3 4 5

   Strongly Disagree Strongly Agree

6. I am confident in my ability to implement the skill I was taught using interactive video modeling.

   1 2 3 4 5
   Strongly Disagree Strongly Agree

7. I am confident in my ability to implement the skill I was taught using video modeling.

   1 2 3 4 5
   Strongly Disagree Strongly Agree

8. Overall I had a positive experience participating in this study.

1 2 3 4 5
Strongly Disagree Strongly Agree

9. Other comments or suggestions:

Appendix C

Least to Most Prompting Fidelity Checklist

Participant should run the protocol for 10 trials. The 10 boxes on the left represent each trial, recording should start at the top right and move across the row before moving to the second row. If the participant does so correctly record a +, if the participant misses a step or performs it incorrectly record a -, if the step is not necessary for the trial leave it blank.

Participant has a reinforcer ready and waits for eye contact

Participant places 3 pictures in front of the child (confederate) and states "Touch ______"

If the child (confederate) responds correctly the participant delivers reinforcer for 20-30 seconds or until consumed. If the child (confederate) responds incorrectly or does not respond the participant states "Touch ______" while pointing at the correct item.

Participant places 3 pictures in front of the child (confederate) and states "Touch ______"

If the child (confederate) responds correctly the participant delivers reinforcer for 20-30 seconds or until consumed. If the child (confederate) responds incorrectly or does not respond the participant states "Touch ______" while gently moving the child's (confederate's) hand in the direction of the correct item.

If the child (confederate) responds correctly the participant delivers reinforcer for 20-30 seconds or until consumed. If the child (confederate) responds incorrectly or does not respond the participant states "Touch ______" while gently guiding the child to touch the correct item.

Participant delivers reinforcer for 20-30 seconds or until consumed.

Appendix D

PECS Correction Procedure Fidelity Checklist

Participant should run the protocol for 10 trials. The 10 boxes on the left represent each trial, recording should start at the top right and move across the row before moving to the second row. If the participant does so correctly record a +, if the participant misses a step or performs it incorrectly record a -, if the step is not necessary for the trial leave it blank.

Participant waits for eye contact

Participant places one PECS icon depicting a reinforcer, and one PECS icons depicting non-preferred items in front of the child (confederate)

Participant entices the child (confederate) with both items depicted on the PECS icons

Once the child (confederate) hands over a card the participant delivers the corresponding item in under two seconds

If the child (confederate) interacts with the item, the participant allows him/her to have the reinforcer for between 20 and thirty seconds the begins again

If the child (confederate) does not interact with the item for more than 5 seconds, the participant takes the item back and shows the/ taps on the icon depicting the preferred item

The participant then holds their hand open to accept the preferred icon and uses a gestural or physical prompt to have the child (confederate) to hand it over

Once the child (confederate) hands over the icon the participant provides praise but does not hand over the corresponding item

The participant then has the child (confederate) perform a high probability action (do this and claps hands) and starts over at step one.

Appendix E

Least to Most Prompting Questions

1. What is the third step of the least to most prompting?
    a. Full physical
    b. Verbal
    c. Gestural
    d. Partial physical

2. What is involved in a gestural prompt?
    a. A gentle physical guide that increases the chance of a correct response
    b. Giving the instruction while pointing to the correct answer
    c. Vocally telling the child the correct answer
    d. Gentle physical guidance to ensure the child makes the correct answer

3. What should you do if the child responds incorrectly after gently guiding them in an approximation of the correct response?
    a. Participant places 3 pictures in front of the child (confederate) and states "Touch ______"
    b. Participant delivers reinforcer for 20-30 seconds or until consumed.
    c. The participant states "Touch ______" while gently guiding the child to touch the correct item.
    d. The participant states "Touch ______" while pointing at the correct item.

4. At what point is a reinforcer delivered?
    a. After the full physical prompt
    b. After a correct response is made
    c. When you feel like it
    d. When eye contact is made

5. What item was the student asked to point to?
    a. Bear
    b. Ball
    c. Train
    d. Gremlin

6. In which step did the student respond correctly?
    a. Partial physical
    b. Verbal
    c. Gestural
    d. Full physical

7. What is always the last step when using the least to most prompt hierarchy?

a. Show the child the picture card
b. Give the child a high five
c. Deliver the reinforcer
d. Full physical prompt

8. What is the fourth step in least to most prompting?
   a. Partial physical prompt
   b. Gestural prompt
   c. Full physical prompt
   d. Verbal prompt

9. Had the child responded incorrectly one more time, what would have been the next step?
   a. Partial physical prompt
   b. Verbal prompt
   c. Gestural prompt
   d. Full physical prompt

10. What icon was the child told to touch?
    a. Pig
    b. Train
    c. Bear
    d. Ball

11. What step did this trial end on?
    a. Verbal
    b. Gestural
    c. Partial physical
    d. Full physical

12. What is the 3rd step in the least to most prompting?
    a. Full physical
    b. Verbal
    c. Gestural
    d. Partial physical prompt

13. What is the first step in least to most prompting?
    a. Gestural
    b. Partial physical
    c. Full physical
    d. Verbal

14. What comes after a full physical prompt?

a. Verbal prompt
b. Reinforcer delivery
c. A break
d. Partial physical prompt

15. Had the child responded incorrectly again, what would have been the next step?
    a. Verbal
    b. Partial physical
    c. Gestural
    d. Full physical

16. What comes after waiting for eye contact?
    a. Participant delivers reinforcer for 20-30 seconds or until consumed.
    b. Participant states "Touch ______" while pointing at the correct item.
    c. Participant states "Touch ______" while gently guiding the child to touch the correct item.
    d. Participant places 3 pictures in front of the child.

Appendix F

PECS Error Correction Questions

1. What does PECS stand for?
    a. Chest muscles
    b. Pictures execute commence service
    c. Pictures execute commence service
    d. Pictures execute commence service

2. What should you do after placing the picture cards in from of the student?
    a. Pictures execute commence service
    b. Play with the items
    c. Wait them out
    d. Give them the corresponding reinforcer

3. When is a trial over?
    a. After the child plays with the reinforcer
    b. When the child gets bored
    c. When you prompt the correct choice
    d. After the high probability response

4. What high probability response did the tutor ask the child to perform?
    a. Tap on the head
    b. Touch nose
    c. Tap shoulders
    d. Stomp feet

5. How did this trial end?
    a. With a reinforcer delivery
    b. High probability response
    c. Child throwing the toy
    d. A lot of crying

6. What happens between trials?
    a. A break
    b. Nothing, next trial starts immediately
    c. Talking to the child
    d. Enticing the child

7. What is the first step of PECS?
    a. Enticing
    b. High probability response

c. Child receives reinforcer
d. Eye contact

8. What should you do after you have prompted the child to hand over the correct icon and they have done so?
    a. Deliver the item
    b. Entice them
    c. Tell them to perform a high probability behavior
    d. Deliver praise

9. What do you do if the child plays with a normally non-preferred item for 5 second/s?
    a. Let them play with it for 20- 30 seconds
    b. Prompt them to choose the correct icon
    c. Take the item back
    d. Deliver praise

10. What should you do after the child has finished their high probability response?
    a. Deliver the preferred reinforcer
    b. Entice the child
    c. Wait for eye contact
    d. Prompt the child to choose the correct icon

11. Why did the tutor stop after he delivered the slinky?
    a. He knew it was a preferred item
    b. The child played with it over 5 seconds
    c. He didn't want the child to get upset
    d. He had just prompted the correct response

12. Why didn't the tutor prompt the student to choose the other icon when she seemed unlikely with her choice?
    a. She played with it over 5 seconds
    b. He didn't
    c. He wanted her to like that toy
    d. He thought she was getting tired of the slinky

13. What should the tutor do if the child does not make eye contact to start?
    a. Say "look at me"
    b. Move around so she is interested
    c. Wait her out
    d. Play with the toy to entice her

14. How should the tutor reinforce choosing the prompted icon?
    a. Thanking her

b. Delivering the reinforcer
c. He doesn't
d. Praise

15. How does the tutor determine that the child really prefers the reinforcer delivered?
    a. The look on the child's face
    b. The just know
    c. Eye contact
    d. The child plays with the item for over 5 seconds

16. In which step would the tutor have the child clap her hands?
    a. The first
    b. The last
    c. The fifth
    d. The third

Appendix G

Stand Alone Literature Structure

A Review of Training Techniques for Staff in Cognitively Delayed and Mental Health Settings

Steven Sparks

Western Michigan University

Abstract

A review of behavior analytic literature published on the training of frontline staff who work with individuals who have been diagnosed with a mental health or cognitive delay was conducted. Articles for all years of the *Journal of Applied Behavior Analysis* (1968 through the end of 2015) and the *Journal of Organizational Behavior Management* (1977 though the end of 2015) were reviewed. Behavior analytic staff training research first emerged in the 1950's, and it has continued to evolve along with the available technology. Written instructions alone have been shown to be relatively ineffective in training staff without the use of supplemental training; feedback can result in successful training but studies have shown that it takes an extensive number of feedback sessions to reach mastery. Modeling with role-play and video modeling have been shown to be the most effective techniques for training staff, but these techniques continue to be quite costly in terms of staff and trainer time and pay. Computer technology has evolved greatly in the last 20 years, and staff training programs are available but little research has been published on their effectiveness and costliness in the journals reviewed.

Keywords: Staff training, mental health, cognitive delays, modeling, role-play, video modeling

Introduction

Over the years powerful behavior analytic technology has been designed to teach new skills to people diagnosed with a variety of different developmental disabilities and mental health diagnoses. The effectiveness of these procedures depends on accurate and consistent implementation by family members and direct-care staff who may not have formal training in behavior analysis. Thus, the development of effective training strategies is necessary (Ducharme & Feldman, 1992).

One of the earliest examples of using behavioral techniques to train staff was at a mental health facility (Ayllon & Michael, 1959). While the field of behavior analysis has advanced significantly since the dissemination of this study, there is an ongoing opportunity to improve staff training techniques as technology continues to evolve.

Implementing an intervention accurately and consistently in a manner that reflects how it was originally designed is referred to as treatment integrity or treatment fidelity (DiGennaro-Reed, Codding, Catania, Maguire, 2010; Gresham, 1989). Treatment integrity needs to be directly measured because interventions conducted with high integrity tend to produce better results (DiGennaro-Reed et al. 2010; DiGennaro, Martens, & Kleinmann, 2007; DiGennaro, Martens, & McIntyre, 2005). Measuring treatment integrity is also helpful because if an intervention is implemented with high fidelity and is still ineffective, it will suggest the need to modify the intervention (Arkoosh, Derby, Wacker, Berg, McLaughlin, & Barretto, 2007; DiGennaro-Reed et al., 2010).

Many different training techniques have been developed in an attempt to increase treatment fidelity. Written instructions (Neef, Parrish, Egel, & Sloan, 1986), modeling and role-play (Ducharme & Feldmen, 1992; Sarokoff & Sturmey, 2004), and video modeling (Catania, Almeida, Liu-Constant. & Reed, 2009; Collins et al., 2009; Moore & Fisher, 2007) are among the most widely studied staff training techniques. Additionally, feedback has been extensively examined both as a primary training tool (Alavosius & Sulzer-Azaroff, 1990) and as part of a training package where it is used in addition to these other training interventions (DiGennaro-Reed et al., 2010; Ducharme & Feldman, 1992; Sarokoff & Sturmey, 2004).

The current review consisted of a systematic search in both *the Journal of Organizational Behavior Management*, and the *Journal of Applied Behavior Analysis* for the search terms “staff training, written instruction, feedback, modeling and role-play, and video modeling” in any part of articles published in the two journals from their conception through 2015. Articles which were part of the initial search results, but did not mention any of the search terms in the title, abstract, or keywords were excluded from the final search results. Articles that described training for frontline or teaching staff that work with individuals with a cognitive delayed or mental health diagnoses were included. The search was intended to review initial training techniques. Thus, articles that described research on improving previously learned performance, as well as articles which detailed teaching consumers who had mental health or cognitively delayed diagnoses, training for parents/caregivers, and training for staff who worked with other populations were excluded. Total count interobserver agreement (IOA) was calculated.

To collect IOA, a second researcher completed an identical review using the same terms and inclusionary criteria. IOA was collected on the articles found as well as the type of staff being trained, the populations those staff work with, and the independent variables of each article. Any disagreements between reviewers (an article included by one reviewer but not both) were reviewed again with both reviewers present so an agreement could be made on whether or not the article met inclusionary criteria. IOA was 100% across articles found. IOA for the participants of the studies in which the reviewers were in agreement was 100% with 42 out of 42 studies being agreed upon in all areas, including participant populations, the participants they were learning to work with, and the independent variables implemented.

Table one depicts all of the articles found which met the search criteria. Forty-two articles met inclusionary criteria overall. Six articles were found in the *Journal of Organizational Behavior Management* and 36 articles were found in the *Journal of Applied Behavior Analysis*. The number of staff training articles in the *Journal of Applied Behavior Analysis* has increased since the year 2000 with 21 of the 36 articles having been published in the last 15 years of this review. The articles published in the *Journal of Organizational Behavior Management* were quite spaced out with two appearing in 1980, three published in the late 1990's, and one published in 2014. Only two articles used written instructions alone, although most of the articles used written instructions as a baseline condition. Thirteen articles used feedback as the main independent variable. All 13 also included written or verbal descriptions of the tasks being trained. Eleven studies had modeling and/or role-play as the primary independent variable; all but two of the studies also included written or verbal instructions, and eight explicitly reported the use of feedback as well. Sixteen studies used video modeling as the primary independent variable. Thirteen of these articles also included written or verbal instructions, seven reported the use of performance feedback, and the participants from one study received training in the form of modeling and role-play prior to the video modeling.

Table 1.

Reviewed Articles

Article	Participants	Population staff were trained to work with	Independent Variable(s)
Written Instructions alone			
Neef, N. A., Parrish, J. M., Egel, A. L., and Sloan, M. E. (1986).	Respite workers	Developmentally disabled children	A self-instruction manual
Graff, R. B., Karsten, A. M. (2012).	Teachers	Individuals with autism and related developmental disabilities	Self- instruction manual
Feedback			
Alavosius, M. P., and Sulzer-Azaroff, B. (1990).	Direct service providers	Developmentally and physically disabled children	Written instructions, intermittent feedback, and dense feedback were compared
Arco, L. (1997).	Early intervention instructors	Children with autism	Verbal instructions and feedback
Harchik, A. E., Sherman, J. A., Sheldon, J. B., Strouse, M. C. (1992).	Group home staff	Adults with severe or profound mental retardation	Workshops, observation, and feedback
Huberman, W. L., O’Brien, R. M. (1999).	Group home employees	Chronic mental patients	Training and feedback

Ivancic, M. T., Reid, D. H., Iwata, B. A., Faw, G. D., and Page, T. J. (1981).	Institutional staff	Profoundly mentally handicapped children	In-service meeting, supervisor prompt, and feedback
Matthews, K., and Hagopian, L. (2014).	Paraprofessionals	Children with autism	In-service, and feedback based on baseline performance
Page, T. J., Iwata, B. A., Reid, D. H. (1982).	Direct care staff	Severely and profoundly handicapped residents	Instructions, prompts, and feedback.
Panyan, M., Boozer, H., Morris, N. (1970).	Hall personnel	Mentally retarded children	Classroom training and feedback
Parsonson, B. S., Baer, A. M., and Baer, D. M. (1974).	Aids in a kindergarten-style program in an institution	Developmentally disabled children	Program description and feedback
Petscher, E. S., and Bailey, J. S. (2006).	Classroom instructional assistants	Students with disabilities and severe problem behavior	Verbal description, scenario description, and some modeling
Quilitch, H. R. (1975)	Institutional staff	Residents at an institution for the retarded	Workshop and contingent feedback
Reid, D.H., and Parsons, M. B. (1996).	Direct care home staff	People with severe developmental disabilities	Classroom based instruction, on the job monitoring, and feedback.
Roscoe, E.M., Fisher, W.W., Glover, A.C., and Volkert, V.M. (2006).	Trainees at an outpatient clinic	Children with autism	Written instruction, and positive and corrective feedback

Modeling and/or Role-play			
Ducharme, J.M., and Feldman, M.A. (1992).	Direct care staff in group homes	Adolescents and adults with developmental disabilities	Written instructions, and multiple variations of modeling with role-play
Gardner, J. M. (1972).	Institutional attendants	Institutionalized people with developmental disabilities	Role-play compared to lecture alone
Homlitas, C., Rosales, R., and Candel, L. (2014).	Teachers from an autism center	Children with autism	Verbal instructions, a response checklist, modeling and role-play, and feedback
Krumhus, K. M., and Malott, R. W. (1980).	Tutors at an autism center	Children with autism	Modeling, role-play, and feedback
Lambert, J. M., Bloom, S. E., Kunnavatana, S., Collins, S. D., and Clay, C. J. (2013).	Residential home staff	Adults with developmental disabilities	Written instruction, modeling and role-play
Lerman, D. C., Tetreault, A., Hovanetz, A., Strobel, M., and Garro, J. (2008).	Teachers	Children with autism	Lectures, discussion, and role-play, modeling, and feedback
Miller, R., and Lewin, L. W. (1980)	Inpatient psychiatric aides	Psychiatric patients	In-service, modeling, prompting and role-play
Pence, E. M., St. Peter, C. C., and Tetreault, A. S. (2012).	Teachers	Students with special needs	Written materials, oral explanations, modeling, role-play, feedback, and modeling
Roscoe, E.M., and Fisher, W.W. (2008).	Behavior techs	individuals with developmental disabilities	Written instructions, written instructions,

			role-play, and feedback
Sarokoff, R. A., and Sturmey, P. (2004).	Teachers	Children with autism	written instructions, feedback, rehearsal, and modeling
Schepis, M. M., Reid, D. H., Ownbey, J., and Parsons, M. B. (2001).	Preschool support staff	Children with disabilities	Written and verbal instructions, role-play, on the job training, and feedback
Video Modeling			
Catania, C.N., Almeida, D., Lui-Constant, B., and Reed, F.D.D. (2009).	Direct service staff	Children with autism	Brief descriptions and video modeling
Collins, S., Higbee, T.S., and Salzberg, C.L. (2009).	Staff at a community residential program.	Adults with developmental disabilities	verbal instructions, modeling, and role-play, and a video modeling
DiGennaro-Reed, F.D., Codding, R., Catania, C.N., and Maguire, H. (2010).	Teachers	Students with autism	Written protocols, Video modeling, and video modeling with feedback
Gladstone, B. W., Sherman, J. A. (1975).	High school tutors	Children diagnosed as profoundly retarded	Verbal instructions, video models rehearsal, and feedback
Kissel, R.C., Whitman, T.L., and Reid, D.H., (1983)	Institutional direct care staff	Severely and profoundly mentally retarded residents	Instruction, modeling, rehearsal, and feedback

Koegel, R. L., Russo, D. C., and Rincover, A. (1977).	Teachers	Children with autism	Written manual, video modeling, and feedback
Lavie, T., and Strumey, P. (2002).	Teacher assistants	Children with autism spectrum disorders	A brief instruction, a video model, and rehearsal with verbal feedback
Moore, J. W., and Fisher, W. W. (2007).	3 staff members with bachelor level degrees	People with developmental disabilities	Written instructions, full video models, partial video models
Neef, N. A., Trachtenberg, S., Loeb, J., and Sterner, K. (1991).	Respite care trainees	Developmentally disabled children	Video models with viewer guidelines
Nigro-Bruzzi. D., and Strumey, P. (2010).	Special education teachers and speech pathologists	Children with autism	modeling, rehearsal, and feedback
Rosales, R., Gongola, L., and Homiltas, C. (2015).	Teachers	Children with autism	Article review, written instructions, and video modeling
Rosales, R., Stone, K., and Rehfeldt, R. A. (2009)	Graduate and undergraduate students	Adults with severe developmental disabilities	Videos, feedback, modeling, and rehearsal
Shore, B. A., Iwata, B. A., Vollmer, T. R., Lerman, D., C., and Zarcone, J. R. (1995).	Direct-care staff	Individuals who exhibit self-injurious behavior	Written instructions, verbal instructions, and video modeling
Vladescu, J. C., Carroll, R., Paden, A., and Kodak, T. M. (2012).	Staff at an early intervention center	Children with autism	Written protocol and video modeling
Wallace, M. D., Doney, J. K., Mintz-	Classroom teachers and a	Students with self-injurious behavior and	Written materials, video modeling, a

Resudek, C. M., and Tarbox, R. S. (2004).	school psychologist	severe problem behavior	written test, and feedback
Weldy, C. R., Rapp, J. T., and Capocasa. K. (2014).	Behavioral staff members	Children and adolescents with autism	Video modeling

Table 1. Compilation of all articles found which met the search criteria, along with the type of staff being trained, the clientele those staff were being trained to work with, and the independent variables. *Journal of Applied Behavior Analysis* articles are in white and *Journal of Organizational Behavior Management* articles are shaded gray.

Written instruction

The definition of written instructions varied greatly between studies in the current review. Some of the studies used manuals with dozens of pages, while others used a single page consisting of a task analysis. The majority of studies that included written instructions did so as either a baseline condition or as a secondary independent variable and did not report how extensive the written instructions were. Because of this, for the current review, written instructions will be defined as any written material that outlines at least a description of the steps necessary to implement the task analysis.

Written instructions alone have been shown to be relatively ineffective. For example, Neef et al. (1986) conducted a series of four experiments in an attempt to increase the reliability with which respite workers implemented tasks with developmentally disabled clients using an instruction manual consisting of four sections which discussed four task areas. Each section was made up of an introduction, management strategies, examples of rationale for the strategies, quiz, answer key, and a remedial quiz. Staff were given two to four weeks to review each section, once they achieved 90% correct on the section quiz, a generalization probe was immediately conducted. Although the staff were successfully trained during experiment one, remedial training was necessary to achieve the desired level of mastery. Other studies that have measured the effects of written instructions have warranted even less impressive results which has led to the use of the written instructions as a baseline condition prior to the implementation of another staff training technique (Alavosius & Sulzer-Azaroff, 1990; Collins et al., 2009; Ducharme & Feldmen, 1992; Sarokoff & Sturmey, 2004).

Feedback

Feedback is considered by many to be an essential part of any staff training intervention. However, feedback alone also has been insufficient in training staff to conduct tasks with high fidelity. There has been much debate in the field of behavior analysis as to what constitutes feedback. For the purpose of this study, feedback will be defined as “information provided to individuals about the quantity or quality of their past performance” (Balcazar, Hopkins, & Suarez, 1985, p.65). Feedback can be delivered in many forms including, but not limited, to vocal verbal feedback, written feedback, video feedback, and graphic feedback. Balcazar et al. (1985) conducted a thorough, critical review of the effects of performance feedback in industry as well as human service settings and in sum examined 126 feedback applications. Of the 47 studies that used feedback alone only 28% achieved the desired mean effects of increasing or decreasing target behavior for all subjects, settings, and/or behaviors. Only 57% reached the desired mean increases or decreases in behavior for some but not all subjects, settings, and/or behaviors. Finally, no effects occurred in 15% of the studies. Outcomes were improved in studies in which behavioral consequences were added to the feedback but fewer than 60% were able to attain the desired mean effects of increasing or decreasing target behavior for all subjects, settings, and/or behaviors. Though feedback is widely used as a performance management technique, this analysis shows that when used alone it is often not effective. The studies that have evaluated feedback alone since the Balcazar et al. review have demonstrated similar results.

In one such study (Parsons et al.,1989), two experiments were conducted in Medicaid-certified public residential facilities. Before treatment implementation, data showed residents were spending an average of 67% of their time off task and 19% of their time engaged in active treatment. Experimenters implemented a package with four components including assigning staff to specific roles, training the rationale for the intervention, staff monitoring, and feedback. The intervention produced variable results with an average of 41% of time spent off task. Active treatment increased from an average of 20% in baseline to an average of 38% after the intervention. Although using written materials to describe staff roles along with feedback can produce a noticeable change in behavior, the amount of off-task behavior was still substantial after the intervention was in place.

Roscoe, Fisher, Glover, and Volkert (2006) compared the results of the contingent delivery of feedback versus the contingent delivery of money for accurately implementing preference assessments. The authors concluded that when delivered individually, feedback alone was sometimes successful in producing skill acquisition while contingent money had little effect. On the occasions that 90% mastery criterion was not met using feedback or money alone, money and feedback were delivered together which led to the achievement of mastery criteria.

The studies strongly suggest that feedback alone often is not effective in training frontline staff to mastery level without training lasting an extended period of time. In fact, of the studies discussed, only the participants in one investigation (i.e., Alavosius & Sulzer-Azaroff, 1990) were able to manage to maintain 80% mastery criteria and that required as many as 18 sessions to train a single skill with a single trainee.

Modeling and Role-play

Sims and Manz (1982) described modeling as an individual learning to perform behavior by observing an outside stimulus. Role-play has been described as participants acting as part of a social interaction which offers a framework in which they can test a behavioral repertoire or study the interactions of the members of the interaction (Van Ments, 1989). Modeling and role-play have been shown to be quite successful in training staff who work with developmentally disabled and mental health clients compared to written instructions and feedback alone.

Sarokoff and Sturmey (2004) used a behavioral skills training package to train teachers how to conduct discrete-trial training (DTT) sessions for a 3-year-old child diagnosed as having an autism spectrum disorder. Baseline consisted of the teacher receiving a list of definitions for the components of DTT and being asked to implement it to the best of their ability. During training the experimenter provided the participants with a written copy of the components and reviewed it with them, implemented rehearsal and modeling for 10 minutes, then the participant completed 10 uninterrupted trails. Training continued until 90% accuracy was achieved on three consecutive sessions. Post training consisted of the participant implementing the skill without any of the other components. The three participants averaged 43%, 49%, and 43% accuracy respectively during baseline, and 97%, 98%, and 99% accuracy respectively during post-training.

Miles and Wilder (2009) replicated the Sarokoff and Sturmey (2004) intervention while teaching caregivers to implement guided compliance with children who were consistently noncompliant. The procedures were the same with the addition of generalization probes to see if the training produced similar results in novel settings. The percentage of correct components across the three caregivers in baseline were 38%, 36%, and 29% respectively, their performance increased to averages of 99%, 97%, and 95% during post training, and they exhibited the correct responses 98%, 94%, and 86% of the time during the generalization probes. Results from both studies demonstrated that this behavioral skills training package increased participant accuracy to well over 90%.

Ducharme and Feldmen (1992) conducted two studies to compare different staff training strategies for staff who were learning to teach self-care routines to clients with developmental disabilities and to determine which training strategies lead to greater generalization.

They found that written instructions may not be enough to produce a high level of treatment integrity. The single case training, in which the experimenter used only one specific client program while implementing modeling and role-play, might result in near or at mastery skill levels for the individual task being trained but it did not result in generalization to other skills. Having the trainer play the role of the client was just as effective as using the actual client as supported by the results of the common stimuli condition, and general case training, in which the staff members were exposed to a wider range of client programs, produced the best results in terms of treatment integrity and generalization of staff skills to other tasks.

Roscoe and Fisher (2008) showed that role-playing with simulated clients without the use of modeling can be an effective method of training behavioral technicians to conduct paired stimulus and multiple stimuli without replacement preference assessments. During baseline the trainees were given brief summaries of the two assessments. In training the trainees received feedback based on the videos taken of them implementing the assessments and data sheets recorded during baseline. The trainees also engaged in role-play, playing the role of the behavior technician while the experimenter played the part of the client. Feedback was delivered contingent on their performance. During baseline, performance averaged fewer than 50% for both assessment techniques and after training performance averages were over 90%. This result suggests that modeling may not always be a necessary component during staff training.

Unlike written instruction alone and feedback alone, there is significant evidence that modeling and role-play often results in successful training. One limitation of modeling and role-play is that it can be time consuming. Both staff and trainers are paid for their time during the modeling component as well as during role-play. Ducharme and Feldmen (1992) mentioned that it took an average of seven sessions in order to achieve mastery criteria with their trainees. Had an alternative training technique been used, such as video modeling, less trainer involvement might have saved a significant amount of money.

Video Modeling

"In a video-modeling intervention, the trainee watches a video presentation of someone correctly performing the targeted skill (the video model) and then has the opportunity to use the targeted skill in an identical or similar situation" (Collins, Higbee,

& Salzberg, 2009, p. 849). Video modeling and video modeling with role-play have been shown to be as, if not more effective, than modeling with role-play in training staff to work with clients with developmental disabilities and mental health concerns. One of the earliest studies to use a training package that included video models was conducted by Kissel, Whitman, and Reid in 1983. Their investigation involved a multifaceted program for teaching behavior training skills to direct care staff. The baseline condition consisted of verbal instruction, written instruction, modeling and role-play which resulted in under 50% correct responding. During training, five-minute video models were used to train each staff member to implement both a tooth brushing protocol and a face washing protocol. Following training and feedback, instruction and physical guidance improved to more than 84% correct responding. This procedure also resulted in an increase in client self-initiated responses, and a decrease in the use of physical guidance.

Collins, Higbee, and Salzberg (2009) compared the use of role-play alone to role-play along with video modeling for increasing the completion of problem-solving steps in staff at a community residential program. During baseline the participants were provided access to the written procedures and were prompted to engage in role-playing with the researcher using contrived scenarios. The intervention phase was identical to the baseline condition except that a video model was added prior to the role-play session. During baseline participants only responded correctly 38% of the time but when video modeling was added performance increased to an average of 91%. Participants took between three and seven sessions after the addition of video modeling to reach mastery which is quite a bit faster than the results of studies using other training techniques.

Moore and Fisher (2007) also used video modeling to successfully train new skills to staff who work with clients who exhibit severe problem behavior. In this study the authors compared the use of lecture only, partial video modeling, and complete video modeling to determine which conditions would be effective in training staff to conduct functional analyses (FA) in both simulated (with the experimenter role-playing) and natural settings (with the real client.) The partial video modeling differed from the complete video modeling in the number and range of behaviors shown; partial video modeling depicted approximately half of the potential therapist behaviors that might be exhibited during an FA and presented mostly responses to client target behaviors. The results showed that the lecture only condition resulted in an increase in correct responding but it was still below mastery criteria, partial video modeling resulted in small to moderate improvements when compared to baseline, and that full video modeling resulted in 8 out of the 9 participants reaching mastery criteria. This study leads to the conclusion that training will tend to be more effective if includes adequate number of examples of the correct performance.

Catania et al. (2009) successfully taught staff to implement discrete trial training using video modeling. In baseline, the experimenters provided three new direct care staff with brief explanations of the sections of a lesson plan, how to conduct discrete trial training, and told them to do their best. Baseline performances averaged between 12% and 63% accuracy, video modeling using a video less than eight minutes long was employed. The video depicted a simulated discrete trail session of a match to sample intervention and included a voiceover, a brief introduction, and an explanation of the relevant skills. Two of the of the participants reached the mastery level after the first video modeling session and the other participant met that level of performance after their third video modeling session. Vladescu, Carroll, Paden, and Kodak (2012) replicated this study with similar results.

Thus far the interventions implemented to train staff have been quite time consuming, costing the home or staffing agency money that that could be spent otherwise improving the quality of life of the client. According to a survey conducted by the Association of Professional Behavior Analysts in 2014, Board Certified Behavior Analysts (BCBA) charged between $30 and $200 per hour with the greatest distribution of BCBAs charging between $60 and $90 per hour (APBA, 2014). There is little evidence that written instructions are able to produce a large enough change in behavior to be considered effective although they seem to be included in the majority of treatment packages. Feedback alone failed to reach even the lowest mastery criteria in any of the studies (80%) except for in the Alavosius and Sulzer-Azaroff (1990), which required up to 18 hours to train a single skill.

Modeling and role-play have been shown to be quite effective in the studies in which it was implemented but it is not clear if this technique would be effective without providing multiple training sessions, subsequent training in the natural environment with the client, or more in-depth training on multiple skills. In their 1992 study Ducharme and Feldmen found that their modeling and role-play intervention needed an average of just over seven sessions to reach mastery criteria for the behaviors on which staff were being specifically trained. According to the authors, the average training session lasted three hours meaning that it could cost up to $4,000 to train a single staff person.

Video modeling seemed to produce the most consistent results and is widely accepted as an effective training technique (as is modeling and role-play) but still failed to train one of the participants in the study by Moore and Fisher (2007) to mastery criteria. Although video-modeling reduces costs by removing the trainer from the model, and by being reusable, it can still be quite costly if trainees must be paid to go through several rounds of training. Participants in the Collins et al. (2009) study took an average of five sessions to train staff using video modeling. The authors did not discuss how long sessions were but assuming they were at least an hour long it could cost up to $1000 to have train a single staff person. The authors also suggested that their interventions might have achieved mastery criteria sooner than in other applications of this training because the behaviors being taught were fairly simple, meaning that most training situations could cost much more.

Based on the possible cost exemplified by these two studies, it is evident that a staff training technique that is more cost effective in terms of money and time spent on training would be advantageous. Future research should focus on testing alternatives, such as interactive video modeling and other computer based training systems, to determine if they result in the same quality of training for the new staff members, and to determine whether or not they are actually more cost effective.

One potential solution is interactive video modeling. Interactive video modeling could potentially be more cost effective, because staff being trained are required to actively respond in the form of answering questions related to the videos being shown, and receive feedback on the accuracy of their response. This feedback could reduce the amount of time that a BCBA needs to interact with the staff being trained. Very little research has been conducted on the effectiveness of interactive video modeling. In fact, only one peer reviewed article was found during the current literature review and the technology being used was quite primitive (Neef et al., 1986).

In 1987 Roger Bass published an article on his use of a combination of a 256 kilobyte personal computer and VCR to create a computer assisted training procedure to train college students to record 10-second partial interval data. A computer training program called Target Behavior Recall trained the students to identify written examples of target behaviors and a program called Establishing an Observational Repertoire trained the students to identify videotaped examples of target behaviors. Participants were asked to record the partial interval occurrence of either three target behaviors or seven target behaviors. Each video was scored using a program that allowed repeated observing of each interval, the participants recorded each response using a computer keyboard and incorrect scoring resulted in instant computerized feedback and rescoring. No baseline data were reported but high levels of correct responding occurred immediately after training and mastery criteria was reached after observing between 9 and 14 videos. Other interactive instruction programs do exist but no articles supporting their use were found during the current review.

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