Using Auditory Feedback to Teach Dance Skills to Adults with Intellectual Disabilities

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Using Auditory Feedback to Teach Dance Skills to
Adults with Intellectual Disabilities

by

Aracely Abreu

A thesis submitted in partial fulfillment
of the requirements for the degree of
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Department of Children and Families
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Abstract

The purpose of this study was to evaluate the use of auditory feedback for teaching individuals with intellectual disabilities the “Mississippi Cha Cha Slide.” Participants consisted of six males ages 35 to 61. During baseline, line dance skills were low for all participants. During the auditory feedback intervention, the trainer used a clicker to reinforce dance steps and forward chaining to chain movements into a sequence. Once auditory feedback was implemented, line dance skills increased substantially for all participants. Generalization assessments for four of the participants resulted in performance levels similar to baseline and demonstrate the need for future training with music. Follow up data collected for all four participants showed that dance skills were maintained.
Introduction

Applied behavior analysis has been evaluated to enhance performance in various sports such as football, gymnastics, golf, dance, and soccer (Boyer, Miltenberger, Batsche, & Fogel, 2009; Brobst & Ward, 2002; Fogel, Weil, & Burris, 2010; Quinn, Miltenberger, & Fogel, 2015; Stokes, Luiselli, Reed, & Fleming, 2010) with populations including beginners (Quinn et al., 2015), college players (Brobst & Ward, 2002; Kladopaulos & McComas, 2001), competitive athletes (Hume & Crossman, 1992; Scott, Scott, & Goldwater, 1997), and athletes with intellectual disabilities (Guidetti, Francioso, Gallota, Emerenziani, & Baldari, 2010; Luiselli et al. 2013; Stanish, McCubbin, Draheim, & van der Mars, 2001). In most interventions, feedback is used with varying results (e.g. Brobst & Ward, 2002; Fogel et al., 2010). One particular form of feedback, auditory feedback (AF), has shown promising results, but currently only a few studies on this procedure exist (Andrews & Miltenberger, 2014; Fogel et al., 2010; Harrison & Pyles, 2013; Quinn et al., 2015; Stokes et al., 2010), and none involve individuals with intellectual disabilities (ID). Future research is needed to determine if AF is an effective treatment procedure for teaching individuals with ID sports skills.

In most studies on enhancing sports performance, some variation of feedback is used. Feedback consists of praise and correction contingent on a person’s performance that increases correct performance over time (Miltenberger, 2012). Boyer et al. (2009) used video-feedback combined with video-modeling to improve performance for gymnasts. Anderson and Kirkpatrick (2002) used verbal and visual feedback as part of a treatment package to increase the
performance of young in-line speed skaters with low tag scores. However, following intervention, performance levels of the participants returned to baseline levels. Kladopoulos and McComas (2001) used descriptive feedback to improve form on foul shooting performance for a women's college basketball team. All players reached criterion performance. Brobst and Ward (2002) used oral feedback in combination with public posting and goal setting to improve skills for female soccer players. The intervention was successful, but increases in soccer skills were not maintained, nor generalized to games. In sum, the literature highlights that different forms of feedback are used, with positive results during and following intervention in the field of sports performance.

One type of feedback used in this field is auditory feedback (AF). In AF, correct performance is reinforced immediately with an auditory stimulus such as a clicker (Skinner, 1951). In early applications, animal trainers used a clicker as a conditioned reinforcer to shape animal behavior. When using AF with humans, modeling and instructions are used to prompt the target behavior. Recently, AF has been used to enhance sports performance (Andrews & Miltenberger, 2014; Fogel et al., 2010; Harrison & Pyles, 2013; Quinn et al., 2015; Stokes et al., 2010). Quinn et al. (2015) used AF to improve dance performance for four girls, aged 5 to 9 years. Dance skills improved for all participants. Andrews and Miltenberger (2014) used AF to teach yoga poses to four college-aged females who had limited experience with yoga. Once AF was implemented, participants reached high levels of accuracy across all yoga poses and the skills maintained after intervention ended. Stokes et al. (2010) used AF to enhance pass blocking skills of high school athletes. In this study, all the football players exceeded or maintained criterion performance in pass blocking skills with the use of AF and descriptive feedback plus video-feedback. Harrison and Pyles (2013) used AF and verbal instruction with high-school
football players to teach tackling skills. Players reached criterion performance across all intervention phases. Fogel et al. (2010) used AF to train five different golf skills with a novice golf player. Four of the five skills met criterion with only seven AF sessions. Overall, these studies suggest that AF can be effective for enhancing performance for a variety of sports and with different types of learners. However, little research has been conducted on enhancing sports performance for individuals with ID.

Researchers have used feedback and other behavioral methods (e.g. instruction, modeling, physical guidance, and video-modeling) to enhance sports performance for persons with ID; a few of these studies have focused on dance (Gies, 2012; Lagomarcino, Reid, & Ivancic, 1984; O’Conner & Cuvo, 1989; Roswal, Sherrill, & Roswal, 1988). Roswal et al. (1988) taught participants dance skills with instruction, modeling, praise, physical guidance, and feedback. Lagomarcino et al. (1984) found that participants’ dance moves improved following a combination of modeling, praise, feedback, rehearsal, and physical guidance, but participants needed further intervention at dances by trained volunteers to engage in appropriate dancing behavior. O’Conner and Cuvo (1989) used instruction, modeling, rehearsal, praise, physical guidance, and forward chaining to teach individuals with ID a dancercise program. Results showed substantial improvement in accuracy of dance movements, but dance skills didn’t generalize to different settings. Gies (2012) used video prompting to teach seven adolescents with high functioning autism a hip-hop line dance. Six out of seven participants learned the dance in its entirety within a 4-week period at a summer camp.

Based on these findings, applications of behavioral procedures can be effective for individuals with ID, but with varying results. Given the fact that AF is a procedure that has obtained consistent results for improving different sports skills with different types of learners,
AF may be a more efficient intervention for individuals with ID compared to current behavioral treatment packages. As of now, AF has never been evaluated for enhancing dance or other athletic skills with persons with ID. Therefore, the purpose of this study was to evaluate the effectiveness of AF to teach dance skills to individuals with ID.
Method

Participants

Participants included six men with mild to moderate ID (IQs from 52-68), ages 35 to 61 years. Anthony was 49 years old with an IQ of 58 (Wechsler Adult Intelligence Scale-Revised, 1996). Jay was 45 years old and had an IQ of 62 (Wechsler Adult Intelligence Scale-Revised, 1997). Ted, the youngest at 35 years old, had an IQ of 54 (Wechsler Intelligence Scale for Children-Revised, 1994). Stevie was 36 years old and had an IQ of 52. Randy was 61 years old and had the highest IQ at 68 (Wechsler Adult Intelligence Scale-Revised, 1988). Rodger was 53 years old with an IQ of 62. Information on the IQ scales for Stevie and Rodger’s scores was not available. During the study, participants were attending a male-only adult day training program. The program focuses on teaching life and work skills. The facility in which the program operates is located next to residential group homes where participants live. Staff are present at the facility and provide various levels of supervision depending on client need. To qualify for the study, participants needed to be at least 18 years old, diagnosed with an ID, be ambulatory, follow verbal instructions, imitate models, be free of any medical conditions that would make it harmful to engage in light exercise, and not have significant hearing or visual impairment. In addition, participants had to have an expressed interest in improving dance skills and score 50% or lower on accuracy of dance skills for the line dance assessed during baseline.
Recruitment

The researcher contacted an agency in the Tampa region that provides services to individuals with ID via email with details of this study. Following permission from the agency via email, the researcher set up an appointment to meet with the director and senior behavior analyst. During this meeting, the researcher provided an overview of the purpose of the study, expected duration, resources required, and other relevant information.

After the director provided written consent for the primary investigator to conduct research at the facility, prospective participants were contacted for an information session which discussed the study’s purpose, eligibility requirements, and procedures. At this time, prospective participants could ask questions about the study. The participants provided written consent. The clinical director and senior behavior analyst signed off on the participant’s ability to consent.

Potential participants needed to have an IQ score between 50-70, and this was verified by the agency. Probes were conducted to determine if the participants could follow simple verbal instructions and if they had an imitative repertoire. Participants were asked to perform simple tasks (e.g. “Clap your hands”, “Stomp your feet”) and respond to a two-step command without model prompts. Also, participants were asked to imitate simple actions the researcher performed (e.g. raising arms above head, patting knees) without verbal prompts.

Materials

A task analysis was used to determine eligibility for participation in the study by assessing the potential participant’s accuracy of the line dance movements in baseline. The task analysis corresponded to steps used in the “Mississippi Cha Cha Slide.” During intervention, maintenance, and generalization, performance was assessed using the same task analysis. A video camera was used to record the participants’ performance of the dance steps. These videos
were observed on a laptop with video software (equipped with pause, stop, fast-forward, and rewind functions) and were used for collecting inter-observer agreement and treatment fidelity data. Datasheets were used to collect IOA and treatment fidelity data. A clicker was used to provide AF for correct performance. The clicker is a small, hand-held plastic device and has a pliable metal sheet that when pressed produces a distinct sound. In addition, edible items were used to compensate participation in the session. An informal verbal preference assessment was conducted to determine what items the participants preferred.

**Target Behaviors**

Target behaviors (or dance steps) in the task analysis came from the “Mississippi Cha Cha Slide.” The line dance is composed of several dance moves that are repetitive throughout the song. Each individual dance component is broken down as a discrete unit and operationally defined. The 22-step task analysis is described in Appendix A. Each dance step in the task analysis occurs when the singer announces the step in the song (e.g., “Right foot stomp, “Left foot stomp,” etc.). To control the cadence during training and assessments, the researchers did not teach the steps to the music, rather she taught the participants to engage in each step as she announced the step. She announced the steps during training and assessments with the same wording and in the same order as did the song.

**Data Collection**

Sessions took place once or twice a week (Wednesdays and Fridays) for 28 weeks. Each session lasted approximately 15-20 min. On Wednesdays, the researcher ran all sessions in a one-hour period. On Fridays, the researcher ran all sessions in a two-hour period. During baseline and intervention, sessions took place at one of two rooms in the client’s adult day training program. During the intervention phase, assessments occurred immediately after each
training session. Datasheets were used to record the percentage correct on the task analysis for each dance performance. The datasheets included the task analysis steps and descriptions of each dance step (refer to appendix A).

**Interobserver Agreement (IOA)**

IOA was calculated for 37% of sessions by taking the number of agreements on steps in the task analysis and dividing by the number of agreements plus disagreements. An agreement is defined as the research assistant (RA) and researcher both scoring a “+” or “-” for the same trial of a specified task analysis step. A disagreement is defined as a discrepancy in recording for the same trial of a specified task analysis step. The same data sheets for data collection were used for collecting IOA.

**Treatment Fidelity**

Treatment fidelity was calculated for 35% of intervention sessions. Components of AF (i.e. feedback, instruction, and identifying the target behavior) were scored as occurring within 1-min intervals. RAs watched the videos and placed a “+” or “-” in the appropriate category for the minute they were viewing on the treatment fidelity datasheet (refer to Appendix B).

**Research Assistant Training**

RAs learned AF procedures, read the task analysis, watched examples (i.e. modeling and videos) of the line dance correctly performed, and had the opportunity to ask any questions about the dance. In addition, the RAs watched various videos of line dance attempts and practiced scoring with the researcher. To be considered competent in recording, RAs had to score an average of 90% IOA or higher with the researcher for three videos. For additional information on research assistant training, refer to Appendix C.
Social Validity

Participants completed a social validity survey after the study. This survey consisted of five statements assessing how much the participant enjoyed the intervention. These statements were answered on a Likert rating scale from 1-5, with 1 being “Strongly Disagree” and 5 being “Strongly Agree.” An example of a statement was, “I liked that the clicker told me when I was doing the moves right.” An RA provided the survey, read each question out loud, and answered participants’ questions. This RA was not present during baseline, intervention, or follow-up sessions. The RA was briefly instructed on how to answer, in a neutral manner, questions posed by the participants about the survey. Refer to Appendix D for the survey.

Design

The study used a multiple baseline design across participants. The independent variable was the implementation of AF. The dependent variable was the percentage of dance steps in the task analysis performed correctly.

Procedure

**Baseline.** During the first baseline session, the researcher performed the line dance. After watching the researcher, the participant attempted the dance. The researcher said the steps out loud and waited for the participant to attempt the dance steps. In each subsequent baseline assessment session, the participant was asked to dance without seeing the model. The dance performance was scored based on the moves that the client performed, and could be a zero if no moves were attempted. General praise and/or “thank you” was provided at the end of the session.

**Auditory feedback.** At the first intervention session, the instructor described what a clicker is, what it does, and what it is used for. The researcher and participants completed various
practice games to introduce the clicker. A set of simple behaviors (raise your hand, stomp your feet) was chosen and the researcher identified the target behavior by modeling it and then clicking whenever the learner performed the behavior correctly. In turn, the participant had the opportunity to click the same target behavior when the researcher performed it correctly. Training on AF lasted between 5 and 10 min for each participant. Intervention sessions took about 15 min for each participant. At the end of the training, in the same session, participants were assessed.

The first target behavior taught consisted of the first dance step from the task analysis. The instructor (researcher) and participant stood next to each other facing the same direction. The instructor provided instruction and modeled the dance step. Then, the participant attempted the move. Following rehearsal, if the target was performed correctly, the instructor provided a click and had the participant perform the step correctly two more times. To demonstrate mastery of a step, participants needed to perform each step at least three times correctly. If a participant demonstrated the step two times in a row, then failed to get a third click, he was told to try again. If needed, the trainer could also rehearse the move with the participant and then ask the participant to imitate the target behavior by himself. During joint rehearsal, the clicker was not utilized.

Explicit verbal feedback about performance was not provided when the researcher was delivering AF. However, if a participant was performing a move incorrectly, the researcher modeled the step and provided verbal instruction on how to complete the step. If performance was incorrect after three attempts, the instructor modeled the behavior and rehearsed with the participant before having him attempt the move again. If attempts were still incorrect, the instructor would move on to the next target behavior.
When the participant moved on to the next step, the previous move and the current step were modeled and both moves were verbally stated (e.g. “Right foot stomp, left foot stomp”). To obtain a click, the participant would have to perform the current target behavior correctly. If the previous dance step(s) were done incorrectly, the participant would still obtain a click for correct performance of the current target behavior. Incorrectly performed dance steps could be reviewed later on in the session. As the participant learned more of the steps, these steps were added to the sequence. The entire sequence consisted of the 22 target behaviors outlined by the task analysis. Following each AF training session, the researcher conducted one to four assessments under baseline conditions. General praise and/or “thank you” was provided at the end of each session. Eventually, soft drinks were provided due to extended baselines (refer to results and discussion for more information).

**Maintenance.** Maintenance conditions were identical to baseline conditions. Maintenance assessments were conducted for each participant 5-8 days following intervention.

**Generalization.** During generalization assessments, participants attempted to dance with the song played from the beginning through the first cycle (or the first repetition of the steps in the task analysis). After the first attempt, the song was played again from the beginning through the first cycle. This occurred two more times. For a dance step to be marked correct, the participant had to dance the step at the right time (e.g., stomping right foot forward when the singer says, “Right foot stomp”).
Results

Figure 1 shows assessment data for all participants in baseline and intervention; James, Ted, Randy, and Rodger in maintenance and generalization. Figure 2 shows session data for all participants in intervention. In Figure 1, black circles represent assessments during baseline, intervention, and maintenance; white squares represent assessments during generalization. In Figure 2, black circles represent the average of assessments in each training session; white circles represent the best score of each training session; white squares represent generalization assessments. In this study, intervention decisions were based on assessment, not overall session results. In general, all participants’ dance performance improved substantially. To take into account acquisition over the course of the intervention, the last 10 data points of training were averaged. Anthony had a baseline average of 14%. His mean performance during training was 66%. His highest performance score usually occurred on the first assessment following training. Anthony decided to leave the study before training was complete and maintenance and generalization data were not collected. Jay had a baseline average of 20% and an intervention average of 92%. Intervention data for Jay were highly variable, especially during the first half of training. Jay had a mean of 86% during maintenance and 9% during generalization. Maintenance data for Jay was collected 8 days following the last intervention session. During baseline, Ted scored an average of 26%. With the implementation of AF, Ted’s average rose to 93%. Ted had the highest performance averages across all phases. In addition, Ted’s data had the most stability within attempts following a session and between attempts across sessions. Ted had a
maintenance mean of 98% and a generalization mean of 24%. Ted’s maintenance data was collected 5 days following the last intervention session.

Stevie had a baseline average of 4% and an intervention average of 45%. Throughout the first part of intervention, Stevie’s training performance improved consistently while assessment data remained low and similar to baseline levels. However, after Stevie’s high assessment score (i.e. assessment 52), Steve’s assessment data improved and he ended intervention on an increasing trend. For the rest of training, Stevie’s training data and assessment data corresponded more closely. Stevie left the study before training was complete and there are no maintenance or generalization data. Randy’s baseline average was 14%. His intervention average was 83%. Randy’s data show an increasing trend with moderate variability, which stabilized at data point 53. His maintenance mean was 82% and his generalization mean was 14%. Randy’s maintenance data was collected 5 days following the last intervention session. Rodger had a baseline of 15% and an intervention average of 85%. Baseline data were stable, while intervention data were highly variable with an increasing trend. His maintenance mean was 89% and his generalization mean was 0%. Rodger’s maintenance data was collected 6 days following the last intervention session. For information on phase means, refer to Table 1.

IOA, calculated for 37% of all sessions, averaged 96% and ranged from 77% to 100%. Treatment fidelity, calculated for 35% of intervention sessions, averaged 95% and ranged from 81% to 100%. The first statement, “I enjoyed participating in this study” had a mean of 4.7. The second statement, I learned a lot of new dance moves” had a mean of 4.7. The third statement, “I liked that the clicker told me when I was doing the moves right” had a mean of 4.5. The fourth statement, “I would like to be taught with a clicker when learning new dances” had a mean of
4.5. The last statement, “I would tell other people they should use the clicker to learn new dances” had a mean of 4.3. For individual scores, refer to Table 2.

Based on preference assessment results, participants were compensated with a Gatorade or a soda. Compensating participants occurred in the middle of the study and compensation began at different sessions, as some of the participants were not in intervention when the first participants received the soda/Gatorade and the amount of attempts varied per session. Compensation occurred at the end of each session. Anthony received compensation starting at the end of assessment 18; Ted received a soda/Gatorade following assessment 21; James and Stevie began receiving compensation at the end of assessment 21; Randy received compensation at the end of assessment 30; and Rodger after assessment 35.
Discussion

The purpose of this study was to evaluate whether auditory feedback could teach individuals with ID dance skills. During baseline, performance levels were low for all participants. All participants increased their dance moves with the implementation of AF and the four participants with maintenance data performed at levels similar to intervention. However, generalization results demonstrated that participants’ performance were similar to baseline levels when they performed with music. Training with music after participants learned the dance moves was not incorporated in the study as it exceeded the scope of the experiment. Participants took 2 to 4 months to learn the dance moves of one line dance song without the music. Based on this observation, training participants to dance to the music could be a lengthy process. Future training can involve using AF to teach the dance skills with the song playing at a slow pace and gradually increasing the speed of the song to its regular speed. This would eliminate any variation in cadence that occurred when the song lyrics were verbally stated. Whether AF can be used to successfully train this population to perform dance skills in a natural setting (e.g., dance or social event) remains a second research question that needs further investigation.

The study mainly took place in a large activity room in which staff often wandered in and out to get supplies which often disrupted sessions. Anthony had a tendency to socialize with incoming people. Jay seemed embarrassed, which was indicated by his verbal behavior (e.g., “Oh no, they’re going to watch me dance” and “I’m embarrassed when people see me dance”). There were four occasions in which a smaller room was used and this may have affected
performance. In addition, other activities at the facility and work responsibilities were competing contingencies for attending training sessions. These were contingencies that provided social and monetary reinforcers for participants.

A previous study at this day treatment facility had used edibles that participants could earn. Providing edibles contingent on performance might have increased the acquisition speed of dance skills for this study. However, the study’s purpose was to evaluate AF alone and did not originally include edibles. Though all participants had expressed interest in dancing, the lack of tangible reinforcers may have affected motivation for participating in the study. Once edibles were used to reinforce participation, attendance was more consistent for all participants. Anecdotally, when edibles were used, participants started waiting outside the activity door for their turns and would ask if I had brought their preferred brand of soda. Rodger’s favorite brand was diet coke. Once, when I didn’t have more diet cokes to distribute, he politely declined to participate in the session. Thus, it appears that the drinks served as a reinforcer for the participants’ continued participation.

Sessions occurred twice a week: on Wednesdays for one hour and Fridays for two hours. On Wednesdays, it was often difficult to work with all of the participants, especially when most of them were in the training phase. As a result, participants did not all receive the same amount of time in training. For instance, some received training twice a week, and some participants that I didn’t get to work with on Wednesday, were absent on Friday. In addition, interruptions by other staff members and clients prolonged sessions.

For some of the participants (i.e. Anthony and Stevie) moves needed to be retaught at almost every lesson. At the beginning of each session, I started assessing what skills were in their repertoire before beginning training. About halfway through the study, I began sessions by
rehearsing previously learned moves with the participants to determine which move to start with. Some of the participants (i.e., Anthony, Stevie, and Rodger) learned dance moves during training, but did not display those moves during assessments. This was first evident with Anthony and starting on his fifth intervention session (prior to assessment 10); I began to verbally prime participants to perform what they had learned in training. I would say phrases such as, “Please do it exactly the way you just did it” (if they performed the training attempt well), “Please do it the way we’ve been practicing together,” or “Do it just like you learned it…nothing new, nothing different.” If a participant did not use the moves learned during training, I would prime him for the next assessment. During training, it was clear what moves were reinforced with the clicker. Once assessments occurred, no feedback on how the participant was performing was provided. This lack of reinforcement may have resulted in the variability noted with consecutive attempts and the novel target behaviors observed (i.e. untrained dance moves not in the task analysis) following a training session. However, priming may have had an effect as training and assessment data did correspond more once it was implemented. For Stevie, training and assessment data did not correspond until the end of intervention. During these last sessions, once training was done, I ran assessments while facing him, about five to ten feet away as I did in training. Previously, I stood behind the camera while conducting assessments following training. Proximity may have influenced Stevie’s increased performance. Future research should study how antecedents affect performance during assessments and investigate how to incorporate and fade training conditions during assessments.

One limitation of this study was the lack of pairing AF with praise. This study focused on teaching dance moves without verbal feedback. In other studies with typically developing persons, AF is taught in a relatively quick manner. Participants learn via instruction and a few
practice simulations that the activation of the auditory stimulus equates to praise (e.g., Fogel et al., 2010; Quinn et al., 2015), a social reinforcer that has been established early in life for most people (Miltenberger, 2012). Despite similar training of AF principles throughout the study, participants asked if they were doing well and I had to explain repeatedly that the purpose of the clicker was for correct performance. All of the participants looked at me for feedback during and/or after performing dance moves. This occurred regardless of correct or incorrect performance and in training and assessment conditions. Upon reviewing videos, I noticed that I smiled more often during correct performance. Though praise wasn’t systematically paired, it is possible that smiling, another social reinforcer, successfully paired with AF and reinforced correct performance. Further research is needed.

Based on the number of behavioral procedures needed (e.g. instruction, modeling, individual/joint rehearsal, feedback, and reinforcement for participation) using auditory feedback with persons with ID may not be more efficient than procedures used in previous studies (i.e., both AF and other approaches). In addition, most participants in AF studies have had previous experience and regular exposure to the skills targeted. Stokes and Luiselli (2010) used high school varsity players and had weekly practice for offensive skills. All participants in the Harrison and Pyles (2013) study had a least one year of experience playing high school football. In Quinn et al. (2015), dancers had had at least 6 months of dance instruction prior to participating in the study. As a result, these studies focused on improving, or fine tuning target behaviors the participants have previously observed, rehearsed, and received feedback on. In contrast, the focus of this study was to teach individuals new target behaviors that they had minimal exposure to, if any. Besides Andrews and Miltenberger (2014), participants in other AF studies had substantially higher baseline scores. Since participants in the present study had very
low scores (i.e. near zero levels), using AF to improve dance skills showed greater levels of acquisition compared to most AF studies with typically developing participants. However, dance skills learned did not generalize. During generalization probes, most participants attempted the first two moves. Ted and Randy attempted the last steps. Rodger stood in place after failing to dance to the beat on the first step. Jay and Randy went through the sequence, instead of dancing at the right timing. These observations are a contrast to the positive effects of generalization noted in other AF studies (e.g. Andrews & Miltenberger, 2014; Fogel et al., 2010; Stokes et al., 2010). Thus, it appears that people with ID may benefit from AF, when combined with other behavioral procedures to train in the natural environment.

Furthermore, the AF intervention was somewhat comparable to many behavioral coaching packages that include instruction, modeling, rehearsal, prompting, and feedback (Gies, 2012; Kladopulos & Coma’s, 2001; Luiselli et al., 2013; Stokes & Luiselli, 2010). All of these procedures were necessary for the participants to learn the dance moves. The major difference is that this study did not use physical prompting or verbal feedback. Instead, the feedback component was AF. Yet, it is possible that instruction provided during training was functionally equivalent to feedback. When the trainer taught a move, instruction, modeling (and sometimes joint rehearsal) occurred. Then, the participant had the opportunity to attempt the target behavior.

If the target behavior was not performed correctly, the trainer performed the move and described what was correct. Describing correct performance was directly related to the topography of the target behavior the participant had previously performed incorrectly. For instance, if the participant had to perform the move “Back it up” and executed the move, but didn’t jump back like he needed to, the trainer performed the move and commented on how she jumps back during the target behavior. In Quinn et al. (2015) when a dancer wasn’t performing
the dance move correctly, the target behavior could be broken down and modified to specify which part of the dance step needed to be corrected. Even though the trainer in this present study modeled the target behavior and verbalized the expectations for a click to avoid explicit verbal feedback, the instruction following performance still functioned as verbal feedback. Possibly, the difference between verbal feedback and instruction is their degree of salience. However, after several repetitions of providing instruction with modeling following incorrect performance, participants began to verbalize that they had done something incorrectly. Anecdotally, participants said phrases such as, “Oh. I messed up,” and “Did I do something wrong?” Sometimes, participants accurately described what they did wrong. Instead of agreeing, I still modeled the behavior to confirm their assumption without direct verbal feedback. In Quinn et al. (2015) the dance moves were fluid, while this study had moves taught in discrete steps. For this study, it may have been effective to use verbal feedback because the moves were discrete and taught one at a time. Also, the participants have a history of receiving praise for appropriate work and behavior. This lack of praise may have impeded acquisition speed.

Furthermore, although the multiple baseline design showed experimental control, however, longer baselines would have resulted in greater experimental control (i.e. brief staggers from Jay to Ted and from Randy to Rodger). In addition, using a multiple baseline design across participants may have prolonged the amount of time participants were in the experiment. For instance, Ted was in the study for 4 weeks before he started intervention. He reached 91% after six sessions and finished intervention in 9 weeks. Similarly, Randy was in baseline for 7 weeks before receiving intervention and finished intervention in 13 weeks. He achieved 91% in nine sessions. Future research in this area should consider alternative designs (e.g., multiple probe design or multiple baseline across behaviors). Due to the prolonged duration
of the study, participants were provided preferred drinks (e.g., Gatorade, soda) following participation in the session. Though reinforcing participation did not affect performance during the study, using a different design may have decreased the duration of the study and minimized the need for external reinforcers for participants to continue participating.

The purpose of this study was to evaluate the effects of AF on individuals with ID. This study adds to the literature as it is the first study that targets this population to test this technology. Results show skill acquisition for all participants with AF. Generalization for dancing to the music did not occur and this finding indicates that training for this skill is necessary. Future training can involve using AF to teach participants to dance to the song by gradually increasing the speed from a slow pace to its regular speed. Unlike other studies that have used AF to enhance performance that is already occurring, participants were not familiar with the dance steps. In addition, research that has evaluated AF usually has participants that are currently attending practices and have participated in the sport/activity for some time (e.g., Quinn et al., 2015). This study concludes that although AF increased skills for individuals with ID, the increase was gradual and took many sessions. In various studies, video modeling and behavioral skills training (that includes verbal feedback) are used to teach athletic skills (e.g., Boyer et al., 2009; Gies, 2012). For future research, researchers should evaluate the application of AF after video-modeling and behavioral skills training to supplement behavioral deficits in dance performance for this population. This method may speed up the process by which individuals with ID learn to dance to the music of a dance routine. Future studies should compare the individual and combined effects of verbal feedback and AF on skill acquisition. Finally, the relationship between training conditions and assessment conditions and how this affects performance during assessments should be further studied.
Tables and Figures

Table 1

Percentage Averages of Line Dance Assessments

<table>
<thead>
<tr>
<th>Participant</th>
<th>BL</th>
<th>INT</th>
<th>Post-INT</th>
<th>GEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rodger</td>
<td>14</td>
<td>85</td>
<td>89</td>
<td>0</td>
</tr>
<tr>
<td>Jay</td>
<td>19</td>
<td>92</td>
<td>86</td>
<td>9</td>
</tr>
<tr>
<td>Stevie</td>
<td>4</td>
<td>45</td>
<td>--------</td>
<td>----</td>
</tr>
<tr>
<td>Ted</td>
<td>26</td>
<td>93</td>
<td>98</td>
<td>24</td>
</tr>
<tr>
<td>Anthony</td>
<td>14</td>
<td>66</td>
<td>--------</td>
<td>----</td>
</tr>
<tr>
<td>Randy</td>
<td>18</td>
<td>83</td>
<td>82</td>
<td>14</td>
</tr>
</tbody>
</table>

*Note.* BL=Baseline; INT=Intervention; Post-INT=Post-Intervention; GEN=Generalization
Table 2

Social Validity Results

<table>
<thead>
<tr>
<th></th>
<th>Anthony</th>
<th>Jay</th>
<th>Ted</th>
<th>Stevie</th>
<th>Randy</th>
<th>Rodger</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I enjoyed participating in this study.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>2. I learned a lot of new dance moves.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>3. I liked that the clicker told me when I was doing the moves right.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>4. I would like to be taught with a clicker when learning new dances.</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
<tr>
<td>5. I would tell other people they should use the clicker to learn new dances.</td>
<td>5</td>
<td>5</td>
<td>4</td>
<td>5</td>
<td>4</td>
<td>3</td>
</tr>
</tbody>
</table>

Note. 1= Strongly Disagree; 2= Disagree; 3 =Neutral; 4=Agree; 5=Strongly Agree
Dance Steps in Line Dance Assessments

Figure 1. Percentage correct of dance steps during assessments. Black circles are baseline, intervention, and maintenance assessments. White squares are generalization assessments with music.
Figure 2. Average of correct dance steps during sessions. Black circles are the average of assessments for each training session and/or maintenance. White circles are the best attempt of each training session. White squares are generalization assessments.
References


Appendices
Appendix A: “Mississippi Cha Cha Slide” Task Analysis

<table>
<thead>
<tr>
<th>Dance Steps</th>
<th>Instructions</th>
<th>+/-</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Right Foot Stomp</strong></td>
<td>1. Take a step forward with right foot, keeping left foot on the ground. Back of right shoe should be next to front of left shoe (some overlap is ok).</td>
<td></td>
</tr>
<tr>
<td><strong>Left Foot Stomp</strong></td>
<td>2. Place left foot right next to right foot (with shoe parts should be corresponding or overlapping).</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with Your Right</strong></td>
<td>3. Take a step with right foot to the front (about two feet), keeping left back knee straight and left foot heel up</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with Your Right</strong></td>
<td>4. Swing right hip to the right (hips not parallel)</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with Your Right</strong></td>
<td>5. Lift left back leg up (left knee bent) balancing on right leg</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with Your Right</strong></td>
<td>6. Place left leg back to its position in step 2</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with Your Right</strong></td>
<td>7. Bring right leg back to its position in step 2</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with Your Right</strong></td>
<td>8. Step in place once with left foot</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with Your Right</strong></td>
<td>9. Step in place once with right foot</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with your Left</strong></td>
<td>10. Take a step with left foot to the front (about two feet), keeping right back knee straight and right heel up</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with your Left</strong></td>
<td>11. Swing left hip to the left (hips not parallel)</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with your Left</strong></td>
<td>12. Lift right back leg up (right knee bent) balancing on left leg</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with your Left</strong></td>
<td>13. Place right leg back to its position in step 2</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with your Left</strong></td>
<td>14. Place left leg back to its position in step 2</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with your Left</strong></td>
<td>15. Step in place once with right foot</td>
<td></td>
</tr>
<tr>
<td><strong>Cha Cha with your Left</strong></td>
<td>16. Step in place once with left foot</td>
<td></td>
</tr>
<tr>
<td><strong>Turn to the Right</strong></td>
<td>17. Pivot 90 degrees to the left from original position, extend right foot beyond hip-width, placing left foot next to right (overlap is ok)</td>
<td></td>
</tr>
<tr>
<td><strong>Turn to the Right</strong></td>
<td>18. Take a step beyond hip-width to the right with right foot, placing left foot next to right.</td>
<td></td>
</tr>
<tr>
<td><strong>Move to the left</strong></td>
<td>19. Take a step beyond hip-width to the left with left foot, placing right foot next to left.</td>
<td></td>
</tr>
<tr>
<td><strong>Move to the left</strong></td>
<td>20. Take another step beyond hip-width to the left with left foot, placing right foot next to left.</td>
<td></td>
</tr>
<tr>
<td><strong>Back it up</strong></td>
<td>21. Jump backwards with right foot and place left foot next to right foot</td>
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<tr>
<td><strong>And jump</strong></td>
<td>22. Jump forwards with right foot and place left foot next to right foot.</td>
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</tbody>
</table>
### Appendix B: Treatment Fidelity Checklist

**Participant Name:** ____________________  
**RA Name:** ____________________  
**Session Date:** ____________________  
**Date scored:** ____________________  
**TF %:** ________

<table>
<thead>
<tr>
<th>Min</th>
<th>Feedback</th>
<th>Instruction</th>
<th>Target Behavior Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td>19</td>
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<td>20</td>
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</table>

**Correct feedback:**
- When the move is correct and the trainer clicked
- When the move is incorrect and the trainer doesn’t click
- When the researcher is rehearsing with the participant and the trainer doesn’t click
- When a participant attempts a move and the researcher does not provide evaluative feedback (e.g. “That was great”, “Nice job backing it up”, “That was wrong”)
- It is alright to provide non-specific praise at the end of training after last attempt.

**Correct instruction:**
- When the trainer models and describes how a move is done correctly (“I” language in reference to specific details of performance rather than “You”)
- Non-specific instructions like, “I want you to do it exactly like we practiced”, “…exactly like you just did right now”, “Try again”, or “Two more clicks” are counted as prompts. If only non-specific instructions occur, mark N/A.

**Correct target behavior ID:**
- When the researcher says the target behavior out loud prior to the participant attempting the move alone (must be the same SDs used in the line dance song).
Appendix C: Research Assistant Training Checklist

RAs will be provided with an overview of auditory feedback, and will have the opportunity to practice identifying and marking (with an audible stimulus) simple target behaviors. The task analyses for each line-dance will be provided for each RA. Select target behaviors will be modeled and reviewed. The researcher assistants will watch the researcher perform the dance moves correctly and will have the opportunity to practice scoring various videos with the researcher. The RAs will practice scoring with the guidance of the researcher and will answer why some of the dance moves were marked incorrectly. RAs will have the opportunity to ask questions.

To be considered competent in recording, RAs must score an average IOA score of 90% or higher for three videos. If an RA assistant fails to obtain this criterion, scoring discrepancies will be reviewed with the researcher. The RA will watch additional videos, and will need an IOA score of 90% or higher for three videos to participate in this study. Once criterion is met, the RA can start collecting IOA and/or treatment fidelity.

<table>
<thead>
<tr>
<th>Research Assistant Training Checklist</th>
<th>Yes</th>
<th>No</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Overview of AF provided/Practice</td>
<td></td>
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</tr>
<tr>
<td>2. Watch model videos</td>
<td></td>
<td></td>
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<tr>
<td>3. IOA of 90% or higher for first attempt</td>
<td></td>
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<tr>
<td>4. Discrepancies reviewed and new videos scored</td>
<td></td>
<td></td>
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<tr>
<td>5. IOA of 90% of higher for second attempt</td>
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</table>

I__________________________ (name) have read the Research Assistant Training Checklist. The purpose of the study and my responsibilities as a research assistant has been explained to me and I’ve had the opportunity to ask any questions. I understand that I need to meet the criterion IOA score to participate in this study. Failure to meet this requirement will result in a review session and I will need to meet criterion on the second attempt to continue acting as a research assistant.

Signature: ____________________________ Date: _____________________
Appendix D: Post-Study Social Validity Survey

1. I enjoyed participating in this study.

<p>| | | | | |</p>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

2. I learned a lot of new dance moves.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

3. I liked that the clicker told me when I was doing the moves right.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

4. I would like to be taught with a clicker when learning new dances.

<p>| | | | | |</p>
<table>
<thead>
<tr>
<th></th>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>

5. I would tell other people they should use the clicker to learn new dances.

<p>| | | | | |</p>
<table>
<thead>
<tr>
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<th></th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>Strongly Disagree</td>
<td>Disagree</td>
<td>Neutral</td>
<td>Agree</td>
<td>Strongly Agree</td>
</tr>
</tbody>
</table>
Appendix E: IRB Approval Letter

2/2/2015

Aracely Abreu, B.S.
Department of Child and Family Studies
13301 Bruce B. Downs Blvd
Tampa, FL 33612

RE: Full Board Approval for Initial Review
IRB#: Pro00019902
Title: Using Auditory Feedback to Increase Line Dancing Skills for Adults with Intellectual Disabilities

Study Approval Period: 1/16/2015 to 1/16/2016

Dear Ms. Abreu:

On 1/16/2015, the Institutional Review Board (IRB) reviewed and APPROVED the above application and all documents outlined below.

Approved Item(s):
Protocol Document(s):
Line Dance Protocol 01292015

Consent/Assent Document(s)*:
Verbal Consent Form 01292015 Version 1.docx.pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the “Attachments” tab. Please note, these consent/assent document(s) are only valid during the approval period indicated at the top of the form(s).

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB for review and approval by an amendment.
We appreciate your dedication to the ethical conduct of human subject research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

[Signature]

John Schinka, Ph.D., Chairperson
USF Institutional Review Board