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Evaluating Video Feedback as an Antecedent or Consequent Event for Improving Performance of Dance Skills

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Evaluating Video Feedback as an Antecedent or Consequent Event for Improving Performance of Dance Skills

by

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Keywords: Applied Behavior Analysis, Video Feedback, Feedback, Antecedent, Consequent, Dance

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Abstract

This study used video feedback to compare the effectiveness of antecedent and consequent feedback. Video feedback was used to increase the performance of dance skills of young dancers. A multiple baseline across subjects with an embedded multi-element comparison was used for three female dancers between the ages of 10 and 11 years old. Antecedent video feedback was given immediately before the performance of a target behavior, and consequent video feedback was given immediately after a performance of a different dance skill. The results show that video feedback increased all targeted skills for subjects, however, there were no differentiated results when comparing antecedent and consequent feedback.

Keywords: Applied Behavior Analysis, Video Feedback, Feedback, Antecedent, Consequent, Dance

Chapter One:

Introduction

Being involved in dance can have a positive impact on a person's life. For example, self-report data show an increase in positive affect and a decrease of negative affect after engaging in as little as 5 min of free-style dance (Campion & Levita, 2014). Dance has been found to induce a positive mood; recreational and amateur ballroom dancers have reported that their mood is optimistic and happy after dancing (Zajenkowski, Jankowski, & Kołata, 2014). In addition, a decrease in tension and nervousness after dancing has also been reported (Zajenkowski et al., 2014). Kalliopuska (1989) reported that ballet dancers are more likely to have higher self-esteem and empathy than others their age who are not dancers. Though they are self-report measures, the authors suggest that this finding is because of the creative aspect of dance and the ability to express "emotions" through movement. In addition, the authors found that dancers are more likely to develop other hobbies, such as playing an instrument, writing, and other social activities (Kalliopuka, 1989). However, these findings do not necessarily constitute as a causal relationship. A survey was conducted with dancers of various ages who have experience with different dance genres to measure the perceived benefits of dancing on their well-being, and the results suggested that dancing was a benefit. Of the people surveyed, the majority thought that dancing improved their balance and awareness of their body and their overall mood, was important for their minds, and reduced tension (Murica, Kreutz, Clift, & Bongard, 2010). The same study also classified open-ended responses into categories of benefits, and it was reported that dancing offers benefits for emotional, physical, social, and spiritual aspects of the self, and

serves as a coping strategy and a self-esteem booster. Even though these definitions are not entirely behavioral in nature, it suggests that an individual can perceive dance as a benefit.

Even though dance has many potential benefits, dancers may injure themselves while dancing. A survey conducted by Bowling (1989) found that 47% of professional modern and ballet dancers have sustained a chronic injury while dancing, and 42% have had an injury within the past 6 months which affected their ability to dance. In one study, 97% of modern and classical dancers were injured over the 8-month period that the study was conducted (Kerr, Krasnow, & Mainwaring, 1992). It has been found that improper technique is a common reason for injuries among contemporary, ballet, and modern dancers (Baker, Scott, Watkins, Keegan-Turcotte, & Wyon, 2010; Wiesler, Hunter, Martin, Curl, & Hoen, 1996). Technique refers to the safe and methodologically correct execution of skills. It has been suggested that performing skills incorrectly increases the chance for a dancer to be injured (Reid, 1988). Improper technique for the most part is preventable, and it has been said that if dancers performed with proper technique, the risk of injuries would be greatly reduced (Conti & Wong, 2001). Hanin, Malvela, and Hanina (2004) proposed that the repetition of skills through conventional practice alone may not be enough to perfect well-practiced skills. This suggests that typical dance practice may not be enough to perfect technique, and more effective training methods are needed. Better training methods will lead to improved technique, which will lead to the reduced risk of injury. For these reasons, further interventions are needed to teach dance skills to individuals.

There have been few studies that examine the effectiveness of approaches to teaching technically correct skills to dancers. Dearborn and Ross (2006) studied the acquisition and retention of learning combinations with and without a mirror with professional dancers who

studied multiple dance forms. The results reveal that although those who had the intervention with the mirror scored lower the first week, they scored higher in retention of the steps the following week. This suggests that exposure to a visual representation of one's own performance can increase the proficiency of one's skill. Other suggestions to improve dance performance have been made, including developing body awareness, mentoring, and goals (Andrade, Lui, Palma, & Hefferen, 2015). Feedback has been found effective in improving performances. With an instructions-based rubric of what is expected, it has been found that dancers can improve their own choreography (Andrade, et al, 2015).

Behavior analysis has used methods to improve performance of physical skills. Feedback has been a common intervention for increasing skills, such as using descriptive vocal feedback to increase the skill performance. Harding, Wacker, Berg, Rick, and Lee (2004) examined whether descriptive feedback would increase performance in martial arts training. The researchers used differential reinforcement of alternative behavior and extinction to reinforce different techniques performed by martial arts students. After each performance, the instructor gave descriptive vocal feedback to the participant. The results showed that descriptive feedback worked as well as the differential reinforcement and extinction procedures.

Another intervention used is video feedback. Video feedback is when the performance of the individual who is learning the target behavior is recorded and then replayed for the individual as visual feedback of their performance (Boyer, Miltenberger, Batsche, & Fogel, 2009; Harle & Vickers, 2001; Rikli & Smith, 1980). Video feedback is useful in promoting behavior change because it can be given immediately, and gives the individual a visual representation of their performance.

Hodges, Chua, and Franks (2003) evaluated if those who received video feedback would acquire and retain novel motor skills better than those who did not receive video feedback. During intervention, a group received video feedback after a demonstration of a skill and another group received no feedback on their performance. As the authors expected, the group who received video feedback had better performance of the skills. In addition, when the subjects engaged in error-detection tests, the video-feedback group scored better than the non-feedback group on identifying correct and incorrect movements. These findings support the theory that feedback improves physical skills.

Kelley and Miltenberger (2016) used video feedback to increase horseback riding skills, and after the intervention all subjects' skills greatly increased from baseline levels. Video feedback was also implemented as part of a treatment package to increase the accuracy of basketball free throws in a study by Harle and Vickers (2001). The results show that in post-test, the skills increased from their pre-test level. However, this measure was not calculated with the control group, and accurate comparisons cannot be made.

Video feedback in conjunction with video modeling has also been used to improve tennis serving form, wherein the subjects' recorded performances were compared to the instructor's example of the skill (Rikli & Smith, 1980). The results show that those who received the video feedback intervention performed better than the control group who did not receive the intervention.

Boyer et al. (2009) used video feedback in a treatment package with expert video modeling to increase the performance of gymnastics skills. They examined the effects of using both interventions to increase gymnastics skills in children ages 7-10 years old. After a subject

engaged in one attempt of the skill, she viewed an expert model performing the skill in comparison to her own performance that had been video recorded. This instant video feedback in conjunction with the expert modeling allowed the subjects to compare her performance and improve her behavior accordingly. Results suggest that the intervention was successful for all subjects, and their behavior maintained at above baseline levels at follow up. Video modeling and video feedback has also been found to be effective with other physical skills such as basketball (Harle & Vickers, 2001), weight lifting (Mulqueen, Crosland, Miltenberger, & Witherspoon, 2014), and tennis (Rikli & Smith, 1980).

It has been suggested through repeated studies that video feedback is an effective method for teaching physical performance skills. However, there is no published literature that examines how video feedback works. Boyer et al. (2009), who used video feedback, suggest that future research should look into the effects of implementing video feedback after the practice session instead of immediately after the behavior (Boyer et al., 2009). The effects of different timing of feedback delivery have been studied with in educational settings. In one study, the rate of inappropriate verbalizations was examined with a student diagnosed with ADHD; he received feedback either immediately with a FM headset or delayed at the end of the session. Although the behavior decreased in both conditions, the behavior decreased more in the immediate feedback condition (Price, Martella, Marchand-Martella, & Cleanthous, 2002). Immediate and delayed feedback were also examined with acquisition and maintenance of sight words; the subjects performed better in the immediate condition (Barbetta, Heward, Bradley, & Miller, 1994). Another example of comparing immediate and delayed feedback is in Bennett and Cavanaugh (1998), in which a subject either had feedback in the form of self-correction after completing math problems either immediately, delayed, or no feedback at all after the behavior.

The immediate feedback condition had the highest frequency of correct problems, therefore suggesting that the immediacy of delivery of feedback promotes greater acquisition of behavior (Bennett & Cavanaugh, 1998). Antecedent feedback is a form of prompting and sets up the condition as a stimulus control for the subject, whereas the feedback would serve as a stimulus for the proper behavior to occur. Skinner (1953) defines skill as increasing ability in an already existing behavior that is changed through differential reinforcement. Skinner suggests that conditioned reinforcement can link the report of the skill — feedback — to the physical "feel" of the skill. This means that through feedback, an individual can learn the correct properties of a skill by having the specifics identified.

This study is important because it evaluates if video feedback is most effective as an antecedent or a consequent when implemented as an intervention to the target behavior. Although there has been research using video feedback, researchers have not looked at the specifics of the timing of feedback delivery to examine which part of the feedback process is effective for behavior change (BenitezSantiago & Miltenberger, 2016; Boyer et al., 2009; Harle & Vickers, 2001; Kelley & Miltenberger, 2016; Rikli & Smith, 1980). In previous literature, video feedback is used as both an antecedent and consequent component and the effectiveness of the timing of feedback cannot be isolated. By comparing the effectiveness of video feedback as an antecedent versus a consequent for dance skills in this study, it was assessed if the evocative effects of antecedent feedback or the reinforcing effect of consequent feedback was more effective for changing behavior. Applying the intervention to improve dance skills, it extends the literature in video feedback, and investigated the purpose of the study: to examine if video feedback is more effective given as an antecedent or as a consequent to dance skills.

Chapter 2:

Method

Participants & Setting

Three female dancers were selected to participate in the study, aged between 10-11 years old. Isadora was an eleven-year-old who had been dancing for seven years. Her mother spontaneously disclosed that the subject had the diagnosis of ADHD. Misty was also eleven-years-old and had five years of dancing experience. Anna was ten-years-old and had been dancing for six years. All subjects continued with their regular dance classes multiple times a week.

Sessions were conducted at a dance studio in the Tampa Bay area, where the subjects are enrolled in classes. The room used had a marley floor, mirrors, and barres mounted to one wall. In this study, a mirror was not be used in any condition, and were covered with curtains that were already installed. This was in order to eliminate additional visual stimuli that could have served as feedback to the subject.

Materials

A tablet computer equipped with a high-definition camera was used in session to record the subjects' performances and display the recorded video to the subjects as feedback. Task analyses of the dance skills were also used. These can be found in Appendices A through D. A digital camera was used to record sessions for the purposes of collecting treatment integrity data.

Target Behaviors and Data Collection

A variety of dance skills were target behaviors in this study. An example is a *pirouette en dehors* turn, which is a turn-based movement where the dancer stands on one foot and bends the opposite leg to the knee using the standing leg as a vertical axis as the dancer turns. Upon recruitment, the subject picked five skills that they believed could use improvement. Each of the five dance skills were assessed and scored using a task analysis, and the two skills at 50% or below with the closest scores to one another were used as target behaviors. The two skills selected topographically differed in order to avoid carry-over effects.

A task analysis was used to assess each skill. In the task analyses, each skill was broken down into its individual components so data could be collected on the dancers' performance of the skill. Each sequential step of the skill was evaluated as correct or incorrect next to the corresponding step in the task analysis. The subjects' body mechanics were also evaluated throughout the entire skill as a separate measurement. Body mechanics examined if the subject kept proper dance technique and positioning during the performance of the skill, such as keeping proper turnout. If the subject engaged in incorrect body mechanics at any point during the performance of the skill, the particular body mechanic was marked as incorrect for the entire skill. Sequential steps and body mechanics were not influenced by each other when scoring: a subject could correctly perform the skill in the sequential step component but get it incorrect in the body mechanic component, and vice versa. A body mechanics score was calculated by the number of body mechanic components completed correctly divided by the total incorrect and correct for the skill, multiplied by .25. The score for sequential steps was calculated by the total steps completed correctly divided by steps incorrect and correct, multiplied by .75. Then, the entire score for each skill was calculated as a percentage correct and was found by the adding the body mechanics score and sequential score together, and then multiplying by 100. The task

analyses were developed by using published descriptions of dance skills (e.g. Schorer, 1999) and also by consulting with expert dance instructors to ensure the target behaviors are methodologically correct. The dance instructor from the studio reviewed the task analyses to ensure the descriptions of the target behaviors were methodologically correct and are how the students are taught at the studio. The task analysis for *pirouette en dehors* is listed in Appendix A. The task analysis for *saut de chat* is listed in Appendix B. The task analysis for *chaînés* is listed in Appendix C. The task analysis for *arabesque* is listed in Appendix D.

All sessions were video recorded for data collection. Target behaviors consisted of dance skills. Data were collected based on the task analysis for each skill. The additional observer was a student who was in the University of South Florida Applied Behavior Analysis program. The observer was trained on procedures, including explanation of the task analyses and practice scoring videos. After training, there was at least a criterion of 90% agreement between observers on the practice videos before scoring session videos.

For generalization probes, data were collected from video recorded sessions of the subjects' performance in the classroom. Two weeks after intervention was complete, follow up data were taken.

Interobserver Agreement

An additional independent observer scored an average of 36.9% of all sessions for each subject across all conditions. For Isadora, 50% of sessions included a second observer in baseline for both *saut de chat* and *pirouette*, and 33% in intervention for both skills. For Misty, 33% of sessions included a second observer in baseline for both *saut de chat* and *chaînés*, and 35% for *chaînés* and 33% for *saut de chat* in intervention. For Anna, 36% of sessions included a

second observer for *pirouette* and *arabesque,* and 33% for *pirouette* and *arabesque* in intervention. IOA was calculated as a percentage of agreement based the steps of the task analysis. A percentage of agreement was found by dividing the number of agreements on the components of the task analysis by the agreements plus disagreements, multiplied by 100. An agreement was defined as both independent observers marking that an individual component of the task analysis occurred in the subject's performance. Disagreement is when one observer indicates that a component of the task analysis occurred whereas the other observer did not, or vice versa. For Isadora, IOA for *pirouette* in baseline was 100% and was 98.1%, with a range of 94.4% to 100% in intervention. For *saut de chat,* IOA for baseline was 100% and was 99.3% and with a range of 97.7% to 100% in intervention. For Misty, IOA for *chaînés* in baseline was 98.1% with a range of 96.2% to 100%, and was 97% in intervention with a range of 92.5% to 100%. In baseline, *saut de chat* had an IOA of 100%, and was 99.6% with a range of 95.5% to 100% in intervention. For Anna, IOA for *pirouette* was 99.5% and with a range of 98.1% to 100% in baseline, and was 99.3% with a range of 98.1% to 100% in intervention. For *arabesque,* IOA in baseline was 100%, as well as in intervention.

Treatment Integrity

All sessions were recorded with a digital camera. Treatment integrity data were collected on an average of 36.9% of all sessions for each subject in each condition to ensure that the intervention was implemented correctly (see Appendix F) for the treatment integrity checklist). For Isadora, 50% of baseline sessions included a measure of treatment integrity for both *saut de chat* and *pirouette,* and 33% in intervention for both skills. For Misty, 33% of baseline sessions included a measure of treatment integrity for *saut de chat* and *chaînés,* 35% for *chaînés* in intervention, and 33% for *saut de chat* in intervention. For Anna, 36% of baseline sessions

included a measure of treatment integrity for *pirouette* and *arabesque*, and 33% for *pirouette* and *arabesque* in intervention. An additional independent observer viewed video recorded sessions of the researcher implementing the intervention, and assessed if the intervention were implemented correctly according to the checklist and if the researcher correctly gave feedback for the dance skills. Treatment integrity was calculated by dividing the number of steps correctly completed by the number of total possible steps on the checklist (that are relevant for the skill being assessed). Treatment integrity was 100% for all sessions across all subjects.

Social Validity

All subjects completed a social validity survey after they were finished with all data collection (see Appendix G for social validity scale). Questions included if they thought the invention was beneficial, which condition they liked better, if they thought one condition was more helpful that the other, and if they would use a similar procedure in the future. The responses were measured in a 5-point Likert-style scale. The subjects were also asked open-ended questions to assess what they thought of the procedures.

Social validity was also measured by having dance instructors score the accuracy of skills. They viewed randomly selected videos from baseline and intervention for all subjects, and were blind to which phase of the study the videos were from. They scored the videos on a 100% scale to evaluate if the skill was performed correctly (Appendix H). The instructor rated it between 0-20% (strongly disagree) if they thought the skill was performed with no technical ability, 21-40% (disagree) if it was performed with little technical ability, 41-60% (neutral) if it was performed with moderate technical ability, 61-80% (agree) if it was performed with good technical ability, and 80-100% (strongly agree) if they thought it was performed with excellent technical ability.

Experimental Design

A multiple baseline across subjects with an embedded multi-element comparison was used to evaluate the effects of video feedback as an antecedent or as a consequent in increasing dance skills for all subjects. The subjects continued their regular practice and classes throughout all phases of the study. Before all sessions, the subjects were warmed up before performing the skills. To ensure this, the sessions were conducted after or between the subjects' classes. One of each session was conducted per day, with the antecedent condition conducted first, and then the consequent condition.

Procedures

Baseline. To determine the target behaviors for intervention, the five skills the subject indicated that need improvement were assessed prior to baseline. The two with the closest scores at 50% or below were used as the behaviors to target for intervention. The skill with the lowest score received the antecedent intervention, and the other received the consequent intervention. In baseline, the subjects were asked to perform the target behaviors, and received no video or vocal feedback from the researcher.

Video feedback. The intervention used was video feedback. The sessions were video recorded. After the subject engaged in the target behavior, she viewed the recorded video with the researcher. The researcher provided praise and corrective vocal feedback to the subject based on the performance on the video recording. The subjects had the ability to watch the video in slow motion and pause on individual steps. Feedback was compared across antecedent and consequent conditions to assess the effectiveness of the timing of the delivery of feedback. Mastery criterion was 90% correct performance for three consecutive sessions.

Antecedent. The subject received video feedback on the attempt at the target behavior from the previous session prior to performing the target behavior in the current session. Immediately after receiving the video feedback, the subject performed the target behavior. For the first session in intervention, the subjects' last baseline performance was used for feedback. Data were collected on attempt of the target behavior following the video feedback session. This was done so the effects of feedback given as an antecedent could be seen as the subjects' performance improved.

Consequent. As in the antecedent condition, the subject was video recorded performing the target behavior. However, the subject received video feedback immediately after performing the skill. On average, they received feedback within 12 s, with a range between 5-62 s. No feedback was given before the subject performed the skill. In the following session, data were taken on the subjects' performance of the skill to assess the effects of feedback given as a consequent event.

Generalization probes. Probe data were collected in their dance class following intervention once the subjects achieved the mastery criterion for the subjects' performance of the skill. The sessions were scored as in previous sessions.

Follow-up. After the intervention sessions and generalization probes were complete, a follow-up assessment was conducted two weeks later. The subjects were asked to perform the target behaviors and their performances was recorded as in the other phases.

Chapter Three:

Results

Results are shown in Figure 1. Video feedback was a successful intervention for increasing the dance skills for all subjects. However, there was no clear differentiation between antecedent and consequent feedback having better effectiveness for increasing behavior. For Isadora, consequent feedback had quicker gains, but antecedent increased to the same level within six sessions. Misty had quicker gains in the antecedent condition, but the consequent condition increased to the same level in five sessions. For Anna, the antecedent condition had a large increase with the first session while the consequent condition did not, but in the next session, consequent feedback had a large increase for her dance skill.

Isadora's *saut de chat* skill increased from a baseline mean of 25% to an end of intervention mean of 95.6% (the last three sessions). During intervention, Isadora reached 100% for the skill. For her *pirouette* skill, the baseline mean increased from 17% to an end of intervention mean of 94.6%. She also scored 100% for this skill during intervention. Both of her skills maintained in generalization probes and in follow up.

Misty's *chaînés* skill increased from a baseline mean of 39% to an end of intervention mean of 95%. For her *saut de chat* skill, the baseline mean increased from 36.6% to an end of intervention mean of 95%. Both skills maintained at the same levels for generalization probes and follow up.

Anna's *pirouette* skill increased from a baseline mean of 25.7% to an end of intervention mean of 92%. Her *arabesque* increased from a baseline mean of 31% to an end of intervention mean of 97%. Both skills maintained during generalization probes and in follow up.

A summary of results is shown in Figure 2. It displays the average of the last three sessions in intervention, generalization probes, and two-week follow up for all subjects. The average for Isadora's final three sessions in *saut de chat* was 95.6%, and 94.6% for *pirouette.* The generalization probes for *saut de chat* were 92% and 100%, and follow-up was 92%. Generalization probes for *pirouette* was 91% and 95%, and follow-up was at 95%. The average for Misty's last three sessions in *chaînés* was 95%, and was also 95% for *saut de chat.* The generalization probes for *chaînés* were both 95%, as well as in follow-up. For *saut de chat,* she scored 95% in both generalization sessions and follow-up. Anna's average for the last three sessions in *pirouette* is 92%, and the average for the final three sessions for *arabesque* is 97%. The generalization probes for *pirouette* were at 95% and 92%, and was 92% in follow-up. *Arabesque* generalization probes and follow-up were all at 100%.

Figure 3 displays the sequential steps for antecedent and consequent feedback across subjects. For all subjects, their skills increased from baseline scores. Isadora and Misty had a gradual increase during intervention and Anna had a dramatic increase, which is a similar display as the combined score that includes both sequential steps and body mechanics. Figure 4 displays the body mechanics for antecedent and consequent feedback across subjects. There is greater variability seen when compared to the sequential steps. During intervention Isadora scored 0% and 20% several times for her *pirouette*, and she scored a 40% *saut de chat* six sessions in a row before continuing to increase. After session five in intervention, her *chainés* never increased

greater than 80%. However, Anna had high levels of body mechanics for her *arabesque* in baseline, which maintained in intervention.

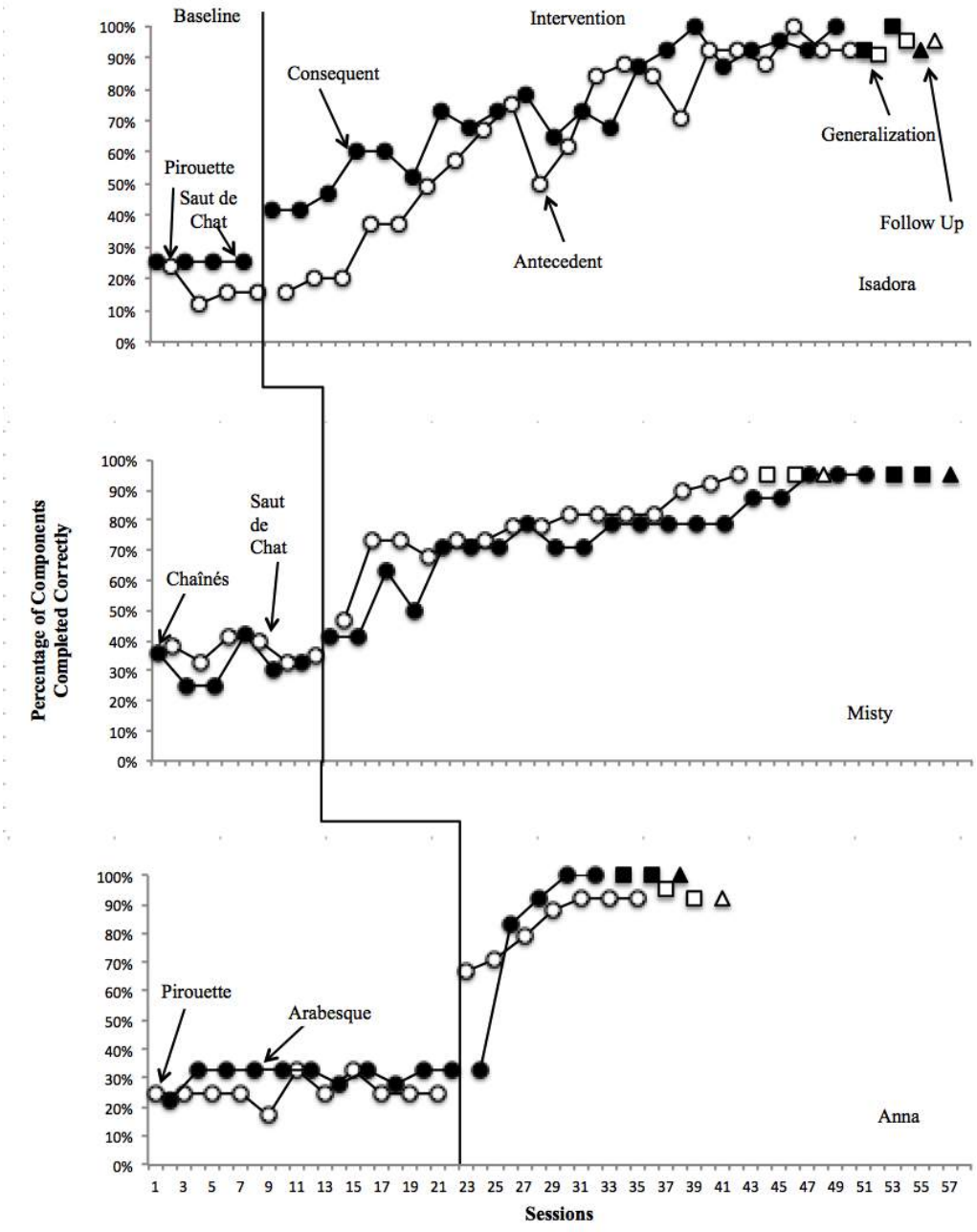

Figure 1. Results for all subjects. The graph displays the percentage of steps completed in baseline and antecedent and consequent feedback sessions.

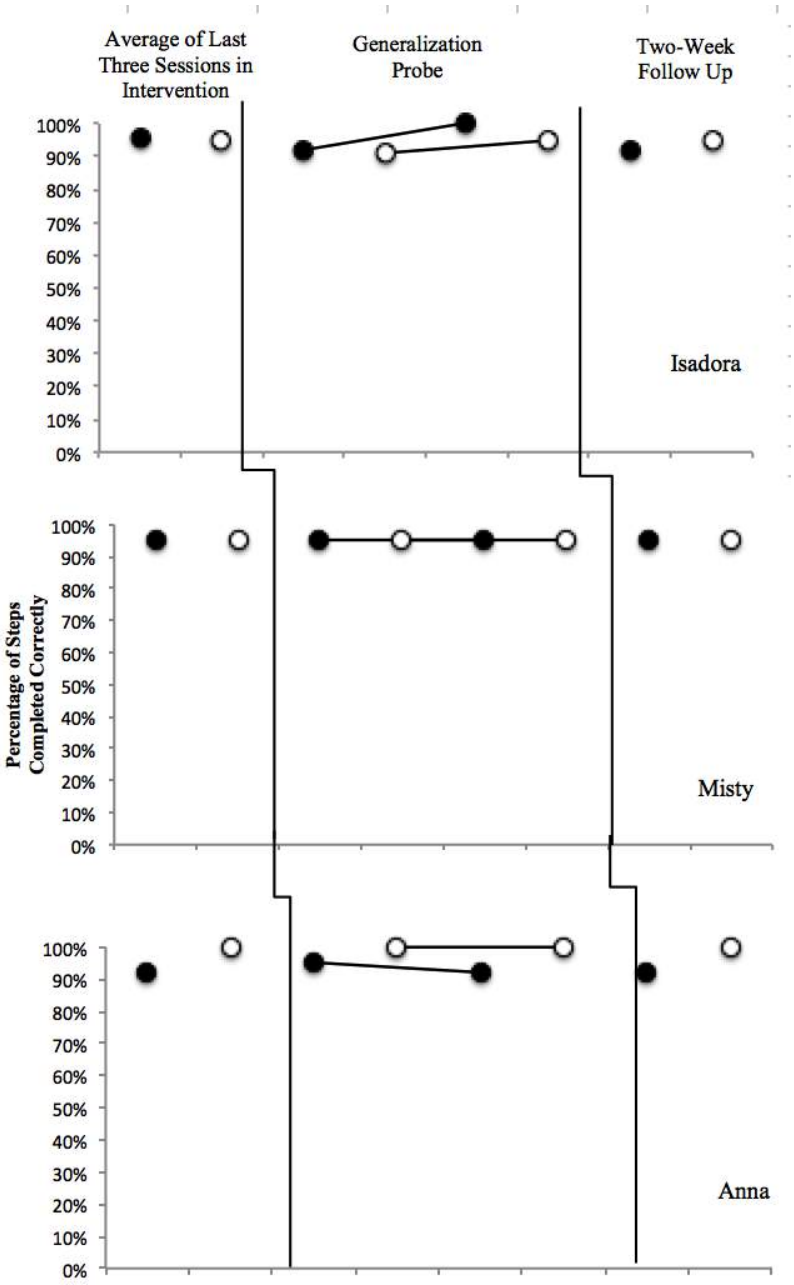

Figure 2. Display of the average of the last three intervention sessions, generalization, and two-week follow up for all subjects.

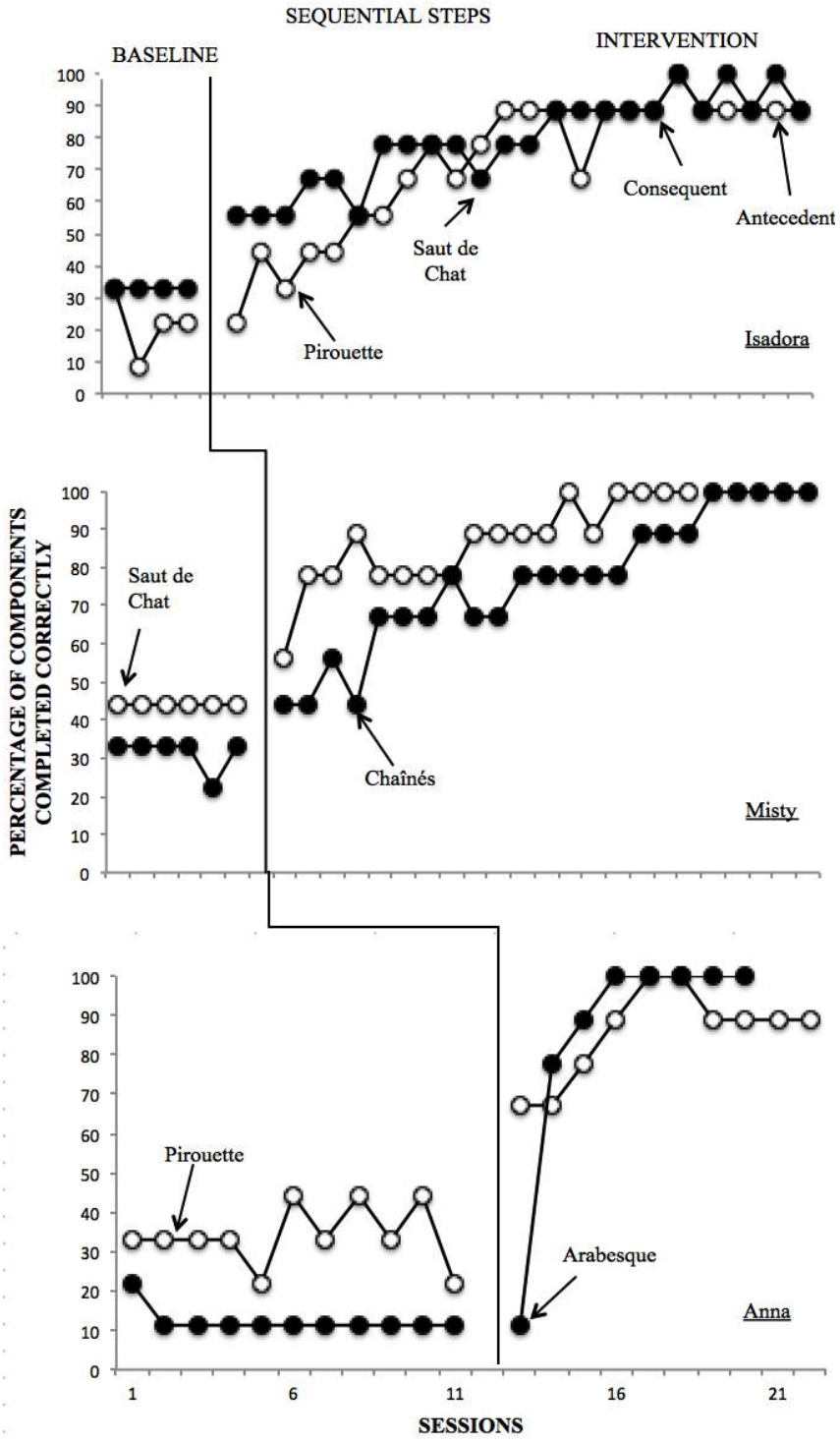

Figure 3. Display of the sequential steps across subjects. The graph displays percentage correct of sequential steps for antecedent and consequent video feedback across subjects.

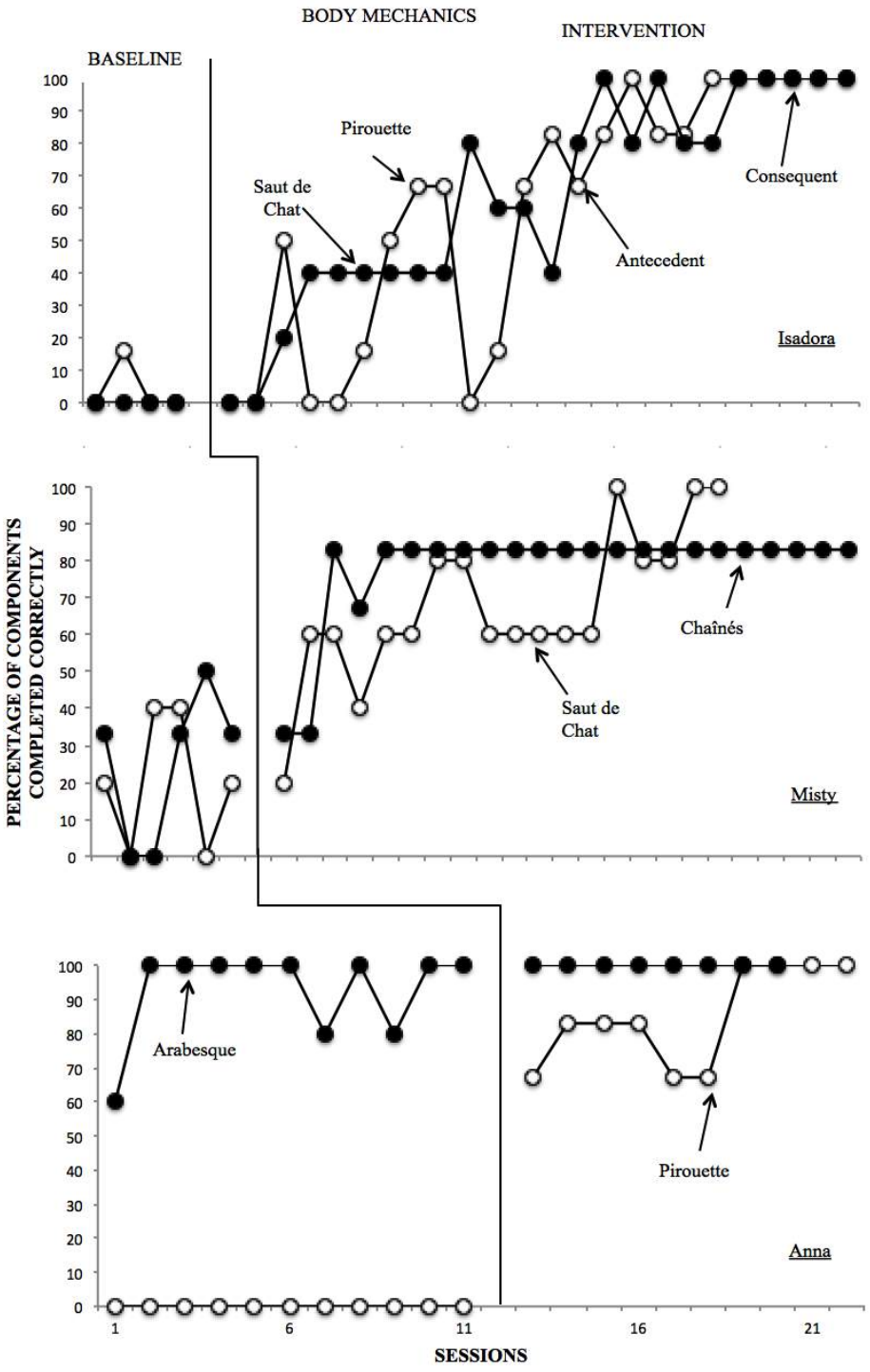

Figure 4. Display of the body mechanics across subjects. The graph displays percentage correct of body mechanics for antecedent and consequent video feedback across subjects.

Social Validity

The results of the social validity questionnaire for subjects are displayed in Appendix E. The numbers in the table represent the number of the times the response was selected by a subject. All subjects strongly agreed that the intervention helped improve their skills and use a similar procedure in the future to improve their dance skills. All subjects also strongly agreed that they liked the video feedback procedure. Misty agreed that she liked participating in the study, and Isadora and Anna strongly agreed that they liked participating. Misty also agreed that she would recommend the procedure to others, and Isadora and Anna strongly agreed they would.

Social validity was collected from all subjects. An expert dance instructor used Appendix G to rate the technical skill of the subjects' performance. The results are as follows: For Isadora's *pirouette* baseline videos, she was scored having 0-20% technicality. Videos from the end of intervention were scored being 80-100% technically correct. For Isadora's *saut de chat* baseline videos, she was scored having 0-20% technical skill, and then 80-100% for the end of intervention. Misty's *chainés* baseline videos were scored having 0-20% technical skill, and 80-100% for videos at the end of intervention. Her baseline *saut de chat* videos were scored having low technical skill of 21-40%. The end of intervention videos for *saut de chat* were scored as having 80-100% correct technical skill. Anna's baseline videos for *pirouette* were scored as having low technical skill of 21-40%, whereas her end of intervention videos were scored as having great technical skill of 80-100%. Her *arabesque* baseline videos were scored as having little technical ability at 21-40%. Her end of intervention videos for *arabesque* were scored as having high technical ability at 80-100%.

Chapter Four:

Discussion

The purpose of this study was to investigate if video feedback is more effective as an antecedent or consequent for improving dance skills. The results show that video feedback is an effective intervention for increasing dance skills; both the antecedent and consequent interventions were effective for all subjects. In addition, the social validity from expert instructors results show the subjects performed better after intervention had been applied. However, there was no clear differentiation between the effectiveness of antecedent and consequent video feedback. For Isadora, consequent feedback had quicker gains, but the antecedent feedback condition increased to the same level within six sessions, continuing the trend until she met criteria. Misty initially had slightly quicker gains in the antecedent condition, but the consequent condition increased to the same level within five sessions and continued the trend until she met criteria. Anna scored better in the antecedent condition in the first session, but then she increased in the consequent condition in the next session and both conditions continued the same trend until she met criteria. For Isadora and Misty, their improvement was gradual and variable, whereas Anna had a dramatic and quick increase.

As found in Kelley & Miltenberger (2016), the immediacy of video feedback in the consequent condition was an important contribution of this study. In the consequent feedback condition, the subjects were able to view their recorded video and receive feedback usually within 12 s because the computer tablet that recorded their performance was also used to display their video.

Another important contribution of this study is the task analyses that were created using dance textbooks and expert instructor recommendations. The instructor recommendations were important because it ensured that the task analyses used were technically correct, and matched the way the skills are taught at the studio the subjects attended. In this study, both the sequential steps that make up a dance skill were measured, but also the body mechanics, which includes the technical aspects of a dance skill. This is notable, because the subjects could be doing the correct steps — such as turning in the correct direction — but be technically incorrect based on their body posture.

Another important component of the study is the social validity results. All of the subjects rated the intervention favorably. Throughout the study, they commented that they enjoyed using a different method for learning dance and they responded positively to seeing themselves correctly perform on video. When asked on the questionnaire, Misty and Isadora stated that they liked the antecedent feedback intervention best, and Anna indicated that she preferred the consequent intervention. In the beginning of the intervention condition, Isadora commented that it was difficult to remember all the feedback given. However, when the study was over and she was asked if the video feedback procedure was helpful, she said that looking at the video helped her remember all the things she needed to improve better than someone "just telling her." Anna stated that she liked seeing the videos because she never she did her skill incorrectly until she saw a recording.

Although Isadora initially had quicker gains in the consequent condition, her performance in the antecedent condition increased to the same level with the trend continuing until she reached mastery. Although Misty initially had quicker gains in the antecedent condition, her performance in the consequent condition increased to the same level with the trend continuing

until she reached mastery. Although a large increase was seen with Anna in the antecedent condition in the first session, the consequent condition increased to the same level in the next session. For Anna, both conditions also remained at the same trend until mastery. The results indicate that one method of feedback was not more effective than the other, because after the initial sessions in intervention, both conditions followed the same trend as they increased. In addition, antecedent was initially more effective for Anna and Misty, whereas Isadora had quicker gains in the consequent condition. A possible explanation for there being no differentiation in results is that antecedent or consequent video feedback are not different enough to cause a dramatic increase in one compared the other.

The individual ability and receptiveness to feedback can explain why a subject's performance increased quicker than others. The difficulty of the dance skills is individualized for each person. A dance skill would be more difficult for some individuals and could take longer to improve, whereas others are more receptive to feedback and their performance increases faster. For example, it took Isadora 21 sessions for her to reach criterion for *pirouette*, whereas Anna reached criterion for *pirouette* in seven sessions, even though they began at similar baseline levels and both had antecedent feedback for that skill.

Prior to the study, the subjects had a history with the dance skills. They were familiar with them from their dance lessons, but needed improvement. Their prior history with the dance steps could be a reason why there wasn't a difference between the effects of antecedent and consequent feedback due to learning history. For future research, it would be interesting to see if there are differentiated results between antecedent and consequent feedback for novel behaviors, whether it is dance, a different sport, or another type of behavior entirely. It could also be

beneficial to compare antecedent and consequent feedback to a condition where a subject receives both.

As seen in previous studies addressing sports performance (Benitezsantiago & Miltenberger, 2016; Boyer, Miltenberger, Batsche, & Fogel, 2009; Kelley & Miltenberger, 2016), video feedback is an effective intervention. Immediate video feedback should be assessed with other sports, as well as the comparing the timing of when video feedback is implemented to see if it makes a difference in skill improvement.

An important contribution of this study was measuring both the sequential steps and body mechanics of the skills. By measuring them separately, the subjects had to increase in both categories in order to reach a mastery criterion. There was overlap with the components; when one increased in performance, so did the other. A potential limitation is that the body mechanics stayed constant across skills. Thus, more generalization of the skill may have been observed than if the skills were entirely independent of one another.

This study allowed the subjects to continue with their regular dance classes, while having the benefit of the video feedback intervention where they could focus on dance skills that needed improvement. The sessions were short and were conducted immediately after their classes, which made the intervention an efficient way to improve skills with minimal time commitment.

The study examined the effects antecedent and consequent video feedback for improving dance skills. The antecedent and consequent video feedback interventions were effective for increasing their performance from baseline, but the results showed that one feedback intervention was not more effective than the other. The results suggest that antecedent and consequent video feedback would be effective in improving the performance of other sports.

Future researchers should continue to evaluate and isolate the effectiveness of antecedent and consequent feedback. It would be beneficial to conduct this intervention with different target behaviors, such as novel behaviors to the subjects, because it might show differentiation in results between the antecedent and consequent conditions.

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Appendices

Appendix A: Task Analysis for *Pirouette en Dehours* (From Fifth Position)

	Sequential step components	Score for sequential step components:	Turn out to _____ degree of outward rotation*	Knee in same vertical plane as toe (vertically aligned to same degree)	Pelvis is vertical, (not tipped forward or tilted backward). Hip bones and pubic bones in same frontal plane.	Rib cage is vertical (not tipped forward or tilted backward).	Shoulders level left to right (in same horizontal plane) and held low enough as to not obscure line of neck.	Head to tail spinal alignment (All parts of spine held in vertical alignment) Ears in line with shoulders, shoulders over greater trochanter.
1.	Right foot forward, 5^{th} position, edge of the heel of front foot in front of big toe of back foot.							
2.	Arms in low first (arms curved from shoulders to fingertips, held so fingertips are parallel to one another and top of hip)							

3.	Go to 4th position – right leg separated and behind left. *Demi plié* (bend knees to 45 degree angle) while arms rise just below horizontal plane of shoulders – right arm out straight in front with left out to side.							
4.	Back foot comes up from floor to bottom of knee, while maintaining turn out. At the same time, the standing leg rises to *releve* (ball of foot and toes replaces whole foot as point of contact with floor). Arm position maintains.							
5.	Outside arm travels across horizontal plane to come parallel with other arm while the							

	movement initiates *en de hor* turn.							
6.	Turn – body rotates full 180 degrees on vertical axis; arms, knee, and foot (with pointed toe) maintain position.							
7.	As body turns, head is front facing until shoulders reach back right corner, head whips around and regains front-facing focus before rest of body.							
8.	Foot at knee traces down leg to floor, maintaining turn out.							
9.	End with right foot back, both feet turned out. Right arm up and left out to side.							
		Error occurred						

		anytime during step?						
	Body Mechanics**	=#/6*.25						
	Sequential Steps**	=#/9*.75						
	Percentage	=S+BM*100						

* Individually determined per dancer prior to beginning
** Calculate

Appendix B: Task Analysis for *Saut de Chat*

	Sequential step components	Score for sequential step components:	Turn out to _____ degree of outward rotation*	Torso and chest are in same frontal plane.	Rib cage is vertical (not tipped forward or tilted backward).	Shoulders level left to right (in same horizontal plane) and held low enough as to not obscure line of neck.	Ears in line with shoulders, shoulders over greater trochanter.
1.	Begin standing on left foot, with right leg back and toe pointed on floor. Arms in low first position (arms curved from shoulders to fingertips, held so that fingertips are parallel to one another and top of hip).						
2.	*Chassé* — stepping with right leg traveling forward, left leg coming in contact with right foot but not crossing in front of it ("chasing" right foot). Arms extended out in						

	front of body at chest level.						
3.	Take step with left foot to prepare for leaping, *plié* with left leg (bending knee).						
4.	Push off floor with left leg.						
5.	Bring right leg forward, extending in *développé* — leg is bent at knee as lifted, then extended straight in front of body with a pointed foot.						
6.	At the same time as step 5, left leg is extended straight in back with pointed foot, completing the leap in air.						
7.	When leaping, right arm is lifted in 70-degree angle from shoulders, left arm extended out in front of						

	body.						
8.	Land on right foot, with left foot landing next.						
9.	Step forward with left leg, with right leg back and toe pointed on floor. Right arm up and left out.						
		Error occurred anytime during step?					
	Body Mechanics**	=#/5*.25					
	Sequential Steps**	=#/9*.75					
	Percentage	=S+BM*100					

* Individually determined per dancer prior to beginning

** Calculate

Appendix C: Task Analysis for *Chaînés*

	Sequential step components	Score for sequential step components:	Turn out to _____ degree of outward rotation*	Knee in same vertical plane as toe (vertically aligned to same degree)	Pelvis is vertical, (not tipped forward or tilted backward). Hip bones and pubic bones in same frontal plane.	Rib cage is vertical (not tipped forward or tilted backward).	Shoulders level left to right (in same horizontal plane) and held low enough as to not obscure line of neck.	Head to tail spinal alignment (All parts of spine held in vertical alignment) Ears in line with shoulders, shoulders over greater trochanter.
1.	Feet in 5th position, with right foot in front; edge of the heel of front foot in front of big toe of back foot							
2.	Step out with right foot to side on *demi-pointe* — on the ball of the foot							
3.	Step with left foot on *demi-pointe* in front of right foot, legs straight and							

	together.							
4.	Bring arms to 1st position as turn begins (arms curved from shoulders to fingertips and positioned in front of chest)							
5.	Turn a full rotation (*chaînés*)							
6.	Spotting; focus on something in the distance in the direction turning. Look at spot as turning occurs without moving head until completing rotation. Quickly whip head with turn and look at same spot again.							
7.	Continue stepping out with right leg and crossing with left to continue turning movement.							

8.	Keep arms in 1st position as turning in *demi-pointe*.							
9.	End standing on left leg with right leg extended back with toe pointed to floor, with right arm up and left arm out.							
		Error occurred anytime during step?						
	Body Mechanics**	=#/6*.25						
	Sequential Steps**	=#/9*.75						
	Percentage	=S+BM*100						

* Individually determined per dancer prior to beginning
** Calculate

Appendix D: Task Analysis for *Arabesque*

	Sequential step components	Score for sequential step components:	Turn out to _____ degree of outward rotation*	Knee in same vertical plane as toe (vertically aligned to same degree)	Pelvis is vertical, (not tipped forward or tilted backward). Hip bones and pubic bones in same frontal plane.	Shoulders level left to right (in same horizontal plane) and held low enough as to not obscure line of neck.	Ears in line with shoulders, shoulders over greater trochanter.
1.	Right foot forward, 5th position, edge of the heel of front foot in front of big toe of back foot.						
2.	Arms in low first (arms curved from shoulders to fingertips, held so fingertips are parallel to one another and top of hip).						
3.	Chest lifted and torso facing forward; back slightly arched.						

4.	Right arm extended straight out to the front of body at 45-50 degree angle.						
5.	Head facing direction of left arm.						
6.	Right arm extended back parallel with and above right leg.						
7.	*Releve* (raise up onto ball of foot) on supporting leg.						
8.	Extend left leg back and lifted off floor, straight with pointed foot, parallel to floor.						
9.	Bring right foot down to ground, ending in fifth position with arms in rounded first.						
		Error occurred anytime during					

		step?					
	Body Mechanics**	=#/5*.25					
	Sequential Steps**	=#/9*.75					
	Percentage	=S+BM*100					

* Individually determined per dancer prior to beginning
** Calculate

Appendix E: Social Validity Data for Subjects

The numbers indicate how many subjects selected the corresponding answer.

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I liked participating in this study.				1	2
2.	I like the video feedback procedure.					3
3.	The video feedback procedure helped me improve my skills.					3
4.	I would recommend this procedure to others.				1	2
5.	I would use a similar procedure in the future to improve my dance skills.					3

I liked seeing the video before I did the skill best.	2
I liked seeing the video after I did the skill best.	1

Appendix F: Treatment Integrity Checklist

Step	Yes	No	N/A
1. Researcher tells subject which skill to perform.			
2. If in the antecedent condition, researcher gives video feedback to subject prior to subject performing target behavior.			
3. If in the consequent condition, researcher gives video feedback after the subject performs target behavior.			
4. The researcher was silent other than the delivery of feedback (ex: did not say, "good job!" while the subject was performing).			
5. The researcher correctly identified the errors correctly and gave appropriate feedback for the errors.			

Appendix G: Social Validity for Subjects

		Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1.	I liked participating in this study.	1	2	3	4	5
2.	I like the video feedback procedure.	1	2	3	4	5
3.	The video feedback procedure helped me improve my skills.	1	2	3	4	5
4.	I would recommend this procedure to others.	1	2	3	4	5
5.	I would use a similar procedure in the future to improve my dance skills.	1	2	3	4	5

Please circle one:

6.	I liked seeing the video before I did the skill best.	I liked seeing the video after I did the skill best.

Questions:

1. What did you think of from previous sessions when you had new sessions? How did you incorporate the feedback that was given to your performance?
2. Did the feedback provided make you want to perform better?
3. Were you more encouraged to practice after having feedback sessions? If so, did you practice one of the steps in the condition more than the other? Why?
4. Did watching videos before or after help you more? Why?

Appendix H: Social Validity for Instructors

The subject performed the skill in a technically accurate manner.

0-20% Strongly Disagree	21-40% Disagree	41-60% Neutral	61-80% Agree	80-100% Strongly Agree

Strongly Disagree: the skill was performed with no technical ability, and little to no components were correct.

Disagree: the skill was performed with little technical ability, and only a few components were correct.

Neutral: the skill was performed with moderate technical ability, and around half of the components were correct.

Agree: the skill was performed with good technical ability, and a lot of the components were correct.

Strongly Agree: the skill was performed with excellent technical ability, and most or all of the components were correct.

Appendix I: USF IRB Approval Letter

USF
UNIVERSITY OF
SOUTH FLORIDA

RESEARCH INTEGRITY AND COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd., MDC035 • Tampa, FL 33612-4799
(813) 974-5638 • FAX (813) 974-7091

April 1, 2016

Kelsey Myers
ABA-Applied Behavior Analysis
Tampa, FL 33647

RE: **Expedited Approval for Initial Review**
IRB#: Pro00025086
Title: Evaluating Video Feedback as an Antecedent or Consequent Event for Improving Performance of Dance Skills

Study Approval Period: 4/1/2016 to 4/1/2017

Dear Ms. Myers:

On 4/1/2016, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
K Myers protocol 3/27

Consent/Assent Document(s)*:
Informed Consent.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).

It was the determination of the IRB that your study qualified for expedited review which includes activities that (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45CFR46.110. The research proposed in this study is categorized under the following expedited review category:

(6) Collection of data from voice, video, digital, or image recordings made for research purposes.

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

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 via an amendment. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) calendar days.

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,

John A Schinka, Ph.D.

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