

March 2018

Using Video Self-Evaluation to Enhance Performance of Competitive Dancers

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Using Video Self-Evaluation to Enhance Performance of Competitive Dancers

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Science in Applied Behavior Analysis
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Date of Approval:
March 20, 2018

Keywords: sports, task analysis, performance feedback, applied behavior analysis

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Dedication

I dedicate this manuscript to my parents, Frank and Zenaida, my brothers, and my boyfriend. Thank you all for your help and support!

Acknowledgements

First, I would like to acknowledge my thesis advisor, Dr. Raymond Miltenberger. I appreciate you always pushing me in order to help me be as successful as possible during this program. Your time, dedication, and feedback has been a significant factor in my success. I would also like to thank my thesis committee members, Dr. Kimberly Crosland and Dr. Kwang-Sun Cho Blair for assisting me in developing quality work. Finally, I would like to acknowledge Cassandra Bochnak for all the time and effort she has put into assisting me with the research. Thank you all for your support!

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Abstract

This study used a multiple baseline across behaviors design to evaluate the use of video self-evaluation on the performance of dance movements. The self-evaluation condition included training participants how to view a video of them performing the dance movement and evaluate their own performance from video using a task analysis of the movement. Each participant applied the self-evaluation procedure to three separate dance moves. Target behaviors were scored using an individualized task analysis for each dance move. Self-evaluation improved all three dance moves for each participant. Self-evaluation produced an increase in all target behaviors from baseline to intervention for each participant. Social validity was also assessed, which yielded high likability of the procedure from the participants as well as social significant increases in target behavior performance as assessed by proficient dance instructors. Though some increases in performance were gradual, self-evaluation is proposed to be an effective, efficient, and accessible procedure to increase performance of competitive dance movements.

Chapter 1:

Introduction

Strenuous athletic training can lead to injuries (Street & Jacobsen, 2017). Street and Jacobsen (2017) noted that 25-60% of boys aged 13-15 who sustained a serious injury attributed it to a sport-related incident. Additionally, they reported that 12-56% of girls in this same cohort attributed their most serious injury to a sport-related incident. There are a large number of injuries reported in professional sports (Kay et al., 2017; Kerr et al., 2017; Yang et al., 2012). Consequently, athletic associations and researchers have published statements that attempt to inform coaches and athletes to be aware of their form while playing sports and to take prevention efforts to reduce injury (Dawson & Herrington, 2015; Dick, Hootman, & Ingersoll, 2007; Heck, Clarke, Peterson, Torg, & Weis, 2004; Hootman, Dick, & Agel, 2007).

Russell (2013) showed that incorrect training and technique is a major risk factor for injuries in dancers. Boston's Children Hospital published a brochure in the Injury Prevention Series in 2013 on injury prevention in dance that provides the argument that dancers train as hard as any competitive athlete, which puts them at equal risk for injuries. In addition, practicing dance with proper technique is crucial to preventing injuries as practicing with poor technique can cause bodily strain (Boston Children's Hospital, 2013). Injuries are frequent in professional dancers and they may lead to continuing physical issues that can be career-ending (Bowling, 1989).

Behavioral coaching is a term that has been used commonly in the research on sports performance (Allison & Ayllon, 1980; Fitterling & Ayllon, 1983; Komaki & Barnett, 1977;

Smith, Smoll, & Christensen, 1996; Stokes, Luiselli, & Reed, 2010), but the term behavioral coaching has not been strictly defined. According to Seniuk, Witts, Williams, and Ghezzi (2013), this term as applied to sports coaching is essentially defined as the use of behavioral intervention strategies to enhance sports performance. This method differs from traditional coaching methods in the sense that traditional coaching often uses coercive methods of training athletes (Laios, Theodorakis, & Gargalianos, 2003).

Traditional coaching methods also lack the rigorous assessment and evaluation of athletes' skills that is seen in behavioral interventions used to teach athletes (Allison & Ayllon, 1980; Boyer, Miltenberger, Batsche, & Fogel, 2009; Wolko, Hrycaiko, & Martin, 1993). Smith et al. (1996) discussed behavioral assessment and intervention in youth sports and highlighted the importance of assessing behavioral chains in sports performance in order to build interventions to improve them. Smith et al. also focused on the assessment of coaches' behaviors as opposed to solely the athletes' behaviors. Assessing behaviors in coaches and athletes can aid in developing interventions that enhance not only the athlete, but also the coaches' interactions with the athlete. A similar study done by Smith, Smoll, and Hunt (1977) used a coding system to assess coaches' teaching methodologies. This system was created as an attempt to structure the process of assessing coaching methods and the article states its implications could be used to make the process of behavioral assessment more accessible to coaches. These efforts in formulating a behavioral approach to coaching have continued in behavior analysis literature.

Research on using behavioral procedures in sports began in the 1970s (Komaki & Barnett, 1977; McKenzie & Rushall, 1974). In the general methodology of behavioral coaching, as shown in the study conducted by Komaki and Barnett (1977), coaches assess sports skills to improve, apply an empirically validated behavioral procedure as an intervention, and evaluate

progress in the athlete's performance of the skill. In this article, the coaches used a checklist format (task analysis) to teach the players how to complete offensive plays. After each play, the coach reviewed what steps were done incorrectly and what steps were done correctly. This process was replicated across three plays, which yielded positive results. Since then, behavioral coaching has been further systematized to include a variety of behavioral procedures. For example, Scott, Scott, and Goldwater (1997) assessed a prompting and shaping procedure with auditory feedback that successfully increased a pole-vaulter's arm extension and jump height. As another example, Boyer et al. (2009) used video modeling and video feedback to enhance the performance of gymnastics skills in four participants. Video modeling and feedback improved skill performance in all participants and this improvement was maintained during follow-up observations.

There is a paucity of research on behavioral coaching methods in dance (Nemecek & Chatfield, 2007), but new research has been published that successfully applied behavioral coaching procedures to improve dance performance. The following studies broke down dance movements into small, measurable steps that must occur in sequence to be scored as a correct performance of the movement. Each of these studies measured the percentage of steps performed correctly in the task analysis as a measure of improvement following training. Quinn, Miltenberger, and Fogel (2015) found that utilizing a behavioral intervention known as TAGteach increased dance performance for three out of four students. TAGteach utilizes auditory feedback delivered through a clicker to reinforce correct performance of steps in a task analysis. The researchers added an additional phase for the fourth student in which she earned tokens with an auditory feedback procedure, which led to more positive results. Another article evaluated auditory feedback in which students implemented auditory feedback with their peer

(Quinn, Miltenberger, Abreu, & James, in press). Results showed that all students receiving auditory feedback improved in their skill performance, and some students who delivered auditory feedback to their peers also saw some improvements in their skills even though they did not receive the feedback for their performance. Quinn and colleagues also looked at public posting and its effects on dancers' performance (Quinn, Miltenberger, Abreu, & Narozanick, 2017). The students had the opportunity to earn a publicly posted gold star if their performance scores improved from the previous session. Results showed that posting the dancers' scores each week for their classmates to view was effective in increasing their performance scores in future weeks.

Most recently, Quinn, Narozanick, Miltenberger, and Greenberg (2017) evaluated video modeling and video feedback to enhance dance performance. They first used video modeling and then added video feedback if needed to enhance the performance of dance skills. When video modeling was applied alone, the dancers' improvements were slight. After the researchers added a video feedback component, the dancers' scores improved even more, though one dancer had to have the perspective of the video model changed to show an effect. Thus, it appears that video feedback was a more effective procedure than video modeling for enhancing dance performance. Other researchers have shown video feedback is an effective intervention for enhancing performance in other sports such as martial arts (Benitez-santiago & Miltenberger, 2015), horseback riding (Kelley & Miltenberger, 2016), swimming (Dowrick, & Dove, 1980), and golf (Guadagnoli, Holcomb, & Davis, 2002).

In an attempt to increase the efficiency of video feedback, Downs, Miltenberger, Biedronski, and Witherspoon (2015) studied the effects of video self-evaluation on enhancing the execution of yoga postures. In the video self-evaluation procedure, the athlete executes the

skill while being video recorded, and then views the video while evaluating his or her own performance. In this way, the presence of a coach or trainer is not required to provide video feedback, and thus the procedure can be more efficient or accessible. Because video self-evaluation is a promising procedure for use in sports and only one study to date has evaluated video self-evaluation to enhance athletic performance, the purpose of this study was to evaluate the procedure for enhancing dance performance.

Chapter 2: Method

Participants and Setting

Participants were two male and one female competitive level dance students. All three participants attended a dance studio in Tampa, Florida and were recruited through flyers handed out by their dance instructors. Each participant met inclusion criteria of being at least 10 years old, having at least three years of dance competition experience, were currently enrolled in a competitive level dance team, and are currently lacking proficiency in at least three dance movements. Amelia was 16 years old and had been dancing for 11 years, Eli was 11 years old and had been dancing for 6 years, and Kyle was 13 years old and had been dancing for 10 years. All participants were a part of the same competitive dance team at their dance studio.

The study took place at dance studios in Tampa, Florida. A letter of consent from the studio owner was obtained prior to beginning any research in the studio. The studios used for sessions all had a marley (a thin, vinyl material) floor that had dimensions sufficient for execution of each dance movement.

Materials

The materials used in this study included a task analysis for each specific dance movement, a video recording device that possesses a playback feature (i.e., a standard IOS recording system on an iPad), and a scoring sheet for the dance instructor and participant to collect data on the students' performance. All participants reported that they have had experience

using the IOS recording system that was used in this study. A treatment integrity checklist was used by the researcher to score the participant's use of self-evaluation during 33% of sessions.

Target Behavior and Data Collection

The dependent variable was a percentage of correct steps completed on a task analysis created specifically for each dance movement. The participants' primary dance instructor chose the dance movements for their student. The dependent variables were consistent for each participant excluding Eli, who was assessed on a single pirouette as opposed to a double pirouette. All three participants were assessed on a fan kick and chasse grand jeté. The dance instructor identified target behaviors for each student by choosing skills with which the student was currently struggling. Each movement was topographically distinctive from the other movements so improvements in performance of one movement were unlikely to affect the performance of another. The study included four different task analyses depending on the skills that the dance instructor and researcher chose to target for each student participant. Each task analysis was created for a movement that each participant was already familiar with, but was not executing proficiently in their regular dance classes. The task analyses were created by breaking down each skill into a chain of sequential, observable, individual steps that makes up the entire dance movement. Each task analysis ranged from 18 to 23 steps. Each step had an operational definition for the specific movement in each step. Each definition was objective, clear, and complete. For example, a step labeled as "Preparatory step– right foot" would be defined as "Right heel lifts off floor so only toes touching floor, steps to left side of body (stepping forward counts as incorrect), foot turned out at least 35 degrees." The dance instructors created the task analyses in order to enhance the social validity of each task analysis. The researcher assisted in

ensuring that the task analyses included steps that are measurable for data collection purposes. Appendix A displays the task analyses used during the study.

Data were collected via video recordings in each session so the researcher, the dancer, and an independent observer were able to score the target behaviors using the task analyses for each movement. Percentage of correct steps completed were calculated by dividing the number of correct steps completed by the total number of steps in the task analyses of the target behavior multiplied by 100.

Interobserver Agreement

Interobserver agreement (IOA) was calculated for at least 33% of the sessions in this study. The researcher and one research assistant scored the selected video for IOA purposes. The research assistant was blind to the condition in which he or she is scoring the target behavior. The researcher trained the research assistant on data collection via behavioral skills training (BST). The researcher assessed the research assistant's proficiency of scoring the target behaviors by using model videos of expert and non-expert performances of the target behaviors. The research assistant demonstrated at least 90% IOA with the researcher in order to move forward in conducting IOA with the data collected in the study. An agreement between both observers occurred when both observers scored the target step as occurring or not occurring. IOA was calculated by dividing the number of agreements by the total number of steps in the specific task analysis multiplied by 100.

The average IOA for all participants was 92%. For Amelia, IOA was collected for 33% of sessions, with 35% in baseline phase and 22% in intervention phase. IOA for Amelia ranged from 83-100% for the fan kick with an average of 94%, 83-100% for the grand jeté with an average of 92%, and 85-100% for the pirouette with an average of 92%. For Eli, IOA was

collected for 33%, with 33% in baseline phase and 33% in intervention phase. IOA for Eli ranged from 73-100% for the pirouette with an average of 91%, 72-100% for the fan kick with an average of 92%, and 78-100% for the grand jeté with an average of 91%. For Kyle, IOA was collected for 36% of sessions, with 35% in baseline phase and 28% in intervention phase. IOA for Kyle ranged from 87-100% for the grand jeté with an average of 95%, 75-100% for the pirouette with an average of 94%, and 72-100% for the fan kick with an average of 92%.

Social Validity

Social validity was assessed via questionnaires with the student participants to assess their reactions to the intervention including how much they liked the intervention and how effective they perceived the intervention to be (See Appendix B). The questionnaire included a 6-point Likert scale as well as five open-ended questions. The responses obtained from the participants' open-ended questions were analyzed descriptively in the social validity section. Social validity was also assessed on the progress each student made with each target behavior. Two videos from baseline and two videos from intervention phase were shown to the students' dance instructor as well as an additional dance instructor who has at least two years of dance teaching experience. The instructors rated the performance on a scale of 1-10, 1 being poor performance and 10 being expert performance (See Appendix C). The baseline and intervention videos were presented in random order. The dance instructors did not have access to the task analysis during this social validity assessment and only rated the performances based on an anecdotal opinion of the dancers' performance. Social validity was also involved in the process of choosing the target behaviors for each student prior to intervention. The dance teacher chose target behaviors that each student was struggling with in order to make the purpose of this study socially accepted by the student and instructor.

Treatment Integrity

Treatment integrity of the student's use of video self-evaluation was assessed using two methods. The researcher scored the student's treatment integrity on the self-evaluation procedure using a treatment integrity checklist that included details such as whether the student watched the video, scored using the task analysis checklist, and whether the student filled out a response for each step in the task analysis (see Appendix D). Treatment integrity on scoring fidelity was also measured by collecting IOA on the performance scores that the student obtains. If IOA between the student and the researcher fell below 80%, the researcher retrained the student on how to score the target behaviors using the task analysis. Treatment Integrity was also assessed on the researcher's use of BST to conduct self-evaluation training. Appendix E displays the treatment integrity data sheet used in the study.

Treatment integrity was assessed 100% of sessions for each participant. All three participants scored 100% in fidelity for implementing the self-evaluation procedure. Treatment integrity of the researcher's use of behavioral skills training (BST) was assessed by the research assistant for 33% of trainings. The researcher's treatment integrity score was 97% across all observations.

Design and Procedure

A multiple baseline across behaviors design was used to evaluate the effectiveness of self-evaluation on enhancing the performance of three dance movements for each participant.

Baseline. Baseline sessions consisted of the instructor telling the student to perform each of the three target behaviors three times per session. Each baseline video ranged from 10-30 s, depending on the length of the movement performed. The instructor video recorded the target

behaviors and provided no feedback. The dance student did not have access to the task analysis or the video of his or her performance during baseline. Once the student attempted each of the target behaviors, the instructor thanked the student for his or her time and ended the session. The researcher scored each execution of the target skill from the video using that particular task analysis. When baseline data stabilized for one target behavior, intervention took place for that target behavior while the other target behaviors remained in baseline.

Self-evaluation training. The researcher utilized BST to teach the student participant how to score her data using the task analysis. A training checklist (Appendix E) was created in order to assess the researcher's treatment integrity during self-evaluation training. An overview of the task analysis steps and instructions on how scoring using the task analysis is completed took place first. Next, the researcher used one of the participants' baseline videos of the target behavior to demonstrate how to score the dance skill. The researcher demonstrated viewing the video multiple times in order to focus on different aspects of the movement, to pause, rewind, and zoom the video in order to view all parts of the movement necessary for scoring with fidelity. Then, the student had an opportunity to score a different baseline video of themselves completing the target behavior in order to rehearse the scoring procedure and receive feedback, as needed. Once the student obtained 90% IOA with the researcher, the training session was completed. This training took place at the beginning of each intervention phase for all three target behaviors and took approximately 30-40 min, depending on if additional rehearsals were required in order to reach 90% IOA with the researcher.

Self-evaluation. Each of the following intervention sessions began with the student completing the target behavior while being video recorded. The student watched the video and scored the dance movement herself using the task analysis scoring sheet. The student then

completed the movement and scored that video two more times. After evaluating three videos of her performance, the student participated in an assessment. She performed the movement three times and completed the other two movements three times while being video recorded for data collection purposes. Each intervention video ranged from 10-30 s, depending on the length of the movement performed and each session ranged 15-44 min total, depending on how long the participant took to score his or her video.

Chapter 3:

Results

Self-Evaluation

Introducing video self-evaluation produced an improvement in performance for all dance movements. Results for Amelia, Eli, and Kyle are shown in Figure 1, Figure 2, and Figure 3, respectively. The means for intervention are calculated using the last five data points of the intervention phases (Boyer et al., 2009).

Amelia's performance (Figure 1) of each target behavior increased from baseline to intervention. Performance of the fan kick increased from a mean of 37% in baseline to a mean of 95% in the last five data points of intervention. The percentage correct gradually increased for the first six data points followed by a steep increase in the last data points of intervention. The grand jeté increased from a mean of 34% in baseline to a mean of 65% in the last five data points of intervention. A steep increase was observed from baseline to intervention. Amelia's pirouette increased from a mean of 30% to a mean of 59% in the last five data points of intervention.

Eli's performance (Figure 2) of each target behavior increased immediately with the intervention. The pirouette increased from a mean of 32% in baseline to a mean of 88% in the last five data points of intervention. The percentage correct showed a continuous increase with some variability during the intervention phase. The fan kick increased from a mean of 49% in baseline to a mean of 88% in the last five data points of intervention. A steep increase was observed from baseline to intervention with little variability during intervention. The grand jeté

increased from a mean of 50% in baseline to a mean of 76% in the last five data points of intervention. An immediate increase was observed from baseline to intervention.

Kyle's performance (Figure 3) increased from baseline to intervention for all three target behaviors. The grand jeté increased from a mean of 32% in baseline to a mean of 90% in the last five data points of intervention. The pirouette increased from a mean of 32% in baseline to a mean of 72% in the last five data points of intervention. There was an immediate increase in level and a change in trend from baseline to intervention. The fan kick increased from a mean of 43% in baseline to a mean of 76% in the last five data points of intervention.

Social Validity

Social validity scores obtained by the participants regarding their acceptability of the study. A Likert scale was used to assess the participants perception on the effectiveness of the study, whether they liked participating, and if they would recommend this procedure to another person. Anecdotal questions regarding the self-evaluation procedure were also assessed. Social validity results are seen in Table 1. Overall, all participants rated the procedure highly in regard to them believing the procedure helped them improve their performance and that they thought the procedure was not too difficult to implement. Some short answer responses included in the social validity results included that the only thing the participant found difficult was having to review the video multiple times to complete the checklist, they would recommend this procedure to another person, and they liked that they could see themselves succeed with the movement through the video. One suggestion provided by a participant was to have additional movements to use for the procedure. Additionally, all participants stated that they enjoyed participating in the study. Table 2 displays social validity data as assessed by the participants' dance instructors. The participants' primary dance instructor as well as an additional instructor with proficient

dance training scored two baseline and two intervention videos of each target behavior for each participant. The results of this assessment yielded higher scores during each intervention video as compared to the corresponding baseline video according to teacher 1. For Amelia, her baseline videos were scored at an average of 3.5 and her intervention videos were scored as an average of 6. For Eli, his baseline videos were scored at an average of 4.2, and his intervention videos were scored as an average of 5.8. For Kyle, his baseline videos were scored at an average of 4.2, and his intervention videos were scored as an average of 5.8. Teacher 2 did not report as favorably. For Amelia, her baseline videos were scored at an average of 2.6 and her intervention videos were scored as an average of 2.5. For Eli, his baseline videos were scored at an average of 3, and his intervention videos were scored as an average of 3.3. For Kyle, his baseline videos were scored at an average of 3.3, and his intervention videos were scored as an average of 3.7.

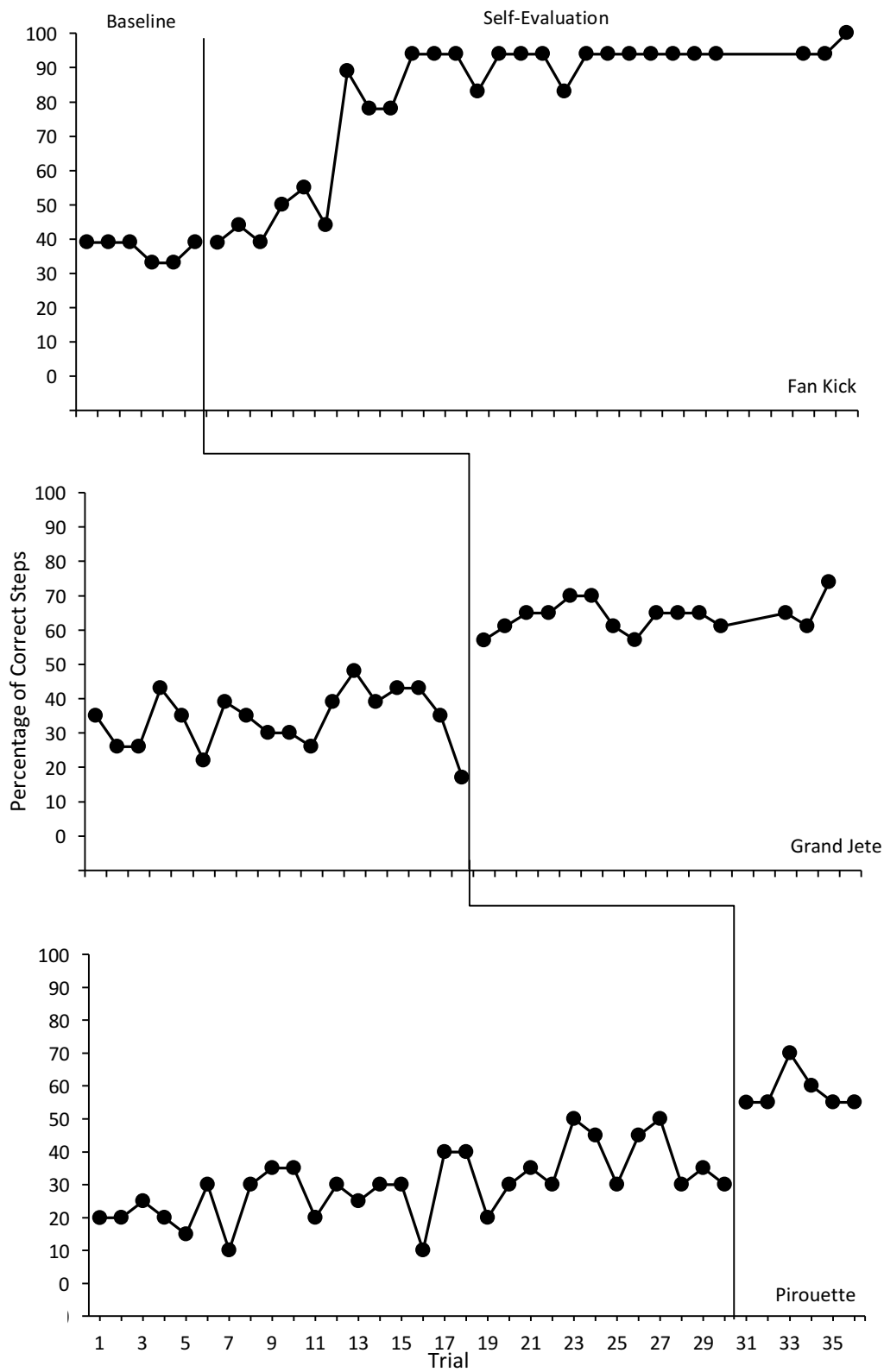


Figure 1. Self-evaluation data for Amelia for fan kick, pirouette, and grand jeté.

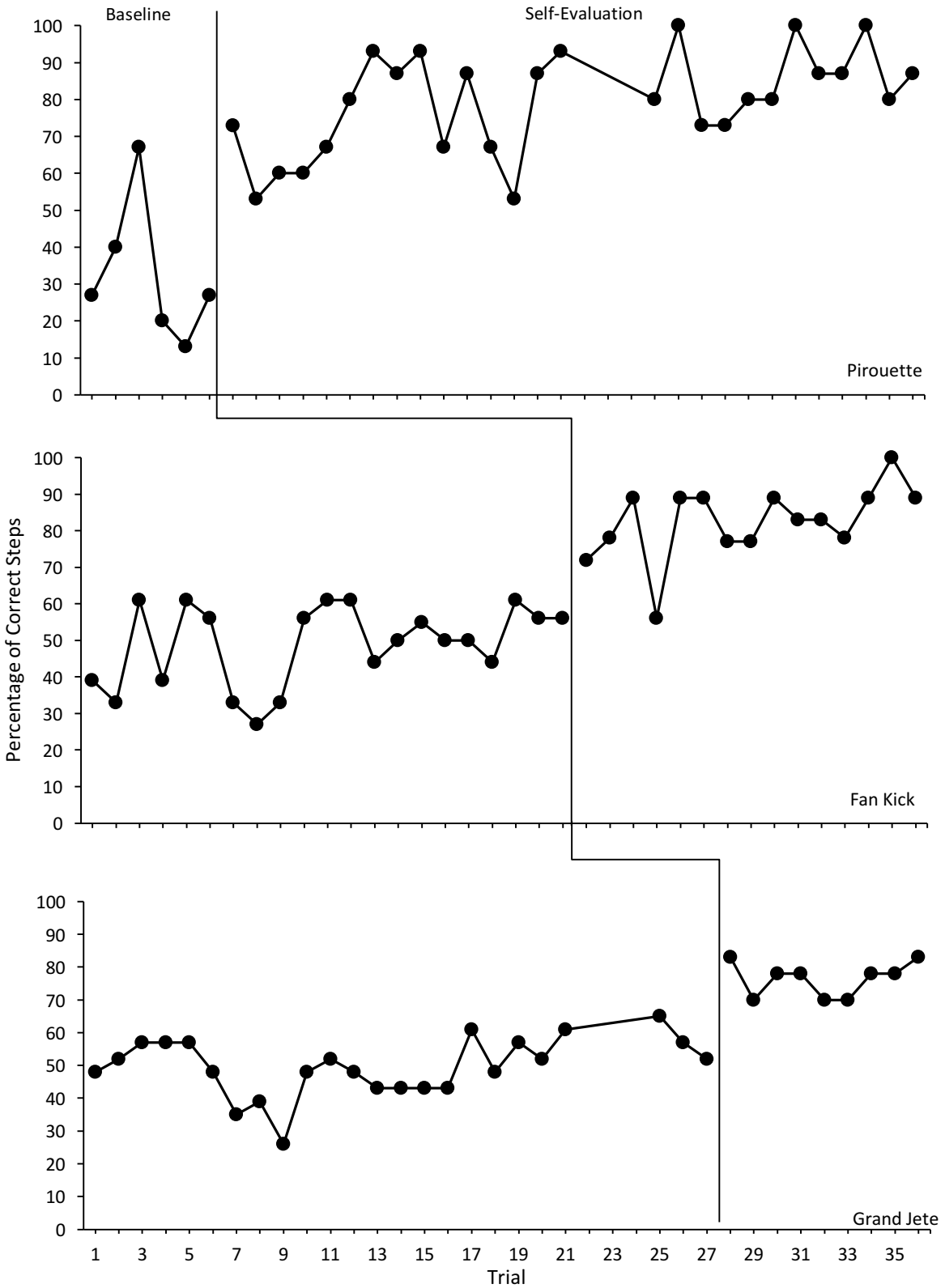


Figure 2. Self-evaluation data for Eli for pirouette, fan kick, and grand jeté.

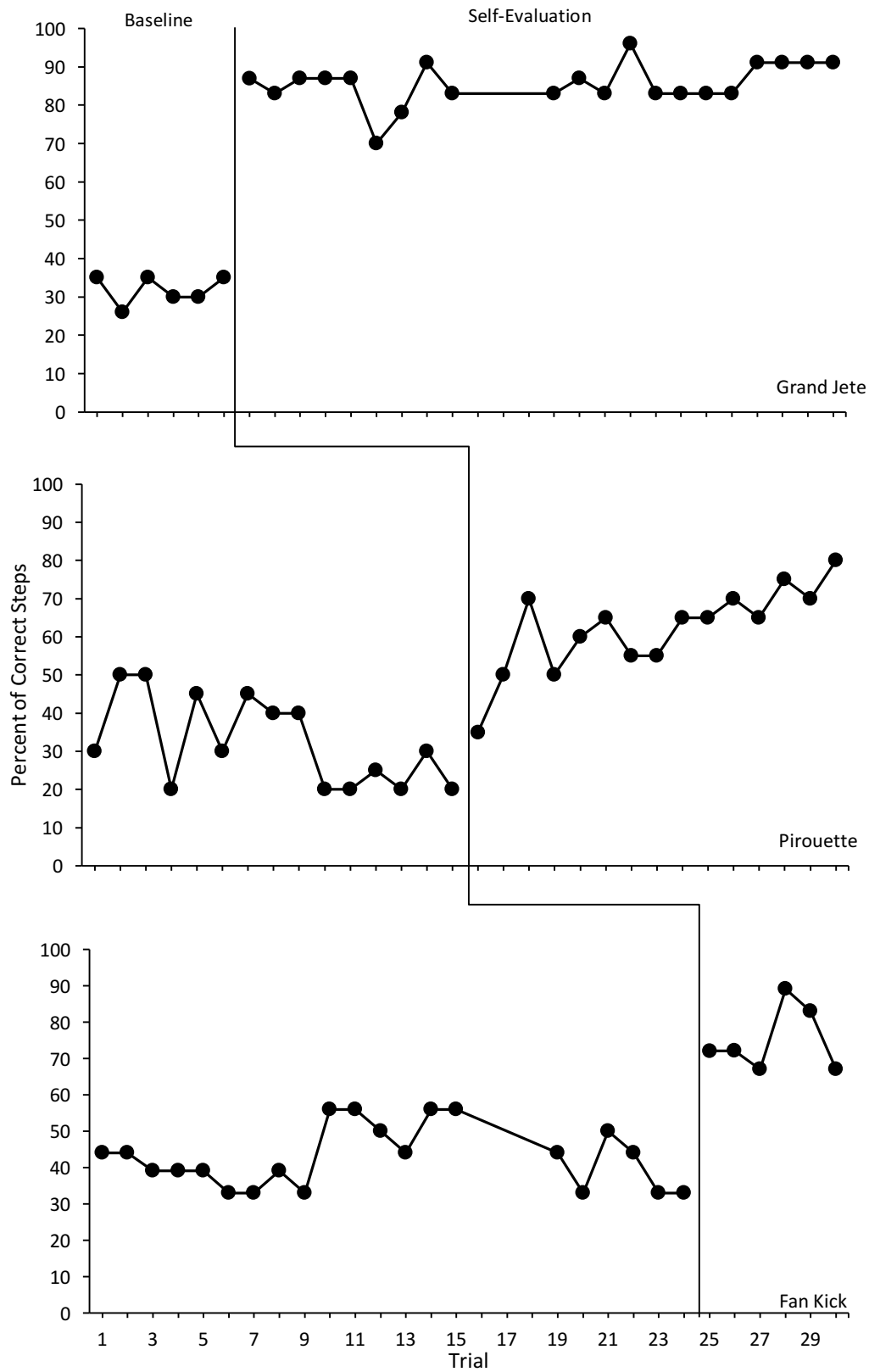


Figure 3. Self-evaluation data for Kyle for grand jeté, pirouette, and fan kick.

Table 1.

Student Social Validity Questionnaire Results

	Amelia	Eli	Kyle
My dance skills improved after using video self-evaluation training	Slightly Agree	Agree	Agree
Using video self-evaluation helped me understand what steps of the movement I need to improve	Strongly Agree	Agree	Strongly Agree
I liked using the video self-evaluation procedure	Strongly Agree	Agree	Slightly Agree
I will continue to use video self-evaluation to improve my dance performance	Strongly Agree	Slightly Agree	Slightly Disagree
I feel more confident in my dance performance after using video self-evaluation	Agree	Strongly Agree	Agree
It was not too difficult to use video self-evaluation of my own dance move	Strongly Agree	Agree	Agree

Table 2.

Teacher Social Validity Questionnaire Results

Participant	Target Behavior	Phase	Teacher 1 Mean Score	Teacher 2 Mean Score
Amelia	Fan Kick	Baseline	3.5	3
		Intervention	6	2
	Grand Jeté	Baseline	3.5	2
		Intervention	5.5	2.5
	Pirouette	Baseline	3.5	3
		Intervention	6.5	3
Eli	Pirouette	Baseline	3	3
		Intervention	5.5	4
	Fan Kick	Baseline	5.5	2.5
		Intervention	7	3.5
	Grand Jeté	Baseline	4	3.5
		Intervention	5	2.5
Kyle	Grand Jeté	Baseline	3	4
		Intervention	4.5	4
	Pirouette	Baseline	4	3
		Intervention	5	3
	Fan Kick	Baseline	5.5	3
		Intervention	8	4

Chapter 4: Discussion

The purpose of this study was to evaluate the effectiveness of a self-evaluation procedure on increasing performance in competitive dancers. The results of this study indicate that the self-evaluation procedure enhanced the performance for all three target behaviors for each dancer. By conducting video self-evaluation of themselves, each dancer improved his or her correct technique, positioning, and posture while executing dance movements they typically perform in dance class, competitions, and performances.

Similar to findings in Downs et al. (2015), self-evaluation was an effective intervention for increasing performance of dance skills. However, some of these improvements were more gradual, perhaps due to the complexity or difficulty of the technique of each move chosen. Due to this study being tailored to competitive level dancers over the age of 10, the dance movements chosen were at a more advanced level, possibly resulting in gradual increases as opposed to immediate increases in proficiency. Also, dance movements are generally more fast-paced and dynamic as compared to yoga postures. The rapid execution of a dance movement as advanced as the ones utilized during this study can make it more challenging for an individual to make as rapid of improvements as those seen in Downs et al. (2015).

Given that dance movements can be modified to fit the dance genre, performance requirements, and teacher preference, the moves utilized during this study can have alternative versions of execution. For example, for the pirouette, the task analysis used in this study asks for the starting position to include that the feet are together and parallel. This is not something that is explicitly required to execute the movement correctly, but was a feature of the movement that the

primary dance instructor chose to include in the task analysis for this study. However, each dancer that participated in this study take dance classes from multiple instructors, those of which may require the starting position of the pirouette to look different than what was required in this study. This could also contribute to variations in responding during the study due to the participants being asked to perform a movement differently than what is specified in the task analysis outside of their self-evaluation sessions.

Another note regarding the self-evaluation session is the range of durations required to complete the session for each participant. Sessions ranged from 15-44 min. One participant, Kyle, consistently took longer to complete the self-evaluation procedure as compared to the other two participants. Implications for this mean that some dancers may require more time outside of class to complete the procedure. If dance studios were to teach their dancers to use this procedure, they should expect for some students to potentially take longer than others to complete the self-evaluation procedure.

An interesting finding from this study is that retraining was required for at least one movement for each participant. When Amelia scored lower than 80% IOA with the researcher during her fan kick self-evaluation session, retraining was conducted during the next session. This also occurred for the pirouette with Eli and the grand jeté with Kyle. This finding suggests that, although the video self-evaluation procedure was effective in increasing performance, it should be overseen by a teacher or other trained individual to make sure the students are effectively trained on the task analysis, conducting the self-evaluation procedure correctly, and are provided with re-training when necessary. One limitation in this study was that the retraining occurred during the participants' next session, which was often a week after the previous session.

Due to this delay, the feedback provided for retraining was not immediate and could result in less effective training.

The results show that video self-evaluation is a promising procedure for promoting dance skills in competitive level dancers and is something that could be done without the need of a dance instructor present. The accessibility of such a procedure is something that could be beneficial to competitive dancers in order to promote progress outside of their scheduled dance classes. The feasibility of this procedures is also an important factor to note. In the competitive dance environment, all time spent practicing one's performance is valuable to progress in the field of competitive dance. If a dancer is able to improve their performance during their personal time, this has the possibility of making larger improvements as opposed to only receiving effective training in a dance class.

Additionally, all dancers reported they perceived that this intervention was successful in improving their dance performance, as well. The participants reported in favor of the use of this procedure and stated that they would recommend this procedure to other dancers. The dance instructors that assessed the baseline and intervention videos for social validity purposes also scored intervention videos higher than baseline videos in proficiency of the movements. The participants also reported anecdotally how they felt that the study has helped improve their dance skills. During a session, Amelia reported that she was thinking about the steps in the task analysis of the fan kick movement while she was completing the movement in class. Kyle stated that he felt the study was helping him slow down and think more about the small steps that occur during each movement. Additionally, Eli emitted statements that implied satisfaction with improving in his skills such as smiling and saying "yes" to himself when he scored higher on a movement during the session.

Future studies should consider conducting longer training sessions and more rehearsals with the self-evaluation procedure so retraining is less likely to be needed. Longer training could also possibly lead to quicker improvement as the participant would have a better understanding of the requirements of each step of the task analysis prior to beginning the procedure.

This study was the first study that evaluated self-evaluation with competitive dance movements. The results show promise that self-evaluation could be an effective and feasible procedure for dancers to use when attempting to access more dance training outside of the classroom setting. Self-evaluation also provides a way for dancers to access effective feedback without a dance instructor being present, which makes this procedure easily accessible to dance students and a beneficial way to enhance their own performance.

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Appendices

Appendix A: Task Analyses

Fan Kick					
Step	Step Name	Description	Trial 1	Trial 2	Trial 3
1	Starting Position – Feet	Standing straight Feet in first position (heels together, toes apart at least 2 inches)	Yes No	Yes No	Yes No
2	Starting Position – Arms	Arms straight down at sides	Yes No	Yes No	Yes No
3	Preparatory Step – Left foot	Steps onto left foot Steps to left side of body (stepping forward counts as incorrect) Foot turned out at least 35 degrees	Yes No	Yes No	Yes No
4	Preparatory Step – Right foot	Right heel lifts off floor so only toes touching floor Right foot completely pointed Leg is turned out (foot at least 35 degrees)	Yes No	Yes No	Yes No
5	Preparatory Step - Arms	Arms lift to shoulder height Palms face down No bend in elbows	Yes No	Yes No	Yes No
6	Fan Kick Prep – Right leg movement	Right heel lowers as right leg crosses in front of left leg Right leg points to front left corner Right leg straightens when foot is in tendu (pointed on floor)	Yes No	Yes No	Yes No
7	Fan Kick Prep – Right leg straight	Right leg straightens at end of step 6, when foot is pointed in tendu, before leaving the floor	Yes No	Yes No	Yes No
8	Fan Kick Prep – Left leg plié	Left leg is slightly bent and turned out at least 35 degrees during entire movement (step 6)	Yes No	Yes No	Yes No
9	Fan Kick – Right leg	Right leg lifts to front left corner Right leg circles up and over to front right corner	Yes No	Yes No	Yes No
10	Fan Kick – Left leg	Left leg straightens by the middle of the movement, when right leg is at highest point (Step 9)	Yes No	Yes No	Yes No
11	Fan Kick – Arms	Left arm stays out at shoulder height (does not drop below)	Yes No	Yes No	Yes No

		Right arm follows right leg – lowers and crosses in front of hips to left side when right foot crosses to front corner, lifts over head when right leg circles to right side, finishes at shoulder height Right arm is rounded (slight bend in elbow) during entire movement			
12	Fan Kick – Leg at 45 degrees	Right leg lifts at or above 45 degrees during fan kick movement (Step 9)	Yes No	Yes No	Yes No
13	Fan Kick – Leg at 90 degrees	Right leg lifts at or above 90 degrees during fan kick movement (Step 9)	Yes No	Yes No	Yes No
14	Fan Kick – Leg straight	Right leg straight during entire fan kick movement (Step 9) – as soon as foot leaves floor until after foot touches floor	Yes No	Yes No	Yes No
15	Fan Kick – Back straight	Back stays straight during entire fan kick movement (Step 9) Body slouching or leaning any direction counts as incorrect	Yes No	Yes No	Yes No
16	Ending Step – Right leg	After right leg circles to right side, right leg lowers to right side of body and steps on right foot (weight moves to right foot) Right foot is turned out at least 35 degrees	Yes No	Yes No	Yes No
17	Ending Step – Left leg	Left heel lifts off floor so only toes touching floor Leg is turned out (foot at least 35 degrees)	Yes No	Yes No	Yes No
18	Ending Step – Arms	Arms lower from shoulder height straight down to sides	Yes No	Yes No	Yes No
Score:					

Double Pirouette					
Step	Step Name	Description	Trial 1	Trial 2	Trial 3
1	Starting Position – Feet	<ul style="list-style-type: none"> • Standing straight • Feet together – insteps touching • Feet parallel 	Yes No	Yes No	Yes No
2	Starting Position – Arms	<ul style="list-style-type: none"> • Arms straight down at sides 	Yes No	Yes No	Yes No
3	Ball change– Right foot	<ul style="list-style-type: none"> • Steps onto right foot (weight on right foot) 	Yes No	Yes No	Yes No

		<ul style="list-style-type: none"> • Steps to right side of body (stepping forward counts as incorrect) • Foot parallel or turned out 			
4	Ball change – Left foot	<ul style="list-style-type: none"> • Left foot steps directly in front of body • Left foot is parallel • Both knees bend or turned out 	Yes No	Yes No	Yes No
5	Ball change – Arms lift	<ul style="list-style-type: none"> • Right arm moves directly in front of right shoulder (in front of body) • Left arm moves to side of body by the end of the second step of the ball change (step 5) • Shoulder height • No bend in arm during movement 	Yes No	Yes No	Yes No
6	Pirouette – Left foot relevé	<ul style="list-style-type: none"> • Left heel lifts off of floor • Heel at least 1 inch off of floor • Left knee completely straightens 	Yes No	Yes No	Yes No
7	Pirouette – Right foot passé	<ul style="list-style-type: none"> • Right knee lifts straight forward in front of hips • Right instep connects with inside of left knee • Right knee parallel (knee facing front) 	Yes No	Yes No	Yes No
8	Pirouette – Arms close	<ul style="list-style-type: none"> • Left arm moves in to meet right arm • Arms softly round (like holding a beach ball) • Palms facing torso • Palms chest height • Elbows lifted (elbows pointing downward counts as incorrect) 	Yes No	Yes No	Yes No
9	Pirouette – First turn	<ul style="list-style-type: none"> • Dancer makes a full 360-degree rotation to the right without dropping left heel to floor • Left leg stays straight by the end of the turn 	Yes No	Yes No	Yes No
10	Pirouette – First turn spot	<ul style="list-style-type: none"> • Head stays facing forward as body starts turn • Head snaps around and back to front prior to finishing first turn 	Yes No	Yes No	Yes No
11	Pirouette – First turn arms stay	<ul style="list-style-type: none"> • Arms stay in rounded position (no point in elbows) • Palms facing torso • Palms chest height 	Yes No	Yes No	Yes No

		<ul style="list-style-type: none"> Fingertips no more than 6 inches apart Elbows lifted (elbows pointing downward counts as incorrect) 			
12	Pirouette – First turn torso	<ul style="list-style-type: none"> Back is straight during entire turn Shoulders are in line with each other Slouching and/or leaning counts as incorrect 	Yes No	Yes No	Yes No
13	Pirouette – First turn passé	<ul style="list-style-type: none"> Right knee stays in front of body Right instep stays at inside of left knee 	Yes No	Yes No	Yes No
14	Pirouette – Second turn	<ul style="list-style-type: none"> Dancer makes a second full 360-degree rotation to the right without dropping left heel to floor Left leg stays straight during entire turn 	Yes No	Yes No	Yes No
15	Pirouette – Second turn spot	<ul style="list-style-type: none"> Head stays facing forward as body starts turn Head snaps around and back to front prior to finishing first turn 	Yes No	Yes No	Yes No
16	Pirouette – Second turn arms	<ul style="list-style-type: none"> Arms stay in rounded position (no point in elbows) Palms facing torso Palms chest height Fingertips no more than 6 inches apart Elbows lifted (elbows pointing downward counts as incorrect) 	Yes No	Yes No	Yes No
17	Pirouette – Second turn torso	<ul style="list-style-type: none"> Back is straight during entire turn Shoulders are in line with each other Slouching and/or leaning counts as incorrect 	Yes No	Yes No	Yes No
18	Pirouette – Second turn passé	<ul style="list-style-type: none"> Right knee stays in front of body Right instep stays at inside of left knee 	Yes No	Yes No	Yes No
19	Ending position – Feet	<ul style="list-style-type: none"> Left heel lowers to floor Right foot lowers to ground Standing straight Feet together – insteps touching Feet parallel or turned out 	Yes No	Yes No	Yes No
20	Ending position – Arms	<ul style="list-style-type: none"> Arms lower from rounded position straight down at sides 	Yes No	Yes No	Yes No

Score:			
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Single Pirouette					
Step	Step Name	Description	Trial 1	Trial 2	Trial 3
1	Starting Position – Feet	<ul style="list-style-type: none"> • Standing straight • Feet together – insteps touching • Feet parallel 	Yes No	Yes No	Yes No
2	Starting Position – Arms	<ul style="list-style-type: none"> • Arms straight down at sides 	Yes No	Yes No	Yes No
3	Ball change– Right foot	<ul style="list-style-type: none"> • Steps onto right foot (weight on right foot) • Steps to right side of body (stepping forward counts as incorrect) • Foot parallel or turned out 	Yes No	Yes No	Yes No
4	Ball change – Left foot	<ul style="list-style-type: none"> • Left foot steps directly in front of body • Left foot is parallel • Both knees bend or turned out 	Yes No	Yes No	Yes No
5	Ball change – Arms lift	<ul style="list-style-type: none"> • Right arm moves directly in front of right shoulder (in front of body) • Left arm moves to side of body by the end of the second step of the ball change (step 5) • Shoulder height • No bend in arm during movement 	Yes No	Yes No	Yes No
6	Pirouette – Left foot relevé	<ul style="list-style-type: none"> • Left heel lifts off of floor • Heel at least 1 inch off of floor • Left knee completely straightens 	Yes No	Yes No	Yes No
7	Pirouette – Right foot passé	<ul style="list-style-type: none"> • Right knee lifts straight forward in front of hips • Right instep connects with inside of left knee • Right knee parallel (knee facing front) 	Yes No	Yes No	Yes No
8	Pirouette – Arms close	<ul style="list-style-type: none"> • Left arm moves in to meet right arm • Arms softly round (like holding a beach ball) • Palms facing torso • Palms chest height 	Yes No	Yes No	Yes No

		<ul style="list-style-type: none"> • Elbows lifted (elbows pointing downward counts as incorrect) 			
9	Pirouette – First turn	<ul style="list-style-type: none"> • Dancer makes a full 360-degree rotation to the right without dropping left heel to floor • Left leg stays straight by the end of the turn 	Yes No	Yes No	Yes No
10	Pirouette – First turn spot	<ul style="list-style-type: none"> • Head stays facing forward as body starts turn • Head snaps around and back to front prior to finishing first turn 	Yes No	Yes No	Yes No
11	Pirouette – First turn arms stay	<ul style="list-style-type: none"> • Arms stay in rounded position (no point in elbows) • Palms facing torso • Palms chest height • Fingertips no more than 6 inches apart • Elbows lifted (elbows pointing downward counts as incorrect) 	Yes No	Yes No	Yes No
12	Pirouette – First turn torso	<ul style="list-style-type: none"> • Back is straight during entire turn • Shoulders are in line with each other • Slouching and/or leaning counts as incorrect 	Yes No	Yes No	Yes No
13	Pirouette – First turn passé	<ul style="list-style-type: none"> • Right knee stays in front of body • Right instep stays at inside of left knee 	Yes No	Yes No	Yes No
14	Ending position – Feet	<ul style="list-style-type: none"> • Left heel lowers to floor • Right foot lowers to ground • Standing straight • Feet together – insteps touching • Feet parallel or turned out 	Yes No	Yes No	Yes No
15	Ending position – Arms	<ul style="list-style-type: none"> • Arms lower from rounded position straight down at sides 	Yes No	Yes No	Yes No
Score:					

Chasse Step Grand Jeté					
Step	Step Name	Description	Trial 1	Trial 2	Trial 3

1	Starting Position – Feet	<ul style="list-style-type: none"> • Standing straight • Feet in first position (heels together, toes apart at least 2 inches) 	Yes No	Yes No	Yes No
2	Starting Position – Arms	<ul style="list-style-type: none"> • Arms straight down at sides 	Yes No	Yes No	Yes No
3	Chasse – Right foot tendu	<ul style="list-style-type: none"> • Right foot slides to point forward to tendu (toes on floor, heel lifted) • Right leg stays straight during entire movement 	Yes No	Yes No	Yes No
4	Chasse – First step	<ul style="list-style-type: none"> • Steps onto right foot • Toes step first, then heel • Leans weight on right foot • Slight bend in knee 	Yes No	Yes No	Yes No
5	Chasse – Second step (sus-sous jump)	<ul style="list-style-type: none"> • Left leg slides into sus-sous position • Both feet leave the floor during sus-sous position • Both toes pointed while jumping 	Yes No	Yes No	Yes No
6	Chasse – Land on left leg	<ul style="list-style-type: none"> • Left foot touches ground first • Toes land first, then heel • Slight bend in knee 	Yes No	Yes No	Yes No
7	Chasse – Right foot steps	<ul style="list-style-type: none"> • Right foot steps in front of body • Toes step first, then heel • Slight bend in knee 	Yes No	Yes No	Yes No
8	Chasse - Arms	<ul style="list-style-type: none"> • Arms lift straight from sides during step 3 • Left arm directly in front of left shoulder (in front of body) • Right arm directly out from right shoulder (on side of body) • Both arms shoulder height 	Yes No	Yes No	Yes No
9	Left foot steps	<ul style="list-style-type: none"> • Left foot steps in front of right foot • Toes step first, then heel • Slight bend in knee 	Yes No	Yes No	Yes No
10	Left foot steps - Arms	<ul style="list-style-type: none"> • Arms lower down • Arms rounded in front of hips • Arms distanced from thighs (arms touching thighs counts as incorrect) 	Yes No	Yes No	Yes No
11	Grand Jeté – Right leg	<ul style="list-style-type: none"> • Right leg slides through to front of body • Right leg brushes to tendu (toes pointed on floor, heel off floor, leg straightens) 	Yes No	Yes No	Yes No

12	Grand Jeté – Right leg lifts	<ul style="list-style-type: none"> • Right leg lifts off floor in front of body to tendu • Right leg stays straight during entire lift 	Yes No	Yes No	Yes No
13	Grand Jeté – Left leg	<ul style="list-style-type: none"> • Left foot pushes off floor to jump • Left leg straightens to back of body 	Yes No	Yes No	Yes No
14	Grand Jeté - Arms	<ul style="list-style-type: none"> • Arms lift overhead • Palms facing in or out • Shoulders down (neck is visible) 	Yes No	Yes No	Yes No
15	Grand Jeté – Hips squared	<ul style="list-style-type: none"> • Hips are in line with each other • One hip twisted higher than the other counts as incorrect 	Yes No	Yes No	Yes No
16	Grand Jeté – Toes pointed	<ul style="list-style-type: none"> • All ten toes are pointed 	Yes No	Yes No	Yes No
17	Grand Jeté – Legs at 45 degrees	<ul style="list-style-type: none"> • Both legs make a 45-degree angle 	Yes No	Yes No	Yes No
18	Grand Jeté – Legs at 90 degrees	<ul style="list-style-type: none"> • Both legs make a 90-degree angle 	Yes No	Yes No	Yes No
19	Grand Jeté – Legs over 90 degrees	<ul style="list-style-type: none"> • Both legs make over a 90-degree angle 	Yes No	Yes No	Yes No
20	Landing – Right foot	<ul style="list-style-type: none"> • Right leg lowers to floor • Toes land first, then heel • Right leg slightly bends after foot touches • Foot is turned out at least 35 degrees 	Yes No	Yes No	Yes No
21	Landing – Left foot	<ul style="list-style-type: none"> • Left leg lowers to floor behind body • Toes land first, then heel • Left leg slides through to front of body with toes and heel on floor • Weight shifts to left foot • Foot is turned out at least 35 degrees 	Yes No	Yes No	Yes No
22	Ending Position – Feet	<ul style="list-style-type: none"> • Right heel lifts off floor • Right leg behind left leg • Left leg is straight • Heels are closer to left foot than toes 	Yes No	Yes No	Yes No
23	Ending Position – Arms	<ul style="list-style-type: none"> • Arms lower straight down to sides 	Yes No	Yes No	Yes No
Score:					

Appendix B: Social Validity Scale for Participants

	Strongly Disagree	Disagree	Slightly Disagree	Slightly Agree	Agree	Strongly Agree
My dance skills improved after using video self-evaluation training						
Using video self-evaluation helped me understand what steps of the movement I need to improve						
I liked using the video self-evaluation procedure						
I will continue to use video self-evaluation to improve my dance performance						
I feel more confident in my dance performance after using video self-evaluation						
It was not too difficult to use video self-evaluation of my own dance move						

1. How do you feel video self-evaluation affected your dance performance?
2. Did you find video self-evaluation to be difficult? If so, what part was the most difficult?
3. Would you be likely to recommend video self-evaluation training to a friend?
4. What did you like most about video self-evaluation?
5. What would you like to see improved about video self-evaluation training?

Appendix C: Social Validity Scale for Dance Instructors

Dancer's Name: _____											
Video	Rating (Circle One)										Comments:
	1 = Poor Performance				5 = Average Performance					10 = Expert Performance	
1	1	2	3	4	5	6	7	8	9	10	
2	1	2	3	4	5	6	7	8	9	10	
3	1	2	3	4	5	6	7	8	9	10	
4	1	2	3	4	5	6	7	8	9	10	

Appendix D: Treatment Integrity Checklist for Self-Evaluation Procedure

Treatment Integrity for Self-Evaluation Procedure		
1.	Did the dancer watch the full video, from beginning to end?	Yes No
2.	Did the dancer use the task analysis checklist while scoring (i.e., did the dancer refer to the task analysis steps while watching the video of their performance)?	Yes No
3.	Did the dancer fill out a response for each step in the task analysis?	Yes No
4.	Did the dancer pause or re-watch any segment of the video for validation?	Yes No

Appendix E: Treatment Integrity for Self-Evaluation Training

Treatment Integrity for Self-Evaluation Training (BST)		
Did the trainer explain how to utilize self-evaluation? (Instructions)		
1.	The trainer explained the task analysis, each of its steps, and how the dancer will use this to score her video.	Yes No
2.	The trainer explained that if the dancer performs the step in the task analysis in the video, to mark it correct and if they do not perform the step in the video, to mark it incorrect.	Yes No
3.	The trainer asked the dancer if she had any questions regarding the self-evaluation procedure prior to moving on to the modeling phase.	Yes No
Did the trainer model how to utilize self-evaluation? (Modeling)		
4.	The trainer used a video from the dancer's baseline data to complete the self-evaluation procedure as a model.	Yes No
3.	The trainer asked the dancer if she had any questions prior to moving onto the rehearsal phase.	Yes No
Did the trainer allow the dancer to practice completing the self-evaluation procedure? (Modeling)		
6.	The trainer provided a different video from the dancer's baseline data in order to have the dancer practice completing the self-evaluation procedure.	Yes No
7.	The trainer observed the dancer complete the self-evaluation procedure and used the checklist from the Treatment Integrity for Self-Evaluation Procedure to assess whether all steps were completed by the dancer.	Yes No
8.	The trainer asked the dancer if she had any questions prior to moving onto the feedback phase.	Yes No
Did the trainer provide feedback after the dancer rehearsed the self-evaluation procedure? (Feedback)		
9.	The trainer used the task analysis to score the video that the dancer scored during the rehearsal phase and compared the trainer's score with the dancer's.	Yes No
10.	The trainer provided specific praise on at least one aspect of the self-evaluation procedure that the dance completed correctly.	Yes No
11.	The trainer provided feedback on what aspects of the self-valuation procedure to improve on.	Yes No
12.	If IOA between the trainer and dancer's score fell below 90%, trainer allowed the dancer to rehearse scoring a new baseline video until 90% IOA was reached.	Yes No