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Evaluating the Effectiveness of Peer-Implemented Video Feedback on Improving Weightlifting Form

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by

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ABSTRACT

This study evaluated the effectiveness of behavioral skills training (BST) in teaching peer-trainers to implement video feedback (Study 1). This study also evaluated the effectiveness of peer-implemented video feedback to improve the form of the deadlift movement (Study 2). Peer-implemented video feedback was used to improve the performance of the deadlift across participants. A non-concurrent, multiple baseline across participants design was employed for all participants in Study 1 and Study 2. The results show that BST was effective at teaching peer-trainers to implement video feedback. Peer-implemented video feedback was effective at improvement the form of the deadlift across all participants.

CHAPTER ONE:

INTRODUCTION

The U.S. Bureau of Labor Statistics has reported that national involvement in sports has increased each year since 2003. Weightlifting has been demonstrated to be the second most popular form of exercise behind walking (Woods, 2017). Weightlifting utilizes explosive muscular power, which is a necessary property of many other sports (Calhoon & Fry, 1999). As a result, weightlifting is used to better the performance of athletes in a variety of sports (Calhoon & Fry, 1999). As weightlifting has become more popular, weightlifting related injuries have increased year-over-year (Nationwide Children's Hospital, 2010).

On average 8.60 million people are injured playing sports per year. Exercise activity and exercise equipment-related injuries accounted for the most injuries treated in 2003 in sports (O'Brien et al., 2005). Nearly one million people visited the emergency room due to weightlifting injuries from the years 1990 to 2007 and 90% of those injuries occurred while using free weights while weightlifting (Kerr et al., 2010). There have been 114 reported deaths due to injury from weightlifting from the years 1990 to 2007 (Nationwide Children's Hospital, 2010). Back injuries are a common form of injuries associated with weightlifting (Calhoon & Fry, 1999). Weightlifting is often associated with disc injuries (Frontera, 2007). Spondylolysis, a degenerative condition, is a common back injury in weightlifting where the vertebrae develop stress fractures (Calhoon & Fry, 1999). Gray and Finch (2015) found that injuries caused by

overextension are most common. To prevent a weightlifting injury, the number one suggestion is to lift with proper form (Fleck & Falkel, 1986).

Researchers in sports and fitness have aimed to discover the most effective way to improve performance and technique while reducing injuries. For example, the effects of verbal instruction and shaping have been evaluated in high school football to improve tackling form (Harrison & Pyles, 2013). Feedback is a common intervention used by behavior analysts to improve sports performance (Schenk & Miltenberger, 2019). Schunk (1995) emphasized the importance of educators using specific feedback. Specific feedback refers to describing what the individual did correctly rather than providing a general statement such as saying, "good job." There is empirical support suggesting the type of feedback an individual receives can influence how quickly they acquire skills (Hattie & Timperley, 2007). Feedback deemed as negative, such as a coach yelling at an athlete, has been shown to lead to improved skills. However, negative feedback can also cause anxiety and low self-esteem and may adversely affect the relationship between a coach and athlete (Carpentier & Mageau, 2013). Positive feedback has not been shown to cause anxiety or low self-esteem like negative feedback and does not pose a threat to the athlete-coach relationship. Athletic trainers should consider the topography of feedback they deliver and how feedback may affect learning (Schunk, 1995).

The effectiveness of feedback-based coaching packages has been evaluated in a variety of sports. Video feedback has been evaluated for horseback riding (Kelley & Miltenberger, 2016), basketball (Aiken et al., 2012), tennis (Van Wieringen et al., 1989), golf (Guadagnoli et al., 2002), and cheerleading (Snapp, 2019). Auditory feedback has been examined in dance (Abreu, 2015; Quinn et al., 2015; Quinn et al., 2017), yoga (Downs et al., 2013; Ennett et al., 2019), rugby (Elmore et al., 2018), and martial arts (Krukauskas et al., 2019). Self-monitoring has been

evaluated in swimming (Schonwetter et al., 2014) and the effects of public posting have been observed for dancers (Quinn, Miltenberger et al., 2017). Verbal feedback has been studied in rugby (Elmore et al., 2018), basketball (Kladopoulos & McComas, 2001), and resistance training (Argus et al., 2011). Overall, the literature suggests that these feedback interventions are effective in improving performance in sports.

Peers providing feedback in a positive manner (e.g., praise) for correct responding has been shown to be useful in helping students improve skills (Tseng & Tsai, 2006). The use of peers to provide feedback is increasing in professional and instructional settings (Toegel & Conger, 2003). Individuals are exercising with peers more now because of the effects it has on meeting goals. In addition, for most team sports, teammates train together, providing an ideal opportunity for peers to be involved in delivering feedback.

Quinn et al., (2017) evaluated the effectiveness of peers providing auditory feedback with the use of a clicker to dance students on a competitive dance team. The researchers trained peers to provide auditory feedback to other dance students for correct dance movements. The dancers were scored using a task analysis and results were graphed as percentage of steps correct. The results showed that all participants improved their turn, leap, and kick movements when they received auditory feedback from peers.

Among the various feedback procedures, video feedback appears to be most commonly used to enhance sports performance (Schenk & Miltenberger, 2019), either used alone (e.g., BenitezSantiago & Miltenberger, 2015; Kelley & Miltenberger, 2016) or as part of an intervention package (e.g., Boyer et al., 2013).

Groom and Cushion (2005) evaluated the perceptions of soccer players who had received video feedback to review their performances. The researchers used athletes in their first professional season playing soccer who had never before used video to review their performance. The athletes attended ten feedback sessions that were led by their coach. Most of the feedback session focused on particular aspects of a play but individual player feedback was also incorporated. Groom and Cushion (2005) evaluated the player's view of the use of video feedback using a semi-structured questionnaire. The players' preference in learning style was also noted prior to evaluating their opinion of video feedback.

The questionnaire assessed five key areas: Usefulness, Learning, Reflection, Timing and Mental Aspects. All players rated the video feedback sessions as useful. Players also reported that the sessions changed the way they thought about their performance after matches, making a conscious effort to not repeat mistakes discussed in the session in future matches. Results of this study revealed that players were receptive to receiving video feedback and found video feedback beneficial to improving future performance.

Although video feedback and other behavioral interventions have been shown to improve performance across numerous sports, few, if any, studies have evaluated the efficacy of behavioral interventions for weightlifting. The statistics on injury associated with weightlifting show a need for improvement of weightlifting training regimes. The current literature supports the effectiveness of video feedback to enhance sports performance and one study shows video modeling plus video feedback was effective for improving weightlifting form. In addition, research suggests that using peers to implement feedback procedures can be effective (Quinn et al., 2017). Establishing the effectiveness of using peers to provide video feedback on weightlifting form can improve the accessibility of ABA technologies in sports. Video feedback

has been previously assessed in a variety of sports, but few studies have been conducted with weight training and fewer still have evaluated peer feedback. Therefore, additional research is warranted in the area of video- and peer-mediated feedback in weightlifting. Thus, the purpose of this study is to evaluate the effectiveness of peer-implemented video feedback to improve weightlifting form. Study 1 evaluates the effectiveness of behavioral skills training (BST) to teach peer trainers to implement video feedback and Study 2 evaluates the effectiveness of peer-implemented video feedback for improving weightlifting skills.

CHAPTER 2:

METHOD

Participants and Setting

Six participants were recruited for the study. Three participants were assigned as peer trainers and three were assigned as trainees. All participants were recruited via word-of-mouth and flyers posted at a local gym in Pinellas County, Florida. Participants were given consent forms once they expressed their interest in the study to the researcher.

Participants were 22 to 40 years of age and required to complete the Physical Activity Readiness Questionnaire (PAR-Q) (Appendix A) to rule out health issues. Participants were placed into the role that they deemed appropriate for themselves. Trainee-trainer dyads were formed based on preference of gender and closeness in age. Peer-trainers all expressed no preference in pairing. The peer-trainer/trainee dyads were formed by asking the individuals assigned to the "trainee" role if they felt comfortable being paired with a specific peer-trainer. There were two female-only dyads and one male-female dyad. There was no more than a 10-year gap in age between trainees and peer-trainers. The three peer trainers were Regina (age 29), Ryan (age 30), and Ezra (age 22). The three trainees were Jackie (age 24), Heather (age 40), and Alice (age 26). Regina had 3 years of experience with weightlifting with a focus on bodybuilding, Ryan had 5 years of experience with weightlifting with a focus on bodybuilding, Ezra had 4 years of experience with weightlifting with a focus on strength training. Jackie had 2 years of experience with weightlifting with a focus on CrossFit-style lifting, Heather had 5 years

of experience with weightlifting with a focus on group training exercise, and Alice had 6 years of experience with weightlifting, and was a group fitness instructor.

Target Behavior and Assessment

In Study 1, the target behavior was correct implementation of video feedback which consisted of reviewing the video of a lift and providing positive feedback for correct steps and corrective feedback for incorrect steps (see Appendix B).

In Study 2, the target behavior was the weightlifting movement called a deadlift. The deadlift requires an individual to stand and lift a loaded barbell off the ground to hip level, with the torso perpendicular to the ground, and then place the bar back on the ground. This movement was scored from video using a task analysis (TA, see Appendix C). The TA used for scoring the deadlift was reviewed by a certified personal trainer who agreed that the steps in the TA followed the correct steps of performing the lift and if followed correctly, would lead to a correctly performed deadlift.

Each assessment in Study 1 consisted of the trainer implementing video feedback with the researcher using a video of a deadlift made in advance for training purposes. In each assessment, the correct percentage of steps in the task analysis was recorded. Two forms of assessment occurred in Study 2. Each assessment of the trainee included one execution of the deadlift. The trainee was asked to perform the lift and no other instructions or feedback were provided. In each assessment the percentage of correct steps on the TA was reported. Assessment of the trainer included one trial of video feedback with the trainee. The percentage of correct steps in the use of video feedback was recorded and no instructions or feedback were provided for the trainer.

Interobserver Agreement

In Study 1, agreements of the steps in the task analysis were compared between two observers and the number of agreements on correct or incorrect steps was divided by the number of steps and multiplied by 100 to produce a percentage of agreement. The target behavior was evaluated based on the TA (see Appendix B). For Ryan, interobserver agreement (IOA) was calculated for 100% of trials of implementation of video feedback in baseline (m=96%; range: 93%-100%) and 66% of trials in intervention (m=100%). IOA data were not collected for Ezra and Regina in baseline. However, for Ezra IOA was calculated for 66% of trials of implementation of video feedback in intervention (m=93%; range: 89%-96%). For Regina IOA was calculated for 66% of trials of implementation of video feedback in intervention (m=88%; range: 82%-93%).

In Study 2, target behavior was evaluated based on the TA of the deadlift by the trainees (see Appendix C). Two observers watched the video independently and scored each step of the lift. An agreement was coded for each step in the TA if the primary and secondary observers both recorded the step as occurring or both recorded the step as not occurring. IOA was calculated by dividing the number of agreements by the number of steps in the TA and multiplied by 100 (Cooper et al., 2007).

Interobserver agreement was calculated for 100% of assessments in baseline for Jackie (m=83%; range: 82%-85%), 44% of assessments in intervention (m=98%; range: 93%-100%), and 66% of assessments in follow-up (m=100%). IOA was calculated for 50% of assessment in baseline for Heather (m=84%; range: 82%-95%), 44% of assessments in intervention (m=90%; range: 82%-100%), and 66% of sessions in follow (m=96%). IOA for Alice was calculated for

40% of assessments in baseline (m=85%; range: 78%-93%), 40% of assessments in intervention (m=92%; range: 89%-96%), and 66% of sessions in follow up (m=100%).

Treatment Integrity

In Study 1, treatment integrity was evaluated in 100% of training sessions by dividing the number of steps correct on the behavioral skills training (BST) task analysis (Appendix D) by the total number of steps and multiplying by 100. Treatment fidelity was 100% for Regina, Ryan, and Ezra.

In Study 2, treatment integrity was assessed for 100% of intervention sessions with the deadlift and using a checklist (see Appendix C). Treatment integrity was calculated by dividing the number of steps completed correctly by the number of steps on the checklist and multiplying by 100. A booster session on how to implement video feedback was provided in the event that a peer-trainer was not implementing video feedback with 90% fidelity.

Materials

The videos used for scoring and providing video feedback were recorded using the HudL© Technique application. The application was installed on an iPad® and videos of the participant's performance were recorded using the application. Researchers scored the videos following baseline and intervention sessions. The application features included slow motion, real-time speed, pause, and replay. These functions were used throughout the study. HudL© Technique allowed users to draw on videos to add notes to emphasize specific movements that need improvement. The application also allowed for side-by-side comparison of videos of the trainee, meaning the trainee can compare their video from a prior session to a new video to see how they have improved, however these functions were not used in this study.

A number of videos of the deadlift were developed for use in training and assessment in study 1. In each video, the model made errors in different steps in the task analysis. Appendix F lists the steps correct and incorrect in each of the videos used for training and for assessment.

Social Validity Questionnaire

Peer-trainers and trainees were given a social validity questionnaire (Appendix G) at the end of the study to evaluate the acceptability of the intervention. This questionnaire assessed the feasibility and acceptability of the intervention.

Experimental Design

For Study 1, a nonconcurrent multiple baseline across participants design was implemented to evaluate BST for teaching peer trainers. For Study 2 a nonconcurrent multiple baseline across participants design was used to evaluate peer-implemented video feedback.

Procedures - Study 1

Baseline

Peer-trainers were instructed by the researcher to use video feedback to improve the form of a deadlift of a researcher to assess the use of video feedback procedures. The peer-trainer was given an iPad with the HudL application installed to use. No feedback was provided to the peer-trainer.

BST

The researcher provided the peer-trainer with instructions on how to conduct video feedback and modeled how to implement the procedure. The instructions directed the peer trainer

to view the video with the participant and use the task analysis to review every step, providing praise for correct steps and corrective feedback for incorrect steps. Modeling the implementation of video feedback occurred after reviewing instructions. The researcher reviewed a prerecorded video with the participant using the task analysis to provide praise for correct steps and instructions for improvement on incorrect steps. The researcher then allowed the peer-trainer an opportunity to practice implementing video feedback with a prerecorded video of a lift. The researcher provided praise or corrective feedback as needed to the peer-trainer as the peer-trainer reviewed the video and provided praise or corrective feedback on each step of the task analysis.

The researcher repeated this process until the peer-trainer correctly identified each step that was executed correctly and incorrectly in the video and provided the appropriate corresponding feedback. After a training session, an assessment session occurred. The peer-trainer was then given a video of a deadlift and asked to provide video feedback to evaluate their use of the video feedback procedure following BST. No other instructions or feedback was provided. The peer-trainer's implementation of video feedback was scored using a task analysis (see Appendix B). Peer-trainers were required to score 90% or higher on implementation prior to beginning the intervention phase in study 2.

Procedures - Study 2

The weight the participants used throughout Study 2 was determined by multiplying the maximum weight used for a deadlift by 0.75. For example, if a participant's maximum weight for the deadlift was 135 pounds, for the study the participant used 101.25 pounds. Participants determined their weight based on previous experience with the deadlift. The participants reported their maximum weight used recently with the deadlift and the researcher calculated the weight to

use for the study from there. There were no indications of strain while participants lifted the weight used for the study. Jackie used 125 pounds, Heather used 105 pounds, and Alice used 135 pounds. There were no injuries throughout the study.

Baseline

The researcher prompted the trainees to stretch before beginning any lifts. Trainees were then instructed to perform the deadlift to evaluate current performance level. No instructions or feedback were provided. The trainee performed the deadlift one time in each assessment session. In the event that a trainee displayed improper form that may result in injury if not corrected immediately, they received feedback to correct the movement to avoid injury, however this did not occur during the study.

Peer-implemented Video Feedback

Each peer-trainer was paired with a trainee. The peer-trainer video recorded the trainee performing the deadlift. Immediately following the performance of the skill, the peer-trainer showed the video to the trainee and provided behavior specific praise or corrective feedback for each step in the task analysis of the lift. Following feedback, the trainee performed the lift again. This sequence continued for three opportunities to receive video feedback. After the three trials of video feedback, an assessment session occurred. In the assessment, the participant executed the lift one time. In each assessment the percentage of correct steps on the TA was reported.

Follow up

Follow-up sessions were identical to baseline sessions. Follow-up sessions took place at a different gym in Pinellas County. Follow-up assessments occurred 2 to 3 weeks after the

intervention was completed. Trainees were instructed to perform the deadlift. No feedback was given to the participant. Skills were video recorded and scored with the task analysis used during baseline and intervention.

CHAPTER THREE:

RESULTS

Behavioral skills training was effective at teaching peer-trainers how to implement video feedback in Study 1. Peer-implemented video feedback was successful at improving form for participants performing the deadlift movement in Study 2. Results for Study 1 are shown in Figure 1 and results for Study 2 are shown in Figure 2.

In Study 1 Regina's implementation of video feedback increased from a mean of 38% of steps correct in baseline to a mean of 89% of steps correct in intervention. Ryan's implementation of video feedback increased from a mean of 13% of steps correct in baseline to a mean of 95% of steps correct in intervention. Ezra's implementation of video feedback increased from a mean of 57% of steps correct in baseline to a mean of 95% of steps correct in intervention.

Treatment integrity data for Study 2 were taken as the peer-trainers gave video feedback to the trainees (see triangle data points in Figure 1). Regina's mean for treatment integrity was 93% (range 89% to 100%). Ryan's mean for treatment integrity was 97% (range 89% to 100%). Ezra's mean for treatment integrity was 96% (range 89% to 100%).

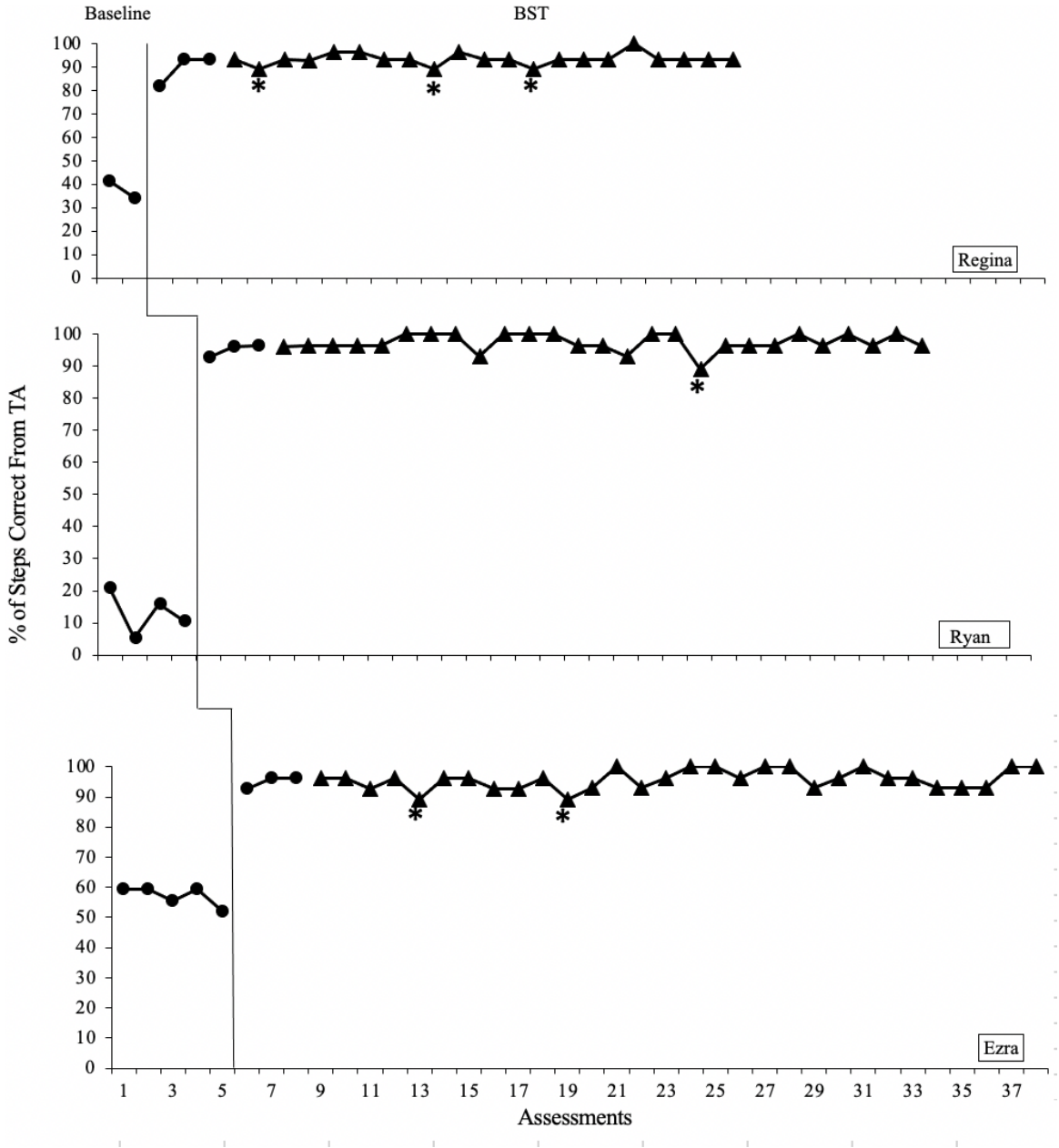
In Study 2 Jackie's deadlift form improved from a mean of 49% of steps correct in baseline to a mean of 96% of steps correct in intervention. Follow up data for Jackie was 100% of steps correct across all three assessments. Heather's deadlift from improved from a mean of 47% of steps correct in baseline to a mean of 95% of steps correct in intervention. Follow up

data for Heather was 100% of steps correct across all three assessments. Alice's deadlift from improved from a mean of 52% of steps correct in baseline to a mean of 93% of steps correct in intervention. Follow up data for Alice was 100% of steps correct across all three assessments.

Peer-trainers and trainees were given a social validity questionnaire (Appendix G) at the end of the study to evaluate the acceptability of the intervention. This questionnaire assessed the feasibility and acceptability of the intervention. The questionnaire was scored on a rating scale, with ranges from strongly agree (5) being the highest score to strongly disagree (1) being the lowest score. The mean social validity responses were as follows: m=5 for "I enjoyed participating in this study", m=5 for "I am pleased with my results from participating in this study, m=5 for "The video feedback I received was beneficial in improving my form/technique for the deadlift", m=4.8 (range: 4-5) for "The video feedback given by a peer was as beneficial as it would have been if delivered by a personal trainer", m=4.8 (range: 4-5) for "The HudL Technique application was simple enough to use that it did not disrupt my workouts", m=4.6 (range: 3-5) for "I would use video feedback in the future when I am practicing other skills", and m=5 for "My overall opinion of the study". Some short answer responses revealed that trainees wished that they could continue in the study to improve other weightlifting movements using the same intervention, and that the experience helped them build confidence in lifting weights.

Figure 1

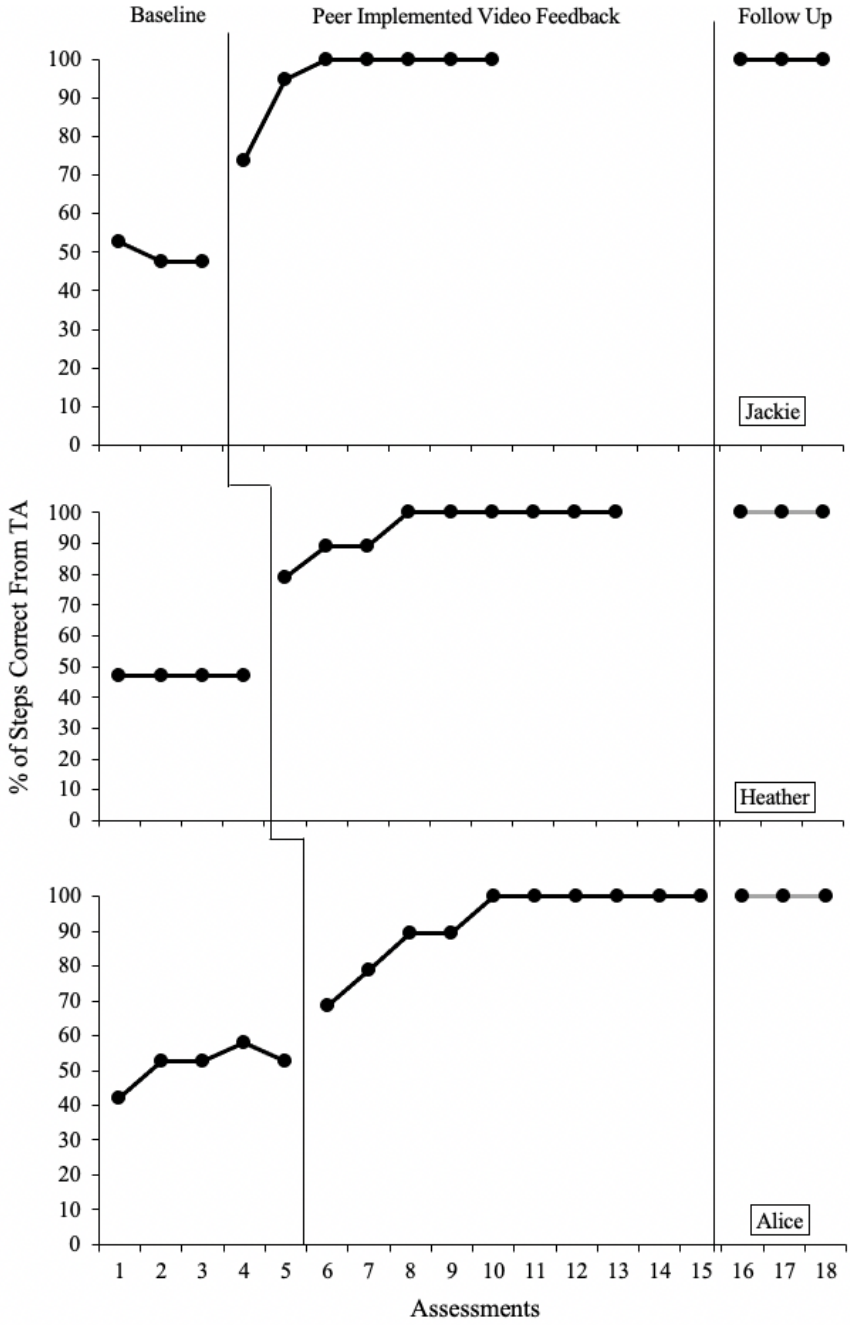
Percentage of Correct Steps of Video Feedback for Regina, Ryan and Ezra for Baseline, Intervention, and Treatment Integrity.



Note. Circles reflect data with the experimenter and triangles reflect data with the trainee. Asterisks indicate booster training sessions.

Figure 2

Percentage of Correct Steps of the Deadlift for Jackie, Heather and Alice for Baseline, Intervention and Follow-Up.



CHAPTER FOUR:

DISCUSSION

The purpose of this study was to evaluate the effectiveness of BST in teaching peer-trainers to implement video feedback and evaluate the effectiveness of peer-implemented video feedback for improving weightlifting form. The current study adds to previous research on video feedback used in sports to improve performance. This study also touches on a new aspect of video feedback: using peers rather than a researcher to implement the procedure. The results of Study 1 show that BST was effective for teaching individuals to give video feedback. The results of Study 2 show that peer-implemented video feedback was effective for improving weightlifting form of the deadlift. These results are consistent with the current literature that video feedback produces improvements in performance across a variety of sports (BenitezSantiago & Miltenberger, 2015; Boyer et al., 2013; Kelley & Miltenberger, 2016). The results also show that the trainers continued to use video feedback with a high level of treatment fidelity with their trainee in the absence of any further training from the researcher.

One reason why BST may have been so successful in teaching personal trainers to use video feedback is that there were multiple exemplars of videos with different steps completed correctly and incorrectly in training. Learning to use video feedback with so many exemplars of correct and incorrect steps likely contributed to successful generalization of the skills to training sessions with actual trainees. Another reason the trainers may have used video feedback so successfully is reactivity to observation. The researcher recorded the trainers each time they

implemented the procedure, so the trainers may have performed at a high level due to knowledge that they were being recorded. It would have been valuable to record their performance surreptitiously to see if they maintained high levels of treatment integrity when they did not know they were being watched (e.g., Mowery et al., 2010).

There are a few limitations of this study that are worth noting. First is a lack of IOA data collection in Study 1 in baseline with Regina and Ezra. IOA data were only collected for baseline for Ryan in Study 1 due to a human error made in the recording of the sessions of Regina and Ezra. However, IOA was calculated for a minimum of 33% of all sessions across all participants in the intervention phase of Study 1, and across all phases with all participants in Study 2.

Another limitation worth discussion is the task analysis of the deadlift itself. The TA may be geared towards those individuals who are familiar with the deadlift movement versus those who have no experience with the deadlift. This limitation could be cause for discrepancies across observers when scoring IOA and also could impact the feedback that peer-trainers give to trainees. Research assistants reported that while they did understand the TA for the deadlift for scoring, they could see how some individuals may get confused by the way a specific step was worded if the individual is not familiar with the deadlift movement.

One observation we made across the course of the intervention phase in Study 2 was a decrease in behavior specific praise and fewer details in corrective feedback from the peer-trainer to the trainee. Although the trainers were still commenting on all steps in the task analysis and scoring high in treatment integrity, their positive comments were less descriptive or more lax as trainees began to reach criterion with the deadlift. For example, the trainer read the step in the TA (such as “neck in neutral position”), identified it in the video, and then said, “you did this,”

or “which you did,” without saying great job or showing enthusiasm. This decrease in the detail in the feedback made the training sessions shorter later in the training phase, perhaps showing that the trainers can give feedback quickly and efficiently while producing good performance in the trainees.

It is possible in the future that a more novice-based version of the TA for the deadlift could be used. This could make IOA simpler and assure peer-trainers (or those using the TA) that the feedback they are providing is aligned with the specific component of the deadlift. All participants in this study had experience with the deadlift movement. In addition to this, the research assistants who scored IOA also had experience with the deadlift movement. Perhaps the use of a pictorial task analysis in the future could be beneficial in simplifying the components. Future research could also evaluate the impact that knowledge of performance has on future assessments of a lift (e.g., letting a participant know how they performed on the previous assessment prior to conducting another assessment).

Researchers could also aim to examine the effectiveness of peer-implemented video feedback with teaching a range of individuals from novices to those with substantial experience. It is not known if the effects may be different across those with different skill levels or different levels of experience. Future research could study if this same intervention is effective with an individual implementing it themselves, using a TA to critique their performance of a skill and using a researcher to assess after the individual completes video feedback sessions. Similar research using video self-evaluation has been conducted with yoga and dance and shown to be effective (Downs et al., 2015; Giambrone & Miltenberger, 2020). Researchers may also benefit from using peer-implemented video feedback to teach skills or improve skills across different sports (e.g., dance, track, football, soccer, etc.). Thus far, only Quinn et al. (2017) have evaluated

a peer implemented feedback intervention for increasing athletic performance. In this study, Quinn et al. showed that auditory feedback implemented by peers improved the performance of other teen dancers. Furthermore, the teens who implemented the feedback procedure also improved, although to a lesser extent. Future research could evaluate if peer trainers improve upon the skill on which they are providing feedback, similar to Quinn et al. (2017). In addition, future research could evaluate the effectiveness of peer-implemented video feedback by using competitors and using competitions as assessments to track improvements with skills.

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APPENDICIES

Appendix A: PAR-Q

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: answer YES or NO.

1. Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor? _____

2. Do you feel pain in your chest when you do physical activity? _____

3. In the past month, have you had chest pain when you were not doing physical activity? _____

4. Do you lose your balance because of dizziness or do you ever lose consciousness? _____

5. Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity? _____

6. Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition? _____

7. Do you know of any other reason why you should not do physical activity? _____

Appendix B: Task Analysis for Implementing Video Feedback

1. Have a video recording device with HudL© installed.
2. Open HudL© application.
3. Instruct the individual to perform their lift once you are ready.
4. Begin recording as soon as they begin moving toward the bar. We do not want to miss any steps.
5. Continue recording throughout the entire lift.
6. End the video recording once the individual has re-racked the bar and is moving away from it.
7. Have the individual join you to watch the recording of the lift they just performed.
8. Provide praise or corrective feedback on step 1.
9. Provide praise or corrective feedback on step 2.
10. Provide praise or corrective feedback for step 3.
11. Provide praise or corrective feedback for step 4.
12. Provide praise or corrective feedback for step 5.
13. Provide praise or corrective feedback for step 6.
14. Provide praise or corrective feedback for step 7.
15. Provide praise or corrective feedback for step 8.
16. Provide praise or corrective feedback for step 9.
17. Provide praise or corrective feedback for step 10.
18. Provide praise or corrective feedback for step 11.
19. Provide praise or corrective feedback for step 12.
20. Provide praise or corrective feedback for step 13.
21. Provide praise or corrective feedback for step 14.
22. Provide praise or corrective feedback for step 15.
23. Provide praise or corrective feedback for step 16.
24. Provide praise or corrective feedback for step 17.
25. Provide praise or corrective feedback for step 18.

26. Provide praise or corrective feedback for step 19.

27. Repeat this procedure three times per lift.

Appendix C: Deadlift Task Analysis

Steps	Component	Component Description	Trial 1
1	**Stance**	Stand with heels separated about 8-12 inches	
2		Bar about 1-1.5 inches away from shins (bar directly above middle of the arch of the foot)	
3	**Grip**	Bend at the waist	
4		Legs straight and knees locked out keep hips at the same level	
5		Place palms in front of the bar. Wrap hands around the bar. Palms facing you (overhand grip)	
6		When grabbing the bar, place hands outside of the legs. Thumbs should not rub legs as you pull.	
7		Keep arms straight. Locked elbows.	
8	**Body Position**	Push knees forward as they bend until shins touch the bar	
9		Push knees slightly out to the sides.	
10		Push ribcage up, raising chest. Keep back straight.	
11		Look at a point on the floor in front to keep your head and neck in a neutral position/in line with the spine	
12	**Pull**	Drag the bar up your legs, making contact with the shins. Keep bar path as a straight, vertical line	
13		Bar ends at arm's length	
14		Chest up knees locked out and back straight	
15		Feet flat on the floor	
16		Bend at the hip, unlock knees, push hips back	

17	**Lower Bar**	Move bar down in a vertical line while keeping in contact with the legs	
18		Keep knees back and back straight	
19		Bar lands above mid-foot	

Appendix D: BST Execution Task Analysis

Steps	Correct/Incorrect
1. Provides instructions to learners	
2. Models the skill for learners	
3. Provides learners chance to rehearse skill	
4. Provides learners with feedback	
5. Continues until learner reaches mastery criteria	

Appendix E: BST Error Videos

Video Number	Lift Name	Steps Correct/Incorrect
1	Deadlift	Step 1: Correct Step 2: Incorrect Step 3: Correct Step 4: Correct Step 5: Correct Step 6: Correct Step 7: Correct Step 8: Correct Step 9: Incorrect Step 10: Incorrect Step 11: Incorrect Step 12: Incorrect Step 13: Correct Step 14: Correct Step 15: Correct Step 16: Correct Step 17: Incorrect Step 18: Incorrect Step 19: Correct
2	Deadlift	Step 1: Correct Step 2: Incorrect Step 3: Correct

		Step 4: Incorrect Step 5: Correct Step 6: Correct Step 7: Correct Step 8: Incorrect Step 9: Incorrect Step 10: Correct Step 11: Incorrect Step 12: Incorrect Step 13: Correct Step 14: Correct Step 15: Correct Step 16: Correct Step 17: Incorrect Step 18: Correct Step 19: Incorrect
3	Deadlift	Step 1: Correct Step 2: Incorrect Step 3: Incorrect Step 4: Incorrect Step 5: Correct Step 6: Correct Step 7: Correct Step 8: Correct Step 9: Correct Step 10: Correct Step 11: Correct

		Step 12: Correct Step 13: Correct Step 14: Correct Step 15: Correct Step 16: Correct Step 17: Correct Step 18: Correct Step 19: Correct
4	Deadlift	Step 1: Correct Step 2: Incorrect Step 3: Correct Step 4: Incorrect Step 5: Correct Step 6: Correct Step 7: Correct Step 8: Incorrect Step 9: Incorrect Step 10: Correct Step 11: Incorrect Step 12: Incorrect Step 13: Correct Step 14: Incorrect Step 15: Correct Step 16: Correct Step 17: Incorrect Step 18: Incorrect Step 19: Incorrect

5	Deadlift	Step 1: Correct Step 2: Incorrect Step 3: Correct Step 4: Incorrect Step 5: Correct Step 6: Correct Step 7: Correct Step 8: Correct Step 9: Correct Step 10: Incorrect Step 11: Correct Step 12: Correct Step 13: Correct Step 14: Correct Step 15: Incorrect Step 16: Correct Step 17: Correct Step 18: Correct Step 19: Correct
6	Deadlift	Step 1: Correct Step 2: Incorrect Step 3: Correct Step 4: Incorrect Step 5: Incorrect Step 6: Incorrect Step 7: Correct

		Step 8: Correct Step 9: Incorrect Step 10: Incorrect Step 11: Incorrect Step 12: Incorrect Step 13: Correct Step 14: Correct Step 15: Incorrect Step 16: Correct Step 17: Correct Step 18: Correct Step 19: Correct

Appendix F: Social Validity Questionnaire

1. **I enjoyed participating in this study.**

   oStrongly Agree oAgree oNo Opinion oDisagree oStrongly Disagree

2. **I am pleased with my results from participating in this study.**

   oStrongly Agree oAgree oNo Opinion oDisagree oStrongly Disagree

3. **The video feedback I received was beneficial in improving my form/technique for the deadlift.**

   oStrongly Agree oAgree oNo Opinion oDisagree oStrongly Disagree

4. **The video feedback given by a peer was as beneficial as it would have been if delivered by a personal trainer.**

   oStrongly Agree oAgree oNo Opinion oDisagree oStrongly Disagree

5. **The HUDL Technique application was simple enough to use that it did not disrupt my workouts.**

   oStrongly Agree oAgree oNo Opinion oDisagree oStrongly Disagree

6. **I would use video feedback in the future when I am practicing other skills in the future.**

   oStrongly Agree oAgree oNo Opinion oDisagree oStrongly Disagree

7. **My overall opinion of the study:**

   oGreat oGood oOkay oBad oVery Bad

8. **What did you like best about having a peer provide feedback to you?**

9. **What did you like least about having a peer provide feedback to you?**

10. What did you like MOST about the study as a whole?

11. What did you like LEAST about the study as a whole?

12. Any other recommendations:

Appendix G: IRB Approval

UNIVERSITY of SOUTH FLORIDA

APPROVAL

September 2, 2020

Emma Cochrane
601 16th Ave SE
4-202
Largo, FL 33771

Dear Ms. Cochrane:

On 9/1/2020, the IRB reviewed and approved the following protocol:

Application Type:	Initial Study
IRB ID:	STUDY001410
Review Type:	Expedited 6, 7
Title:	Evaluating the Effectiveness of Peer-Implemented Video Feedback to Improve Weightlifting Form
Funding:	None
IND, IDE, or HDE:	None
Approved Protocol and Consent(s)/Assent(s):	• Protocol, Version #2, 09.01.2020.docx; • Consent Form, Peer Trainer, Version #1, 08.26.2020.pdf; • Consent Form, Trainee, Version #1, 08.26.2020.pdf; Approved study documents can be found under the 'Documents' tab in the main study workspace. Use the stamped consent found under the 'Last Finalized' column under the 'Documents' tab.

Within 30 days of the anniversary date of study approval, confirm your research is ongoing by clicking Confirm Ongoing Research in BullsIRB, or if your research is complete, submit a study closure request in BullsIRB by clicking Create Modification/CR.

In conducting this protocol you are required to follow the requirements listed in the INVESTIGATOR MANUAL (HRP-103).

UNIVERSITY of SOUTH FLORIDA

Sincerely,

Various Menzel
IRB Research Compliance Administrator