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Examining the Effects of Behavioral Skills Training on Movement Patterns in Youth Female Soccer Athletes

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EXAMINING THE EFFECTS OF BEHAVIORAL SKILLS TRAINING ON THE MOVEMENT PATTERNS IN YOUTH FEMALE SOCCER ATHLETES

by

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Abstract

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In certain sports, the ability of an athlete to change direction while sprinting is considered a vital skill required to be successful. Soccer is one of those sports and because of that learning to properly execute change of direction movements become very important. Statistics show a growing increase in youth female participation in soccer and as a result, injuries within this population has also increased. Because female athletes are at a greater risk for ACL injuries than males, coaches have acknowledged the need for proper training that will assist female athletes in executing skills safely. Current training programs for ACL injury reduction focus on strengthening of muscle, appropriate movement patterns and balance training. However, there is limited research on effective strategies or training procedures being used to teach youth female soccer athletes how to properly perform the desired movements associated with decreased risk of ACL injuries. Behavioral skills training (BST) have been shown to be an effective method for teaching acquisition of a wide variety of skills, however there is limited research on BST package as a teaching procedure in the sports setting. This study evaluated the effectiveness of BST package in teaching steps of a soccer drill to three youth female soccer athletes. The BST package consisted of verbal instructions, modeling, rehearsal and feedback which include video replay. The study used a multiple-baseline design across participants to evaluate the effects of BST. Results showed significant improvements in the number of steps the participants performed correctly relative to baseline and skills were maintained during a three-week follow-up. The study suggested BST was effective in increasing the number of steps performed correctly within the agility drill. Limitations and directions for future research are discussed.

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Introduction

Soccer is the most played sport in the world and has grown in popularity in the United States (Dai, Mao, Garrett, & Yu, 2014; Heidt, Sweeterman, Carlonsa, Traub, & Tekulve, 2000; Keller, Noyes, & Buncher, 1987; Malliou, Gioftsidou, Pafis, Beneka, & Godolias, 2004; Soderman, Werner, Pietila, Engstrom, & Alfredson, 2000; Wong & Hong, 2005). In 2014, the Federation Internationale de Football Association (FIFA) reported an estimated 265 million players were actively involved in the sport worldwide. (Dai, Mao, Garrett, & Yu, 2014). Over the past two decades, the United States has seen an influx of interest in the sport with participation steadily increasing from year to year (Giza & Micheli, 2005). The number of US soccer athletes has climbed upward to almost 15 million active players (Kourtures & Gregory, 2010; Smith, Chounthirath, & Xiang, 2016). Not only has participation increased on the professional level but statistics also indicate that there has been an increase in participation at the collegiate, high school and youth/recreational level, representing an increase of about 90% since 1990 (Smith, Chounthirath, & Xiang, 2016).

With over 200 million males and about 21 million females registered with FIFA (Giza & Micheli, 2005), soccer has generally been perceived as a male dominated sport (Jeanes, 2011; Rutkowska & Bergier, 2015; Soroka & Beriger, 2011). However, current trends suggest that the continued rise in participation can be primarily attributed to the increasing interest in the sport from females (Gall, Carling, & Reilly, 2008; Kiani et al., 2010; Soroka & Bergier, 2011). Across the world, it is reported that soccer is officially played in more than 100 countries with the total number of females participating in soccer estimated to be 26 million to 30 million (Coso, Herrero, & Salinero, 2016; Kiani et al., 2010). The United States Federation reported having 1.6 million registered female soccer athletes (Kiani et al., 2010). In 2014, US Youth Soccer reported

that there were more than 3 million registered youth soccer players with girls accounting for about 48% of those youth athletes (O'Kane et al., 2017). Despite soccer being a relatively safe sport, with this increase in participation from females, pediatricians have also seen an increased in the number of injuries associated with this sport (Esquivel, Bruder, Ratkowiak, & Lemos, 2015; Leininger, Knox, & Comstock, 2007; Smith, Chounthirath, & Xiang, 2016).

Smith et al. (2016) investigated the epidemiology of youth soccer-related injuries that were treated in the emergency departments in the United States. It was found that from 1990 to 2014, about three million children aged 7 – 17 were treated in US emergency rooms due to soccer-related injuries. Children 12 to 17 years of age accounted for about 72.7% of all the injuries. In addition, from 1990 to 2008, the number of soccer related injuries treated in the ER increased significantly for girls. The data analysis also revealed females were treated for ankle and knee injuries at a higher rate than males.

Jacobson et al. (2007) and Gall et al. (2008) reported similar trends in female soccer athletes having experienced the majority of their injuries at the knee, ankle, and thigh areas. Research suggests that soccer poses a high risk for an athlete to sustain lower extremities injuries, specifically injury to the anterior cruciate ligament (ACL). (Dai et al., 2014; Gianotti, Marshall, Hume, & Bunt, 2009; Granan, Bahr, Steindal, Furnes, & Engerbretsen, 2008) when compared with other sports. With a rapid growth in the number of female youth soccer athletes, the increase in lower extremity injuries can be anticipated with knee injuries being common and the ACL injury being the most serious of those injuries (Kiani et al., 2010; Lohmander, Englund, Dahl, & Roos, 2007).

The ACL is essential to the overall function of the knee because it influences the motion of the knee and it provides stability (Ambrose, 2003). The ACL is dense connective tissue that

serves as one of the four major ligaments within the knee joint. The top of the ACL is attached to the femur (thigh bone) and the bottom of the ligament is attached to the tibia (shin bone) (Noyes, 2009). A healthy ACL aids in the stability of the knee joint and resists the lower leg from anterior tibial translation (keeping the shin bone from moving too far forward) (Noyes, 2009). With an injured or torn ACL, the knee is unstable and weak during lateral movements (Gammons & Schwartz, 2016). With an injured or torn ACL, athletes whose sport require quick rapid side movements such as cutting, shuffling and sidestepping, unable to participate or participation is limited (Gammons & Schwartz, 2016).

Injury to the ACL is a specific concern in female soccer athletes because (1) female soccer athletes are about two – three times more likely to experience ACL injuries in comparison to their male counterpart (Dai et al., 2014; Prodromos, Han, Rogowski, Joyce, & Shi, 2007; Walden, Haggland, Werner, & Ekstrand, 2011), (2) female soccer athletes' risk of non-contact injury is four – six times greater than males (Arendt, Agel, & Dick, 1999; Morgan, Johnson, Bovbjerg & Norcross, 2018;), and (3) the short-term and long-term consequences associated with ACL injuries can potentially be very costly. Gainotti et al. (2009) suggested that female athletes in late adolescence pose the greatest risk for ACL injuries, the incidences of ACL injury in youth female soccer athletes increases between the ages of 10 – 12 (Thompson et al., 2017). A number of ACL injuries in female soccer players occur as non-contact incidences, in which there is no external contact made to the knee joint (e.g. ball to knee, player to player, knee to goal post or ground) (Boden, Dean, Feagin, & Garret, 2000; Beynnon et al., 2014; Gianotti et al., 2009; Granan et al., 2008), making this a risk that is potentially modifiable (Beunen & Thomis, 2000; Morgan et al., 2018). As more extensive research is conducted regarding non-contact ACL injuries in females, researchers are realizing that there is not one major contributing factor to

injuries to the ACL (Alenton-Geli, Myers, & Silvers, 2009; Hewett, Myer, & Ford, 2006; Thompson et al., 2017).

The injury risk that is associated with the ACL has been seen to be multifactorial consisting of anatomical, hormonal, neuromuscular, and biomechanical factors (Alentorn-Geli et al., 2009; Hewett et al., 2006; Thompson et al., 2017). Although anatomical and hormonal factors are basically impossible to change behaviorally, neuromuscular and biomechanical factors are modifiable and can have the greatest potential for injury reduction strategies to be implemented that provide a significant decrease in ACL injuries (Thomas et al., 2017). The most common injury scenarios that occur prior to a non-contact ACL injury involved change of direction or cutting maneuvers in combination with deceleration (Boden et al., 2010; Faude, Junge, Kindermann, & Dvorak, 2005; Olsen, Mykleburst, Engebrestsen, & Bahr, 2004) landing from a jump in or near full leg extension and pivoting with the knee near full extension and a planted foot (Boden et al., 2010; Fauno & Wulff, 2006). A soccer athlete's ability to quickly and efficiently execute change in direction maneuvers is an important quality to possess. Increasing the likelihood of proper execution of change of direction movements can be developed by focusing on the technical and tactical skill development amongst youth female soccer athletes (Bailey & Collins, 2013; Ford et al., 2012; Lagestad, Aether, & Ulvik, 2017; William & Reilly, 2000).

For almost four decades, the application of behavioral principles has been utilized in research in the sports arena. Various principles such as public postings (Brobst & Ward, 2002), goal setting (Brobst & Ward, 2002; Ward & Carnes, 2002), oral feedback (Brobst & Ward, 2002), video modeling (Boyer, Miltenberger, Batsche, & Fogel, 2009), self-recording (McKenzie & Rushall, 1974), and behavioral coaching (Allison & Ayllon, 1980; Komaki & Barnett, 1977;

Koop & Martin, 1983) have all been assessed in regards to acquisition, execution and performance within sport. As a result of decades of research, behavioral skills training was able to be evolve and base the teaching procedure in behavior analytic principles.

Behavioral skills training (BST) has grown in popularity and has emerged as an effective method of teaching a variety of skills. The teaching procedure has been successfully implemented to teach child safety skills, graphing skills to graduate students, assessment techniques (Shayne & Miltenberger, 2013) and tackling skills (Tai & Miltenberger, 2017). Behavioral skills training can be described as an empirically supported training protocol consisting of instruction, modeling, rehearsal, and feedback (Miltenberger, 2003). The instruction component of BST involves providing a description of the desired target skill, behavior, or procedure the individual is expected to perform (Miltenberger, 2003). The modeling component of BST entails demonstrating to the individual how to perform that target skill, behavior or procedure; with the intended outcome of being correct imitation of the modeled skill, behavior, or procedure (Miltenberger, 2003). The rehearsal component consists of the individual being provided an opportunity to practice the desired skill with feedback being provided (Miltenberger, 2003). The feedback component involves the delivery of information regarding the performance of the individual as it relates to the target skill, behavior or procedure (Miltenberger, 2003). Behavioral skills training is primarily implemented to teach students, staff, parents, or anyone else a new skill with the end goal of that individual accurately performing the specific desired behavior in a particular context (Himle & Wright, 2014; Miltenberger, 2008).

Tai and Miltenberger (2017) published the first and to date the only research examining the effects of BST on teaching safe tackling skills in youth football players. The researchers created a task analysis breaking down the appropriate steps in completing what they defined as a

safe tackle. Researchers show an immediate increase in the number of steps the participants performed correctly for each tackle. The results of the study suggested that BST was an effective method for teaching safe tackling skills and is consistent with research previous research on BST as a teaching method for skill acquisition.

Purpose of Study

The purpose of the study was to examine the effects of a behavioral skills training package on female soccer athlete's performance of movement patterns in an agility drill. The study aims to determine whether a BST package increases the accuracy of youth female soccer athletes performing movement patterns. Because female athletes have a greater tendency than males to engage in risky movement patterns (Thompson et al., 2017; Swartz, Decoster, Russell, & Croce, 2005) it becomes very important to identify procedures that will teach female athletes to better execute skills safely to reduce the risk of ACL injuries.

Methods

Participants and Setting

Three youth female soccer athletes from an organized, competitive soccer league in the Mid-Southern area participated in the study. Shelby, a 12-year old, was in her seventh season of playing competitive soccer with her primary position being a midfielder. Allison, a 13-year old, was in her sixth season of playing competitive soccer with her primary position being a center midfielder. Miranda, a 12-year old, was in her fourth season of playing competitive soccer with her primary position being an outside back. Miranda and Shelby both reported that they had or currently participate in specialized training that focused running faster. Allison reported that she had no current or previous experienced with any specialized training. None of the participants

reported having previous experience with performing the zigzag agility drill. Shelby was the only participant that reported a relative (her aunt) who suffered from an ACL injury.

The participants performed the baseline, intervention (BST), and the assessment of generalization phases on a turf field located at a private school. The maintenance phase was conducted on a grass field at a small private school.

Target Behavior and Data Collection

The dependent variable for this study was the number of steps, out of eight, within the drill that the participant performed correctly. An eight-step task analysis was used to score each step performed a in zigzag drill. In the drill, field cones where placed in a zigzag pattern with each cone being the same distance from the next cone. The participant moved from one cone to the next cone practicing a series of movements that were the same throughout the entire drill. This particular zigzag pattern (see figure 1) was chosen to mimic movements patterns utilized by soccer athletes. The zigzag drill is a training tool used to improve body positioning when engaging in change of direction movements (Hewett, Stroupe, Nance, & Noyes, 1996). The field cones were used as markers to indicate where the participant was supposed to run toward and initiate the cutting movement to change direction before sprinting to the next cone. A Go Pro Hero 6 was used to record the sessions and the video was then imported into Coach's Eye, a video analysis software. The software allowed the researcher to provide feedback to the participant through video playback that could be slowed down, spotlighted to highlight important details and drawn on using lines to emphasize technique. Each session consisted of the participant performing the zigzag drill from start to finish. The researched used the task analysis to score whether the participant performed the series of movements within the drill correctly.

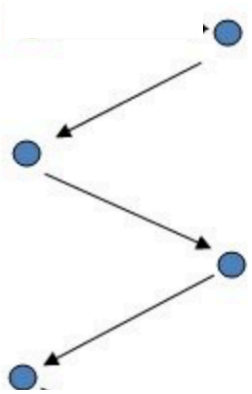

Figure 1

Example of the zigzag pattern training tool utilized in the research study

Interobserver Agreement (IOA)

Inter-observer agreement was scored for 35% of the baseline, intervention, and assessment of generalization probes by two independent observers. One observer was a doctoral student with previous soccer experience and the second observer was a current collegiate soccer athlete. Interobserver agreement was calculated by dividing the number of agreements for each step in the task analysis by the total number of steps in the task analysis and multiplying by 100%. The observers used the eight-step task analysis to score each step of the drill. If both observers scored an item the same (e.g., observers scored a step the same whether correct or incorrect), the researchers counted the score as an agreement. If either observer scored an item differently (e.g., scorer recorded the same steps differently), this was recorded as a disagreement. The mean agreement of the scored sessions was 81.3% (range, 75% - 100%) during the baseline phase, 88% (75% - 100%) during the intervention phase, and 88% (75% - 100%) during the assessment of generalization.

Materials

The materials used in this research study included: A Go Pro Hero 6, four orange field-cones, a measuring tape, Coach's Eye (video analysis app), iPad mini and a video tripod. All participants performed the drill in athletic apparel and soccer cleats during all sessions of the study.

Research Design and Procedures

A multiple baseline across participants was used to evaluate the effectiveness of behavioral skills training. The researcher set-up four field-cones on the soccer field in a zigzag pattern for each phase of the research study. Each field cone was the same color and was six meters apart from the next cone totaling 18 meters.

Baseline. In baseline, the participants performed the zigzag drill moving from one field cone to the next field cone in sequential order. The researcher verbally provided each participant the same set of instructions. The instruction given to participants during baseline was run from one cone to the next cone. The researcher did not provide any other specifics of how the participants were expected to complete the drill. The participants were given two minutes from the time they completed the drill to the when they performed the drill again. Each participant performed the drill without on other participants present. If a participant arrived early, they were instructed to stand in the designated area where they were unable to view the participant performing the drill.

Behavioral Skills Training. The BST components that were used to teach the drill included: (a) instruction, (b) modeling by the researcher, (c) rehearsal by the participant, and (d) feedback via video analysis. The intervention was implemented for each participant and was staggered across the participants. BST was used to teach each step of the zigzag drill. The

researcher provided participants verbal instructions for each of the eight steps in the zigzag drill task analysis (See Table 1 for the task analysis). The researcher then modeled each of the eight steps in the zigzag drill task analysis. The participant was given the opportunity to rehearse each step of the drill before being asked to complete the drill in real-time. Feedback included the researcher viewing the video with the participant, and describing the steps that were performed correctly, and providing corrective feedback on the steps that the participant performed incorrectly. The participant was given two minutes after the completion of each session before beginning a new session. The intervention was conducted in the same manner for each participant during each session.

Assessment of Generalization. This condition was conducted in two phases to probe participants performance in the drill while being presented with distractors and the research removing the BST package. The participants were not provided with any specific instructions, modeling of desired skill, rehearsal of skill or verbal and video feedback. Because soccer involves player movement on and off the ball, the generalization sessions were designed to mimic each type of movement. The first phase of the condition involved indirect distractions in which the participant was not directly involved with distractors and the second phase of the condition involved a direct distraction in which the participant was required to interact with the distractor (soccer ball).

Absence of BST plus distractors. In this phase, the researcher set-up a smaller soccer game consisting of four boys playing two vs. two about eight to ten feet from the where the participants were performing the drill. This scenario was designed to gauge the success of the participant while adding in a distractor, similar to being in a soccer game on the weak side of the field while the action is taking place on the strong side of the field, but still needing to make runs

off the ball to provide support to an athlete's teammates with the ball in the form of an outlet pass.

Absence of BST plus direct distraction. In this phase, a soccer ball was kicked with precision between the first and the second cones of the zigzag drill. This required the participant to perform a change of direction at the first cone and while in route to the second cone pick their head up to receive the ball at their feet. The participants anticipated having to change direction at the first cone but did not know at what point between the first and the con they would have to trap the ball.

Maintenance. In maintenance, the participants performed the zigzag drill three weeks after the intervention. The participants performed the drill with the absence of BST and were only given the directions provided in baseline.

Table 1

Task Analysis of Steps in the Zigzag Drill

	Sprint from the first cone to the second cone
	Shuffle feet to decelerate (slow down)
	Plant outside foot at the cone (foot is flat when planting, the athlete heel and ball of foot should remain in contact with the ground)
	Keep nose align to belly button (athlete body position should not be leaning to either side when foot is planted)
	Knees should remain stable (knees position should be straight, neither knee should be positioned inwards when planted)
	Point lead (inside) foot in direction of the next cone (the left foot should be pointed toward the next cone before the participant)
	Stay low to the ground (athlete is bent at the knees when planting)
	Sprint to the next cone

Results

The results of the research study showed that behavioral skills training was effective in increasing the number of steps correctly performed in the zigzag drill. All three participants showed improved accuracy in performing the steps in the drill when behavioral skills were implemented. Figure 1 displays the effects of behavioral skills training for Miranda, Allison, and Shelby. Performance of the zigzag drill varied from participant to participant with Allison leading the group with the highest number of steps performed correctly in baseline. The mean percentage in baseline was 42% (37.5% – 50%) for Shelby, 54% (50% – 62.5%) for Allison, and 28% (0 – 37.5%) for Miranda. The percentage of steps performed correctly increased immediately when behavioral skills training were implemented. The participants remained above baseline percentage when probed during the maintenance phase of data collection. Shelby and Allison were able to reach 100% accuracy during BST. Miranda was not able to reach 100% during BST but showed a significant increase from baseline. Shelby increased her mean average of 42% in baseline to 72.5% (50% – 100%) during BST. Allison's mean average of 54% in baseline increased to 86% (87.5% - 100%) during BST. Miranda increased her mean average of 28% in baseline to 74% (62.5% - 87.5%) during BST.

After BST, the researcher measured generalization as she instructed the participants to perform the drill while other things were occurring to act as distractions for the participants. In addition, the participants were instructed to change direction at whatever step they were performing in the drill to chase a ball that was kicked toward a space within the field cones. During the first phase to assess generalization (no BST plus distractors), Shelby performed the steps of the drill with 100% accuracy, Allison performed the steps of the drill with 75% accuracy and Miranda performed the steps of the drill with 87.5% accuracy. In the second phase to assess

generalization (no BST plus direct distractors), Shelby performed the steps of the drill with 100% accuracy, Allison performed the steps of the drill with 87.5% accuracy and Miranda performed the steps of the drill with 100% accuracy. Maintenance probes were conducted three weeks after baseline and the intervention. During maintenance, the researcher did not provide the participants with any of the components from the BST model. The only instructions that were provided was those instructions given in baseline. During maintenance, Shelby performed the drill with a mean average of 75% (62.5% - 87.5%), Allison performed the drill with a mean average of 100% and Miranda performed the drill with a mean average of 87.5% (75% - 100%).

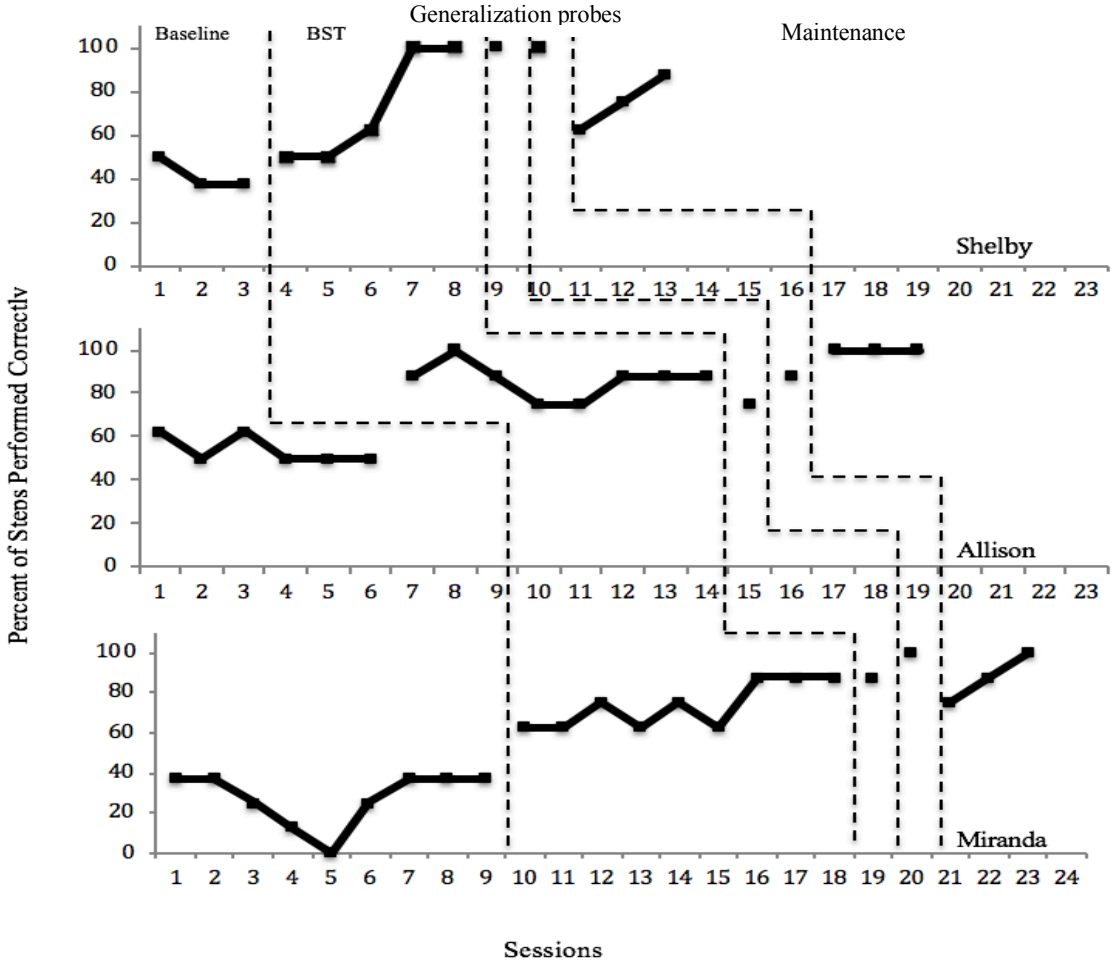

Figure 2

Percentage of steps performed correct in the task analysis for the zigzag drill.

Social Validity

A six-item survey, using a 5 – point Likert scale (1 = strongly disagree, 5 = strongly agree) (Tai & Miltenberger, 2017) was emailed to the participants and their parents at the end of the study (see table 2).

According to the social validity surveys that were completed by the participants and their parents, all three participants agreed that BST improved their cutting movements. In addition, all the participants believed that watching their performance on video helped them the next time they performed the drill. The social validity data also showed that the parents agreed on the importance of the BST model as a tool that coaches could use as a part of their soccer programs. The participants' parents also agreed that they would recommend BST to other parents.

Table 2

Results of Social Validity Survey Responses from Parents and Participants

Respondents	Questions	Mean Rating
Participants	Overall I feel BST improved my cutting skills.	**4.6**
	I feel it is important to learn to improve cutting movements when playing soccer.	**4.3**
	I feel I am able to perform cutting movements more safely.	**4.3**
	I am confident in my ability to complete cutting movements correctly.	**4.6**
	I feel like watching myself on video and being provided feedback helped me the next time I performed movements	**4.6**
	I enjoyed the BST I received.	**4.3**
Parents	Overall I feel BST improved my child's cutting movements.	**4.3**
	I feel it is important that my child learns proper cutting movements.	**5.0**
	I feel my child will be able to utilize what they learned in the study on the field.	**4.3**
	I think coaches should implement BST as part of their soccer program.	**4.6**
	I believe the use of video recording as a tool for feedback was helpful.	**4.6**
	I would recommend BST to other parents.	**4.6**

Summary

The study suggests that BST is an effective method of teaching soccer athletes to correctly perform the steps in a zigzag drill. The results were consistent with current and previous research that have used components of BST to teach skills to athletes (Tai & Miltenberger, 2017). When BST was implemented, there was an immediate increase in the number of steps the participants performed correctly following implementation and continued throughout the study. This is the first study to evaluate BST in youth female soccer athletes with video as an added feature to the feedback component. Utilizing drills to assist athletes in acquiring and retaining movements to correctly perform a drill are important steps to keeping youth athletes' safe and decreasing the likelihood of serious injuries. Training models, such as BST, that emphasis teaching, modeling and rehearsal have the potential to provide increased opportunities for athletes to master steps in hopes that of these correctly performed movements generalize to game sessions. The findings of this research study not only have implications in the field of behavior analysis, but also within other disciplines (e.g., human performance, health and fitness, and education) that require individuals to acquire, retain, and apply a skill, behavior or procedure.

Limitations/Future Research

One limitation of this study was that the participants only performed the drill in isolation and data was not taken on group practice sessions or real-time games. The participants' data was collected in an area totaling 18 meters as opposed to an entire soccer field that would require the athlete to focus on several situations at one-time and not only on performing the movements correctly. A second limitation to the study was that the participants knew what movements they had to perform each time. However, in a real-time game situation, the participant does not necessarily know when they will have to change direction, how quickly they will have to

complete the movement, and what other movement they will have to perform once they have changed direction. Future research could evaluate if the skills taught to the participants generalized to practice and game situations. In addition, researchers could examine an athlete performing the zigzag drill on turf verses grass effects the consistency of proper movement patterns. Lastly, researchers should consider measuring the effectiveness of BST with younger athletes when teaching proper sports mechanics and movements. These study findings may provide a training model that could be used by coaches and parents to assist athletes in skill acquisition and retention. With BST training being shown effective in sport settings, athletes that are able to acquire, retain, and perform a skill accurately has the ability to reduce future injuries.

References

Allison, M.G. & Ayllon, T. (1980). Behavioral coaching in the development of skills in football, gymnastics, and tennis. *Journal of Applied Behavior Analysis*, *13*, 297 -314.

Ambrose, T. (2003). The anterior cruciate ligament and functional stability of the knee joint. *BM Medical Journal, 45*, 495 – 499.

Arendt, A., Agel, J., & Dick, R. (1999). Anterior cruciate ligament injury patterns among collegiate men and women. *Journal of Athletic Training, 34*, 86 – 92.

Bailey, R., & Collins, D. (2013). The standard model of talent development and its discontent. *Human Kinetics, 2,* 248 – 259.

Beunen, G. & Thomis, M. (2000). Muscular strength development in children and adolescents. *Pediatric Exercise Science, 12*, 174 – 197.

Boden, B., Sheehan, F., Torg, J. & Hewett, T. (2010). Non-contact ACL injuries: Mechanisms and risk factors. *Journal of American Academy of Orthopedic Surgeon, 18*(9), 520 – 527.

Boyer, E., Miltenberger, R.G., Batsche, C., & Fogel, V. (2009) Video modeling by experts with video feedback to enhance gymnastics skills. *Journal of Applied Behavior Analysis, 42,* 855 – 860.

Brobst, B., & Ward, P. (2002). Effects of public posting, goal setting, and oral feedback on the skills of female soccer players. *Journal of Applied Behavior Analysis, 35*, 247 – 257.

Chomiak, J., Junge, A., Peterson, L., & Dvorak, J. (2000). Severe injuries in football players. *American Journal of Sports Medicine, 28*, 58 – 68.

Coso, J., Herrero, H., & Salinero, J.J. (2016). Injuries in Spanish female soccer players. *Journal of Sport and Health Science,* 1-8.

Dai, B., Garrett, W., & Yu, B. (2014). Anterior cruciate ligament injuries in soccer loading

mechanisms, risk factors, and prevention programs. *Journal of Sport and Health Science, 3*(4), 299 – 306.

Dickson, M.J., & Vargo, K.K. (2017). Training kindergarten students lockdown drill procedures using behavioral skills training. *Journal of Applied Behavior Analysis, 50,* 407-412.

Esquivel, A., Bruder, A., Ratkowiak, & Lemos, S. (2015). Soccer – related injuries in children and adults aged 5 to 49 years in US emergency departments from 2002 – 2012. *Sports Health, 7*(4), 366 – 370.

Faude, O., Junge, A., Kindermann, W., & Dvorak, J. (2005). Injuries in female soccer players. a prospective study in the German national league. *The American Journal of Sports Medicine, 33*, 1694 – 1700.

Fauno, P. & Wulff, J. (2006). Mechanisms of anterior cruciate ligament injuries in soccer. *Internationale journal of Sports Medicine, 27*(1), 75 – 79.

Federation Internationale de Football Association (FIFA). (2014). Women's Footbal Survey.

Ford, R., Carling, C., Garces, M., Mauricio, M., Miguel, C., Farrant, A., Stenling, A., Moreno, J. Gall, F., Holmstrom, S., Samlmela, J. & Williams, M. (2012). The developmental activities of elite soccer players aged under -16 years from Brazil, England, France, Ghana, Mexico, Portugal and Sweden. *Journal of Sports Science, 30*, 1653-1663.

Gammons, M. & Schwartz, E. (2016). Anterior cruciate ligament injury. www.medscape.com. accessed September 30, 2018. Retrieved September 30, 2018.

Geli-Alenton et al. (2009). Prevention of non-contact anterior cruciate ligament injuries in soccer players. Part 1: mechanisms of injury and underlying risk factors. *Knee Surgery, sports traumatology, and arthroscopy, 17(*7), 705 – 725.

Gianotti, S., Marshall, S., Hume, P., & Bunt, L. (2009). Incidence of anterior cruciate ligament

injury and other knee ligament injuries: a national population -based study. *Journal of Science and Medicine in Sport, 12*(6), 622 – 627.

Giza, E. & Micheli, J. (2005). Soccer injuries. *Medicine and Sport Science*, 49, 140 – 169.

Granan, L., Bahr, R., Steindal, K., Furnes, O., & Engerbretsen, L. (2008). Development of a national cruciate ligament surgery registry: the Norwegian National Knee Ligament Registry. *The American Journal of Sports Medicine, 36*(2), 308 – 315.

Grund, T., Reihl, I., Krosshaug, T., Senner, V., & Gruber, K. (2010). Calculation of ankle and knee joint moments during ACL-injury situations in soccer. *Procedia Engineering, 2*, 3255 – 3261.

Heidt, R.S., Sweeterman, L.M., Carlonas, R.L., Traub, J., & Tekvlve, F. (2000). Avoidance of soccer injurie with preseason conditioning. *American Journal of Sports Medicine, 28*(5), 659 – 662.

Hewett, T.E., Myer, G.D., & Ford, K.R. (2006). Anterior cruciate ligament injuries in female athletes, part 1: mechanisms and risk factors. *The American Journal of Sports Medicine, 34,* 299 – 311.

Himle, M. & Wright, K. (2014). Behavioral skills training to improve installation and use of child passenger safety restraints. *Journal of Applied Behavior Analysis, 47*, 549 – 599.

Houvouras, A. & Harvey, T. (2014). Establishing fire safety skills using behavioral skills training. *Journal of Applied Behavior Analysis, 47,* 420 – 424.

Iwata, B.A, Wallace, M.D., Kahng, S., Lindberg, J.S., Roscoe, E.M., Connors, J., et al. (2000). skill acquisition in the implementation of functional analysis methodology. *Journal of applied behavior analysis, 33,* 181 – 194.

Jeanes, R. (2011). I'm into high heels and make up but I still love football: exploring gender

identity and football participation with preadolescent girls. *Soccer & Society, 12,* 402 – 420.

Keller, C., Noyes, F., & Burncher, C. (1987). The medical aspects of soccer injuries Epidemiology. *American Journal of Sports Medicine, 15*(3), 230 – 237.

Kiani, A., Hellquist, E., Ahlquist, K., Gedeborg, R., Michaelson, K, & Byberg, L. (2010). Prevention of soccer-related knee injuries in teenage girls. *Archives of Internal Medicine, 170*(1), 43 – 49.

Komaki, J. & Barnett, F. (1977). A behavioral approach to coaching football: Improving the play execution of the offensive backfield on a youth football team. *Journal of Applied Behavior Analysis, 10*(4), 657 – 664.

Koop, S., & Martin, G.L. (1983). Evaluation of a coaching strategy to reduce swimming stroke errors with beginning age-group swimmers. *Journal of Applied Behavior Analysis, 16,* 477 – 460.

Koutures, C., & Gregory, A. (2010). Injuries in youth soccer. *Pediatrics, 25*(2), 410 – 414.

Lagestad, P., Aether, S. & Ulvik, A. (2017). Differences in coaching feedback between coaches of junior elite soccer players and junior amateur soccer players. Journal of Physical Education and Sport, 3, 2049 – 2058.

Le Gall, F., Carling, C., & Reilly, T. (2008). Injuries in young elite female soccer players: an 8-season prospective study. *The American Journal of Sports Medicine, 36*(2), 276 – 284.

Leninger, R., Knox, C., & Comstock, R. (2007). Epidemiology of 1.6 million pediatric soccer related injuries presenting to US emergency departments from 1990 – 2003. *The American Journal of Sports Medicine, 35*(2), 288 – 293.

Lohmander, L., Englund, P., Dahl, L., & Roos, E. (2017). The long-term consequence of anterior

Cruciate ligament and meniscus injuries: osteoarthritis. *The American Journal of Sports Medicine, 35*(10), 1756 – 1759.

Malliou, P, Gioftsidou, A., Pafis, G., Beneka, A., & Godolias, G. (2004). Proprioceptive training reduces lower extremity injuries in young soccer players. *Journal of Back and Musculo-skeletal Rehabilitation, 17*(3), 101 – 104.

Martin, G., Thompson, K., & Regehr, K. (2004). Studies using single-subject designs in sport psychology: 30 years of research. *The Behavior Analyst, 27(2),* 263 – 280.

McKenzie, T.L. & Rushall, B.S. (1974). Effects of self-recording on attendance and performance in a competitive swimming training environment. *Journal of Applied Behavior Analysis, 7,* 199 – 206.

Miltenberger, R. G. (2003). *Behavior modification: Principles and procedures*. Belmont, CA: Wadsworth.

Miltenberger, R. G. (2008). *Behavior modification: Principles and procedures* (4th ed.). Pacific Grove, CA: Thomson/Wadsworth.

Morgan, E., Johnson, S., Bovbjerg, V. & Norcross, M. (2018). Associations between player age club soccer coaches' perceptions of injury risk and lower extremity injury prevention program use. *International journal of Sports Science & Coaching, 13,* 122 – 128.

Noyes, F. (2009). The function of the human anterior cruciate ligament and analysis of single and double bundle graft reconstructions. *Sports Health, 1,* 66 – 75.

Olsen, O. E., Myklebust, G., Engerbersten, L., & Bahr, R. (2004). Injury mechanisms for anterior cruciate ligament injuries in team handball. A systematic video analysis. *American Journal of Sports Medicine, 32*, 1002 – 1012.

Prodromos, C., Han, Y., Rogowski, J., Joyce, B., & Shi, K. (2007). A meta-analysis of the

incidence of anterior cruciate ligament tears as a function of gender, sport, and a knee reduction regimen.

Rutkowska, K, & Bergier, J. (2015). Psychological gender and emotional intelligence in youth female soccer players. *Journal of Human Kinetics, 47*, 285 – 291.

Shayne, R. & Miltenberger, R. (2013). Evaluation of behavioral skills training for teaching Assessment and treatment selection skills to parents. *Behavioral Interventions, 28*(1), 4 – 21.

Smith, N., Chounthirath, T., & Xiang, H. (2016). Soccer-related injuries treated in emergency Departments: 1990 – 2014. *Pediatrics, 138*(4), 1- 9.

Soderman, K., Werner, S., Pietila, T., Engstrom, B., & Alfredson, H. (2000). Balance board training: prevention of traumatic injuries of the lower extremities in female soccer players? A prospective randomized intervention study. *Knee Surgery, sports traumatology, arthroscopy, 8*(6), 356 – 363.

Soroka, A. & Bergier, J. (2011). Sense of gender identity in women practicing football with consideration of the formation. *Polish Journal of Sport and Tourism, 18*, 45 – 58.

Stocco, C., Thompson, R., Hart, J. & Soriano, H. (2017). Improving the interview skills of college students using behavioral skills training. *Journal of Applied Behavior Analysis, 50,* 495 – 510.

Tai, A., & Miltenberger, R. (2017). Evaluating behavioral skills training to teach safe tackling skills to youth football players. *Journal of Applied Behavior Analysis, 50*, 849 – 855.

Thompson, J., Tran, A., Gatewood, C., Schultz, R., Slider, A., Delp, S., & Dragoo, J. (2017). Biomechanical effects of an injury prevention program in preadolescent female soccer athletes. *The American Journal of Sports Medicine, 45*, 294 – 301.

Ward, P. & Carnes, M. (2002). Effects of posting of self-set goals on collegiate football players' skill execution during practice and games. *Journal of Applied Behavior Analysis, 35,* 1 – 12.

Walden, M., Haggland, M., Werner, J., & Ekstrand, J. (2011). The epidemiology of anterior cruciate ligament injury in football (soccer): a review of the literature from a gender-related perspective. *Knee Surgery, Sports traumatology, and arthroscopy, 19*(1), 3 – 10.

William, M. & Reilly, T. (2000). Talent identification and development in soccer. *Journal of Sports Sciences, 18*, 657 – 667.

Wong, P. & Hong Y. (2005). Soccer injury in the lower extremities. *British Journal of Sports Medicine, 39*(8), 473 – 482.