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Evaluating Behavioral Skills Training to Teach Safer Tackling Skills to Youth Football Players

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Evaluating Behavioral Skills Training to Teach Safe Tackling Skills to Youth Football Players

by

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A thesis submitted in partial fulfillment
of the requirements for the degree of
Master of Arts
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ABSTRACT

Concussion rates and head injuries for football players have been on the rise and there is a need for further research in football to increase skills and decrease injuries. Behavioral skills training has been proven to be effective in teaching a wide variety of skills but has yet to be studied in the sports setting. We evaluated behavioral skills training to teach safer tackling techniques among six participants from a local Pop Warner football team. Results show safer tackling techniques increased substantially during practice and generalized to games among all six participants.

Key words: applied behavior analysis, athletic performance, behavioral skills training, coaching, football, tackling.

INTRODUCTION

Football injuries were responsible for more than 1 million emergency room visits from 2001 to 2005 for children ages 7 to 17 years (Mello, Myers, Christian, Palmisciano, & Linakis, 2009). With the sense of security the plastic helmet provides, football players often use their helmet as a weapon to strike their opponent (Gove, 2012; Heiner, 2008). When players lead the tackle with the crown of the helmet or engage in helmet-to-helmet contact with another player, they are at a higher risk of acquiring a head injury than if they tackle without leading with the helmet (Gove, 2012; Heiner, 2008). In the 1990s, the Mild Traumatic Brain Injury Committee was formed by the National Football League (NFL) to look into the growing concussion issue among players (Heiner, 2008; Omalu et al., 2005; Pellman et al., 2004). This committee found that concussion rates could be significantly lowered if the players did not engage in helmet-to-helmet contact during a tackle (Pellman et al., 2004). Out of the 107 head injuries studied by the committee, 94 of them were due to inappropriate tackling techniques consisting of the crown of the helmet as the first impact to the opposing player (Gove, 2012; Heiner, 2008; Pellman et al., 2004). Kontos et al., (2013) looked into the concussion rate among 468 youth football players ages 8 to 12 years and found results similar to the study conducted by the NFL; most of the concussions were due to tackles leading with the head as opposed to the shoulder. Kontos et al. (2013) also found that most concussions occurred during games rather than in practice and the 11 to 12 year-olds were at much higher risk of sustaining a concussion or head injury than were the 8 to 10 year-olds.

Applied behavior analysis in sports has grown substantially in recent years and has been effective in increasing skills across several sports (Luiselli, Woods, & Reed, 2011). These interventions have included; visual cues to help batters on a college baseball team hit curveballs (Osborne, Rudrud, & Zezoney, 1990), positive reinforcement in the form of music for increasing practice behaviors for teenage competitive swimmers (Hume & Crosman, 1992), positive self-talk to increase skating performance for young figure skaters (Ming & Martin, 1996), instructions and feedback to enhance accuracy of free throw shooting for college basketball players (Kladopoulos & McComas, 2001), public posting and goal setting for enhancing three soccer skills among high school soccer players (Brobst & Ward, 2002), video modeling and video feedback to enhance three gymnastics routines for young gymnasts (Boyer, Miltenberger, Batsche, & Fogel, 2009), and auditory feedback to improve dance movements among young dance students (Quinn, Miltenberger, & Fogel, 2015). Although there is substantial research in behavior analysis related to sports performance, there have only been a few studies in football despite the need for improved techniques for safer game play.

In football, behavior analysis procedures have proven to be effective in improving several skills. These interventions have included public posting for improving the execution of blocking and route-running of collegiate wide receivers (Ward, Smith, & Sharpe, 1997) and self-set goals and public posting for improving the execution of reads, drops, and tackles for collegiate linebackers (Ward & Carnes, 2002). Different treatment packages have also been evaluated for improving the execution of football skills. Smith and Ward (2006) evaluated public posting with verbal feedback, goal setting with verbal feedback, and public posting with verbal feedback and goal setting to improve wide receiver skills of college football players and found each intervention to be effective. Stokes, Luiselli, Reed, and Fleming (2010) evaluated descriptive feedback, video feedback, and auditory feedback to improve pass blocking skills of high school

offensive linemen. They found that video feedback enhanced the effects of descriptive feedback and, for some participants, auditory feedback increased their skills even further. Two studies evaluated behavioral procedures to improve tackling skills among high school football players. Harrison and Pyles (2013) evaluated shaping and acoustical guidance and showed increases in the percentage of correct tackles. Stokes, Luiselli, and Reed (2010) evaluated differential reinforcement consisting of praise and helmet stickers and showed increases in the percentage of correct steps in the 10-step task analysis of a correct and safer tackle. This research shows that several behavioral approaches, all including some form of feedback, are successful in improving football skills among high school and college players. However, no research has evaluated behavioral procedures for teaching safe tackling skills or other football skills to younger players.

Behavioral skills training (BST) is an active learning approach which uses a sequence of instruction, modeling, rehearsal, and feedback to teach a skill (Himle & Miltenberger, 2004). BST has been used in a wide variety of studies with children including teaching fire safety skills (Houvouras & Harvey, 2014) abduction prevention skills (Johnson et al., 2005), and firearm safety skills (Himle, Miltenberger, Flessner, & Gatheridge, 2005). Although BST has proven to be an effective teaching method for several studies, BST has yet to be evaluated for skill acquisition in sports. Considering the lack of research on teaching safe tackling skills to young football players and the proven efficacy of BST for teaching skills to children, the purpose of this proposed study is to evaluate the effectiveness of behavioral skills training to teach correct and safer tackling techniques to youth football players as an alternative to the head-to-head type of tackling that is widely used but extremely dangerous.

METHOD

Participants and Setting

Six defensive players from a local Pop Warner junior pee wee football team participated in this study. Jake, 11 years old, was in his fourth season playing tackle football as a middle linebacker. Rick, 11 years old, was in his sixth season playing tackle football as a safety. Adam was 10 years old and was in his fourth season playing tackle football as a defensive lineman or linebacker. Ryan, 11 years old, was in his sixth season playing tackle football as a defensive lineman or linebacker. Luke, 10 years old, was in his second season playing tackle football and his twin brother Levi was in his first season playing tackle football, both were defensive linemen.

Four of the participants, Rick, Ryan, Adam, and Jake were chosen based on recommendations from the coaches who identified these players as frequently engaging in unsafe and inappropriate tackling techniques defined as leading with the crown of the helmet while going in for a tackle or who were frequently involved in helmet-to-helmet contact defined as one player's helmet coming into forceful contact with another player's helmet. Two of the participants, Luke and Levi, were recommended by the coaches for participation in this study due to their poor tackling skills that could lead to injury, but did not involve helmet-to-helmet contact.

This study was conducted at the league field where the participants normally practiced with their team. This was a large field shared with multiple age group youth football teams located in a local neighborhood park.

Dependent Variable

The dependent variable in this study was the percentage of correct steps in the task analysis of a correct tackle made by the player during practice and games. A correct tackle is defined as leading in with the shoulder while keeping the head to the side of the other player's body to avoid making helmet-to-helmet contact or contact with the other player with the crown of the helmet. A 10-step task analysis (table 1) was used to score each tackle. In addition, the researcher also recorded whether each tackle involved leading with the helmet.

Data Collection

Data were collected during the 2-month long season using video recording during the participants' regular 2-hr practice session with their team 3 days a week and during weekly games. During intervention, training was conducted during the participants' regular practice time. Assessment consisted of three to four trials during each practice in which the participant demonstrated his tackling skills. This assessment consisted of one player with the football running towards the participant from approximately 10 yards away and the participant attempted to tackle the other player and stop the player's forward progress with the ball. Data were recorded based on the 10-step task analysis (table 1) used by Stokes, Luiselli, and Reed (2010) and based on recommendations from the American Football Coaches Association and USA Football. During games, the full game was recorded and each tackle attempted by the participants was scored (up to five tackles attempted). If more than one player assisted in the tackle, the participant was only scored on that tackle if he was the primary tackler.

Materials and Equipment

All participants were required to bring game day equipment, per the league rules, to each training session which consisted of their helmet, pads, cleats, and mouth guard to be worn and used as safety equipment for each tackle. A 4 ft. foam tackle dummy was used during BST

training so participants could demonstrate and practice appropriate tackling techniques with a foam dummy before demonstrating the tackle skills on another player.

Interobserver Agreement

A second observer recorded data from video on the tackles made during 34% of the practice sessions and 35% of the games. The observer was trained on each component of the task analysis and correctly identified all the steps executed correctly and all the steps that were missed in the task analysis from three sample videos of tackles with 100% accuracy. Training the observer consisted of watching training videos for coaches, expert videos of safe tackles, and modeling by the researcher. IOA was calculated by dividing the number of agreements on the steps of the task analysis by the number of steps in the task analysis and multiplying by 100 to get a percentage of agreement. The mean agreement for tackles made during practices was 90.18% (range, 80% to 100%) and during games was 86.55% (range, 80% to 100%).

Treatment Integrity

A treatment integrity checklist was used to check off each step of the intervention to ensure that the intervention was implemented correctly and consistently each session (see appendix A for the checklist). Treatment integrity was calculated by dividing the number of steps completed by the number of steps on the checklist. Treatment integrity was 100% for all sessions with the exception of one session with one participant which was 97.5% due to the researcher missing one step in the task analysis during the model portion of the BST training.

Social Validity

A five question, 5-point Likert scale survey was given to the participants and two coaches, the head coach and defense coach, at the end of the study to evaluate how the participants and coaches felt about the effectiveness and relevance of the study. A brief training was provided for the participants to ensure the participants' understanding of the Likert scale to

answer questions. This training consisted of comparing favorite foods with foods that are desirable but not favorites and with foods that are not so favorable with foods that are strongly disliked. Results from the social validity survey are shown below in table 2.

A coach, blind to the conditions, was also shown videos of the tackles made by the participants from the last baseline session and the last intervention session and was asked to rate the safety and effectiveness of the tackles he viewed and to select the video of the tackle he thought was the safer tackle. The coach selected the tackle from the intervention phase for the participants each time as the safer tackle and commented on how the participant went from either tackling too high on the other player in baseline, which often leads to helmet-to-helmet contact, or leading the tackle with their head during the baseline phase to making a correct tackle where the participant lead with his shoulder keeping his head to the side of the opponent during the intervention phase.

Experimental Design and Procedures

A multiple baseline across participants design was used to evaluate the effectiveness of behavioral skills training.

Baseline. During baseline, data were taken during regular practice sessions and games prior to intervention. Participants engaged in tackles as they would in regular practice sessions, which consisted of one player with the football running towards the participant from approximately 10 yards away and the participant attempted to tackle the other player and stop the player's forward progress with the ball. The researcher set up three to four trials for each participant to demonstrate tackling skills during the normal practice. No feedback was given for correct or incorrect tackles made; the researcher simply thanked the participant for demonstrating his tackles. Typical feedback from the coaches during practice consisted of phrases such as “too high,” “take your head out of it,” and “make a legal tackle.” The team ended the fundamental

tackle practice at week four and baseline tackle trials were then set up by the researcher with the participants during each practice.

Behavioral Skills Training. Behavioral skills training was used to teach each step of the correct and safer tackle as listed in the 10-step task analysis. The researcher provided instructions on each step of the task analysis to the participant, explaining to the participant how each step should look. After instructions, the researcher modeled each step with the tackle dummy to allow the participant to see what the steps of the tackle look like. After the steps were modeled by the researcher, the participant practiced the tackling steps using the foam tackle dummy before demonstrating the tackling skills on another player. After the participant demonstrated the steps in the task analysis using the tackle dummy, the researcher provided descriptive feedback describing what he did well and what steps he could improve on using the task analysis to show the participant which steps were missed. The training session ended after the participant demonstrated tackling the dummy at 100% accuracy according to the task analysis. After each training session, the participants executed three to four tackles with another player using the same tackle drills seen in baseline. No feedback was provided for assessment purposes, the researcher simply thanked the participant for demonstrating his tackles.

RESULTS

Results are depicted in Figure 1. After the intervention was implemented, the percentage of correct steps in each tackle increased immediately and maintained over the duration of the season for all participants. The improved tackle skills observed during the practice also generalized to game settings for the two participants, Jake and Rick, who were the only participants with game tackles. Jake and Rick were on the starting defense team and had more opportunities to make a tackle during games. All participants reached 100% on several occasions during practice and Rick also reached 100% during games and Jake reached 90% during games. Tackles where the participants were leading with their helmet also decreased after BST. Rick was leading with his helmet for 66% of his tackles during practice in baseline, which decreased to 5% after BST - he only had one tackle during a game where he led with his helmet. Adam was leading with his helmet for 50% of his tackles during baseline which decreased to 0% after BST. Although the coach reported that Jake frequently lead with his helmet, Jake did not have any tackles leading with his helmet for the two practices the researcher observed him during baseline, but only had 10% of his tackles leading with his helmet after BST. Figure 2 depicts the mean percentage of correct steps of the tackle for all participants for practice during baseline and intervention. Due to Adam and Luke steadily improving prior to intervention, the baseline mean for Adam was calculated on the last eight tackles during baseline and the last nine tackles for Luke during baseline when their data were stable. Figure 3 depicts the mean percentage of correct steps of the tackle during games for baseline and intervention for Jake and Rick.

During two games, Jake and Rick were moved to a different defensive position during certain plays and some steps of the task analysis no longer applied to the position they were playing. When this occurred, the steps that did not apply to the position were eliminated and the tackle was scored based on the number of steps that did apply. For example, when Jake moved to a lineman position, steps 4 and 6 did not apply and Jake's tackle was scored out of 8 steps instead of 10 steps as seen with his last three game tackle data points.

Although Luke, Levi, and Ryan did not have any tackles that were led with their helmet, they often engaged in unsafe tackling techniques that involved them tackling the other player too high, defined as hitting the opponent above the waist near the chest, shoulder, or head area which can often lead to helmet-to-helmet contact.

According to the social validity surveys that were given to the participants and two coaches, BST is well liked by both the participants and coaches (see table 2). The participants felt their overall tackling skills improved, they now tackle more safely since receiving the training, their confidence has increased, and they all enjoyed the training. The coaches also enjoyed the training and felt strongly about how effective the training was. Both coaches made comments regarding how important it was for youth football players to learn to tackle more safely and were happy with the results of the players using safer tackles.

DISCUSSION

Football is a physical sport with a high potential for injury. This study evaluated the effectiveness of BST to increase the use of safer tackling skills for youth football players and to decrease the use of unsafe tackling techniques such as leading with the crown of the helmet or engaging in helmet-to-helmet contact. The results of this study showed an overall decrease in the number of tackles that were led with the head and immediate improvement in overall safer tackling techniques. Furthermore, the safer tackling techniques generalized to game settings where serious injuries are most likely to occur.

This study suggests that BST is an effective teaching method in sports settings for teaching a specific athletic skill – safe tackling. Teaching correct and safer tackling techniques at a younger age when children are beginning to play football with more intensity is important for setting them up with good tackling habits earlier on to avoid more serious injuries as they get older and bigger. Although BST was implemented on an individual basis in this study, it may also be effective in group settings. Research should investigate the implementation of BST in small groups with young athletes. Research should also evaluate procedures for teaching coaches to use BST. Teaching coaches how to implement the BST approach will make this effective teaching strategy more accessible to help their players learn safer and more appropriate tackling techniques.

This is the first study to evaluate BST in a sports setting and the results are consistent with research that has used components of BST, such as feedback, evaluated by Stokes, Luiselli, Reed, and Fleming (2010) and Smith and Ward (2006). However, BST uses a specific sequence

of instructions, modeling, rehearsal, and feedback which provides a more systematic active learning approach to teaching a skill. With BST, improvements in tackling skills were seen immediately following the training rather than a slow increase in improvements as seen in prior tackling and football studies.

One limitation of this study was that the task analysis did not allow for different tackle approaches that were observed during the game. The task analysis was based on the standard tackle drills conducted by the team in which a linebacker would tackle a running back that was running towards him. During the games, situations would arise where the opponent with the ball would get past the participant and the participant would then chase the opponent to tackle him. In situations such as those, certain aspects of the task analysis would not apply for that tackle. When this occurred, those steps were omitted from the task analysis while scoring the game tackle and the percentage of correct steps was adjusted accordingly. This may also be a reason for lower interobserver agreement for game tackles. Another reason for lower interobserver agreement during game tackles was that all the game tackles were video recorded by the researcher from the bleachers on one side of the field which would not always provide the best angle to view all the steps of the task analysis during a tackle. A second observer recording from the opposite side of the field would be suggested to ensure all tackles could be clearly recorded from both sides of the field. A second limitation of this study was that we were not able to conduct a follow-up phase due to the short duration of the football season to test if the improvements maintained over time.

Two of the participants, Adam and Luke, were showing a steady increase in their tackling skills prior to the intervention and, due to this, intervention was delayed for those two participants until their baseline data stabilized. A possible reason for the increase in tackle skills prior to intervention for Adam is that both his father and step-father were coaches on the team

and worked with him daily on a variety of football skills outside of practice which included tackling. Although Adam's tackling skills were increasing, he was still engaging in frequent tackles leading with his helmet. Once the intervention was implemented, Adam no longer led with his helmet and reached 100% accuracy on his last two tackles. A possible reason for the increase in tackling skills prior to intervention for Luke may be that his twin brother, Levi, received the training early on in the season and their father reported to the researcher that Levi began correcting Luke on Luke's tackling skills when they would play football at home prior to Luke receiving the training. After receiving the training, Luke immediately tackled with 100% accuracy and the increase in tackle skills remained high. It is important to mention that Adam and Luke's increase in tackle skills were not due to the regular coaching during practices because the coach no longer worked on the fundamental tackling drills after week 3 of the season and focused solely on learning plays, strength and conditioning drills, and blocking. During practices when participants would make tackles while the team was practicing plays, the coaches only provided feedback consisting of general comments such as "good tackle," "nice hit," "commit to the tackle," or "make legal tackles."

The findings of this study support the use of BST as an effective teaching method for teaching safer tackling skills to youth football players. Recommended future research would be to replicate this current study, evaluate BST in a group setting which would be more practical for coaches to implement with their players, and to evaluate the effectiveness of teaching coaches how to implement BST procedures to teach their players a variety of skills among different sports.

TABLES AND GRAPHS

Social Validity Survey Results

	Question	Mean Rating
Participants	1. Overall, I feel this training has improved my tackling skills	4.3
	2. I feel it is important to learn to tackle more safely	4.5
	3. I feel I tackle more safely	4.6
	4. I am more confident in my tackling skills since receiving this training.	4.8
	5. I enjoyed the training I received.	5
Coaches	1. Overall, I feel this training has improved the tackling skills of the players.	5
	2. I feel it is important to learn to teach safe tackling skills	5
	3. I feel my players are more effective at tackling an opponent since receiving this training.	5
	4. My players are less likely to get injured while tackling another player	5
	5. I would participate in this training again for a different football skill.	5

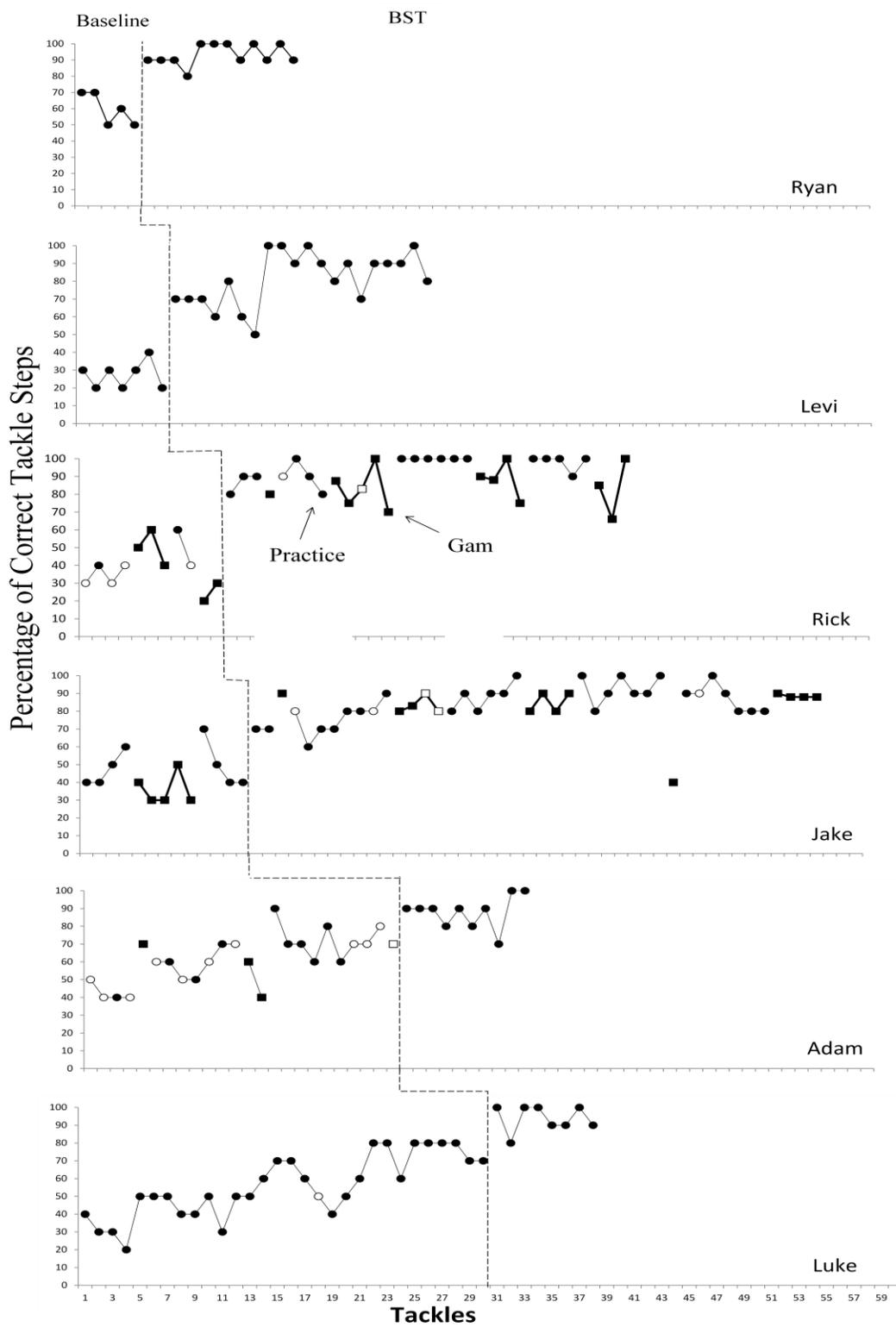


Figure 1. Percentage of steps correct in the task analysis for each tackle made during practice and games. Open data points represent tackles that were led with the head.

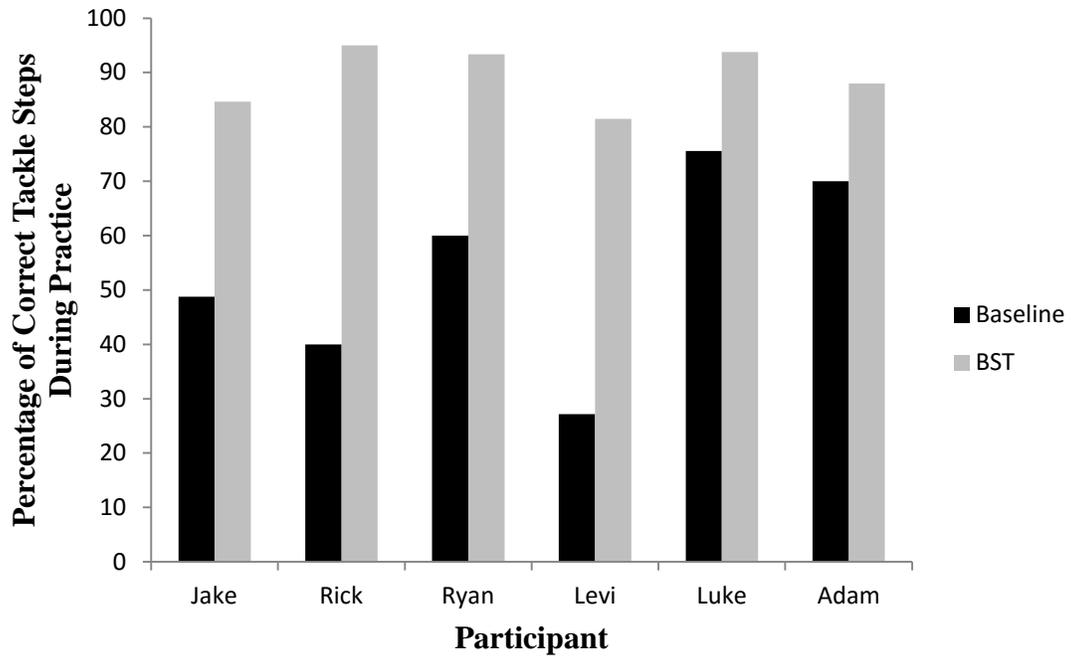


Figure 2. The mean percentage of steps correct in the task analysis for each tackle made during practice.

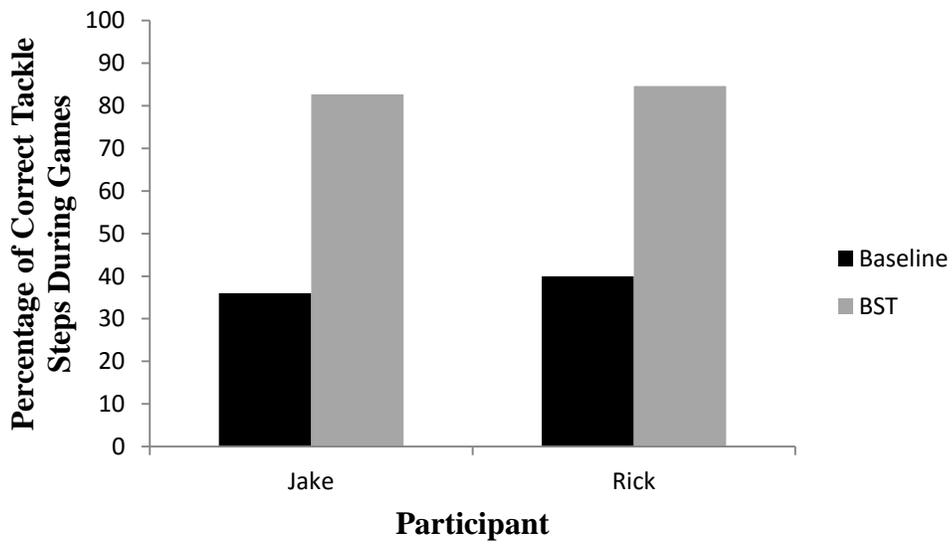


Figure 3. The mean percentage of steps correct in the task analysis for each tackle made during games.

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APPENDIX

10-Step Task Analysis for Tackling

	Steps	Description
Ready Position	1. Feet	Feet shoulder width apart, weight on toes
	2. Squeeze	Squeeze shoulder blades – chest out and head up
	3. Bend	Knees bent to 90 degrees
	4. Hands	Hands open with thumbs pointed up or resting on thigh pads
Tackling Position	5. Hunt	Run towards the opponent
	6. Buzz Feet	Rapidly move feet to gain control and prepare for contact with opponent
	7. Hit	Lead in with shoulder with head off to the side of the opponent and wrap arms around the body
	8. Shoot	Shoot hips upwards towards the opponents sternum
	9. Grab Cloth	Grab the back of the players jersey
	10. Drive to ground	Straighten legs to lift opponent and drive to the ground or use opponent's momentum to bring them to the ground