

*EVALUATING BEHAVIORAL SKILLS TRAINING TO TEACH SAFE
TACKLING SKILLS TO YOUTH FOOTBALL PLAYERS*

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With concussion rates on the rise for football players, there is a need for further research to increase skills and decrease injuries. Behavioral skills training is 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 to six participants from a Pop Warner football team. Safer tackling techniques increased during practice and generalized to games for the two participants who had opportunities to tackle in games.

Key words: athletic performance, behavioral skills training, coaching, football, tackling

Football injuries, including head injuries, were responsible for more than 1 million emergency room visits for children ages 7 to 17 years from 2001 to 2005 (Mello, Myers, Christian, Palmisciano, & Linakis, 2009). When players lead the tackle with the crown of the helmet, 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, formed by the National Football League, found that concussion rates could be significantly lowered if players did not engage in helmet-to-helmet contact during a tackle (Heiner, 2008; Omalu et al., 2005; Pellman et al., 2004). Similarly, Kontos et al. (2013) looked into the concussion rate among 468 youth football players, ages 8 to 12 years, and found that most concussions were due to tackles leading with the head.

Two studies have evaluated behavioral procedures to improve tackling skills among high school football players. Harrison and Pyles (2013) evaluated shaping and auditory feedback

and showed increases in the percentage of correct tackles. Stokes, Luiselli, and Reed (2010) evaluated differential reinforcement with praise and helmet stickers, and showed increases in the percentage of correct steps in a 10-step task analysis of a correct and safer tackle. However, no research has evaluated behavioral procedures for teaching safe tackling skills to younger players.

Behavioral skills training (BST) is an active learning approach that uses instruction, modeling, rehearsal, and feedback to teach a skill (e.g., Lerman, Hawkins, Hillman, Shireman, & Nissen, 2015; Speelman, Whiting, & Dixon, 2015). 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), firearm safety skills (Himle, Miltenberger, Flessner, & Gatheridge, 2004) and correct responding to school lockdown drills (Dickson & Vargo, 2017). Although BST has been an effective teaching method in a wide variety of studies, it has yet to be evaluated for skill acquisition in sports. Considering the limited research on teaching safe tackling skills to young football players and the efficacy of BST for teaching skills to children, the purpose of this study was to evaluate BST to teach correct tackling techniques to youth football players as an alternative to more injury-prone head-to-head tackling.

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METHOD

Participants and Setting

Six defensive players from a Pop Warner 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, 10 years old, 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. Levi and Luke, 10 year-old twins, played tackle football as defensive linemen for 1 and 2 years, respectively.

The coaches recommended these players because they engaged in unsafe tackling techniques. Rick, Adam, and Jake led with the helmet or engaged in helmet-to-helmet contact, defined as one player's helmet coming into forceful contact with another player's helmet. Luke, Levi, and Ryan often tackled the other player with their chests rather than their shoulders, leaving their head in a vulnerable position susceptible to whiplash or helmet-to-helmet contact, which could result in neck or spinal injuries.

This study was conducted during normal team practice at a large field, which was shared with multiple different age group youth football teams and was located in a local neighborhood park.

Target Behavior and Data Collection

We measured each player's percentage of correct steps in the task analysis of safe tackling during practice and games. A safe tackle was defined as leading with the shoulder while keeping the head to the side of the other player's body to avoid making helmet-to-helmet contact or contacting the other player with the crown of the helmet. We used a 10-step task analysis (Stokes et al., 2010) to score each tackle (see Supporting Information). We

also recorded whether each tackle involved leading with the helmet.

We conducted three or four trials for each participant during the normal 2-hr practice, 3 days a week. Each trial consisted of one player with the football running towards the participant from approximately 9.14 m away and the participant attempting to tackle the other player. All trials were video recorded and data were collected from video. We video-recorded each game and scored each tackle attempted by the participants.

Interobserver Agreement

A second observer scored tackles from video for 35% of the practice sessions and games. Interobserver agreement was calculated by dividing the number of agreements on the correctness of each step of the task analysis by the total number of steps in the task analysis and multiplying by 100%. The mean agreement was 90% (range, 80%-100%) during practices and 87% (range, 80%-100%) during games.

Materials and Equipment

All participants were required to bring game-day equipment to each training session: helmet, pads, cleats, and mouth guard. During BST, participants practiced tackling with a 1.2-m foam tackle dummy before demonstrating the tackle skills on another player.

Treatment Integrity

A treatment integrity checklist was used to record each step of the intervention to evaluate whether the intervention was implemented correctly in every BST session. 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 in which integrity was 97.5%.

Experimental Design and Procedures

A multiple baseline across participants design was used to evaluate the effectiveness of BST.

Baseline. Baseline sessions began after the team ended its standard fundamental tackle practice at week four. During baseline, tackle trials were set up by the researcher, and participants engaged in tackles as they would in regular practices. No feedback was given for correct or incorrect tackles; the researcher simply thanked the participant for demonstrating his tackles. Typical feedback from the coaches for tackles made during regular practice in baseline and intervention consisted of phrases such as “too high,” “take your head out of it,” and “make a legal tackle.”

Behavioral skills training. We used BST to teach each step of the tackle (see Supporting Information). The researcher provided instructions on each step and then modeled each step with the tackle dummy. Next, the participant practiced the tackling steps using the 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 described what he did well and what steps he could improve on, using the task analysis to show the participant which steps were missed. The participant was given the opportunity to repeat the tackle to perform the missed steps, and the training session continued until the participant demonstrated two to three consecutive tackles at 100% accuracy with the dummy. For most participants, this required three to five trials. For Luke and Levi, five to 10 trials were required. After each training session, the participants executed three or four tackles with another player for assessment purposes as in baseline. The researcher did not provide any feedback, but simply thanked the participant for demonstrating his tackles.

Social Validity

A five-item survey, using a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree)

was given to the participants, the head coach, and the coach of the defense, at the end of the study. 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 select the video of the tackle he thought was the safer tackle.

RESULTS AND DISCUSSION

Tackling performance was highly variable in baseline, with Rick and Adam leading with the head on numerous occasions. The mean percentage correct in baseline was 40% for Ryan, 27% for Levi, 40% for Rick, 42% for Jake, 65% for Adam, and 56% for Luke. Furthermore, the percentages increased somewhat and finally stabilized in the extended baselines for Adam and Luke. The percentage of correct steps for each tackle increased immediately and maintained during the intervention phase for all participants (Figure 1). The improved tackling skills also generalized to games for Jake and Rick, who were the only participants with game tackles. During BST, all participants reached 100% on several occasions during practice; Rick reached 100% and Jake reached 90% during games. Tackles that included leading with the helmet decreased substantially after BST for Rick (from 36% to 6%) and Adam (from 46% to 0%). Ryan and Levi had no tackles leading with the helmet in baseline or BST phases, and Luke had only one in baseline. There was a slight increase for Jake (from 0% to 12%), although he had three times more tackles during BST than during baseline, which created many more opportunities.

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 1). The participants said their overall tackling skills improved, they now tackled more safely since receiving the training, their confidence had increased, and they all

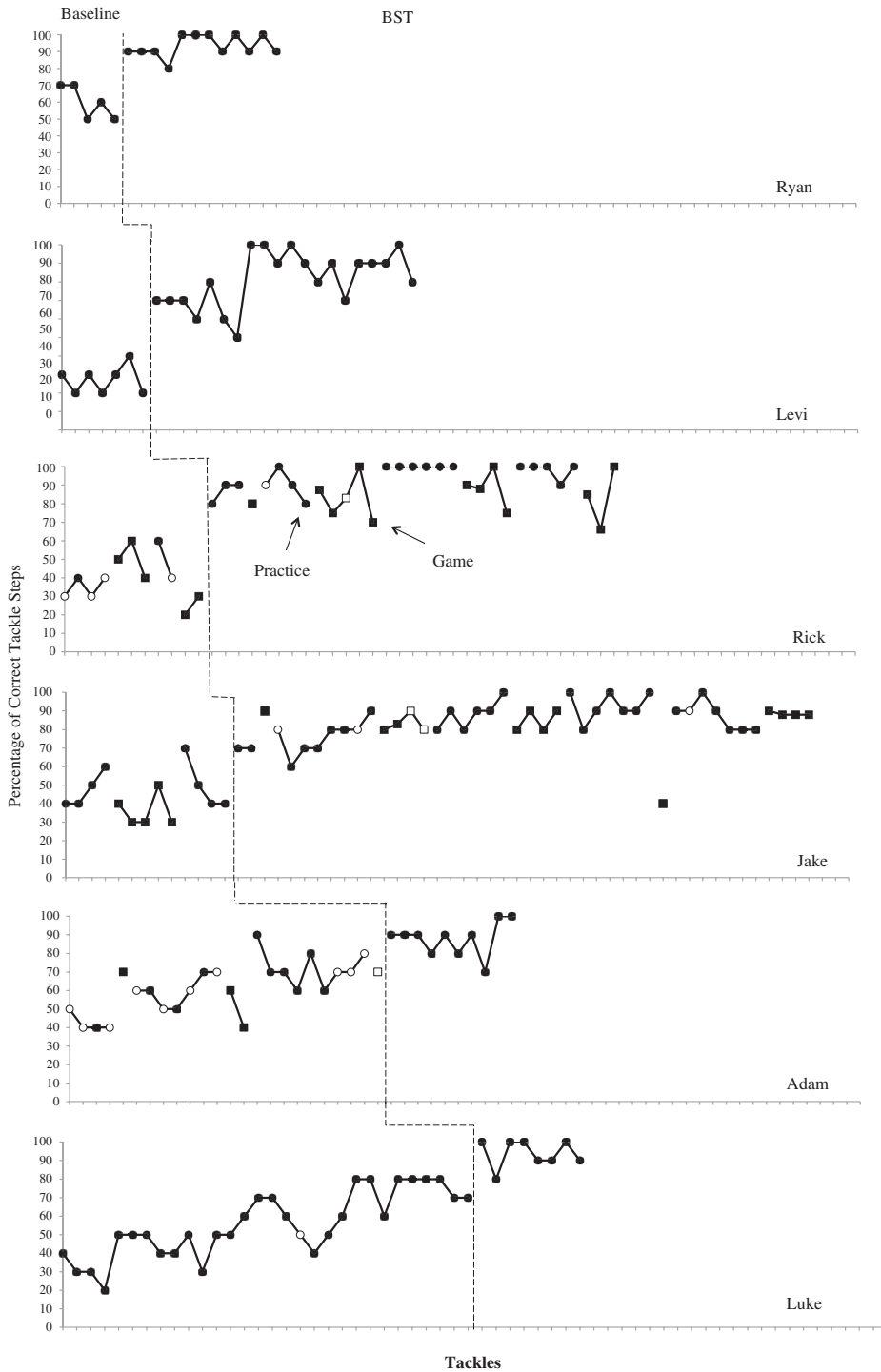


Figure 1. Percentage of steps correct in the task analysis for each tackle made during practice and games. Open data points represent tackles that were led with the head.

Table 1
Social Validity Survey Results

Respondents	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

enjoyed the training. The coaches also enjoyed the training and felt strongly about how effective the training was in increasing safe tackling skills for the players. 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. The coach who reviewed the baseline and intervention videos selected the tackle from the intervention phase each time as the safer tackle. Furthermore, he commented on how the participants went from tackling too high or leading with their head in baseline, which often leads to helmet-to-helmet contact, to leading with their shoulder keeping their head to the side of the opponent during the intervention phase.

This study suggests that BST is an effective method for teaching safe tackling to children, and the results are consistent with research that has used components of BST such as feedback in sports settings with high school and college players (e.g., Harrison & Pyles, 2013; Smith & Ward, 2006; Stokes et al., 2010). With BST, improvements in tackling skills were seen immediately following training and continued throughout intervention. This is the first study to evaluate BST in a sports setting and the results are consistent with research that has used BST to teach other skills to children (e.g., Himle et al., 2004; Johnson et al., 2005). Although other researchers showed improvements in tackling with older players

(Harrison & Pyles, 2013; Stokes et al., 2010), this is the first study with children. BST is ideal for children because it 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.

Teaching safe tackling techniques at a younger age when children are beginning to play football with more intensity is an important step towards preventing serious injuries as children mature. Although BST was implemented on an individual basis in this study, researchers could investigate BST implemented in small groups. Researchers could also evaluate procedures for teaching coaches to use BST, which might enhance the application of this approach.

One limitation of this study is that the task analysis did not fit some types of tackles observed during the game. The task analysis was based on the standard tackle drills in which a player tackles a player running towards him. During the games, situations arose in which the opponent with the ball ran past the participant, and the participant chased the opponent to tackle him. In these situations, some of the task analysis steps did not apply (i.e., "ready position" steps). When this occurred, those steps were omitted from the task analysis, and the denominator was adjusted accordingly. A second limitation of

this study is that we were not able to conduct follow-up assessment due to the short duration of the football season.

Two participants with longer baselines, Adam and Luke, showed an increase in their tackling skills during baseline and, as a result, intervention was delayed until their baseline data stabilized. A possible reason for the increase in tackling 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, including tackling. Although Adam's tackling skills increased in baseline, he still frequently engaged in tackles leading with his helmet. When BST 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 BST earlier in the season and began correcting Luke's tackling skills when they played football at home (as reported by their father). After receiving BST, Luke immediately tackled with 100% accuracy and the increase in tackling skills remained high. It is important to mention that Adam and Luke's increases in tackling skills were not due to the regular coaching during practices, because the coach no longer worked on fundamental tackling drills after week 4 of the season.

Football is a physical sport with a high potential for injury, especially when tackles are performed in a dangerous manner. This study showed that BST was effective in promoting safer tackling with youth football players. Thus, the wider adoption of this approach to promote safe tackling, especially at younger ages, has the potential to decrease the occurrence of serious head injuries. This study is noteworthy because it demonstrates that BST, a proven technique for teaching other skills to children, is effective with children in a sports setting focusing on a socially important target behavior.

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