

The Effectiveness of Prophylactic Ankle Braces in Reducing the Incidence of Acute Ankle Injuries in Adolescent Athletes: A Critically Appraised Topic

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Clinical Scenario: Ankle injuries constitute a large number of injuries sustained by adolescent athletes participating in high school athletics. Prophylactic ankle bracing may be an effective and efficient method to reduce the incidence of ankle injuries in adolescent athletes in the secondary-school setting. **Clinical Question:** Do prophylactic ankle braces reduce the incidence of acute ankle injuries in adolescent athletes? **Summary of Key Findings:** Two of the three included studies reported that prophylactic ankle braces reduced the incidence of ankle injuries compared with no ankle bracing. **Clinical Bottom Line:** There is moderate evidence to support the use of prophylactic ankle braces in adolescent athletes, particularly those who participate in football and basketball, to reduce the incidence of acute ankle injuries. **Strength of Recommendation:** Grade B evidence exists that prophylactic ankle braces reduce the incidence of acute ankle injuries in adolescent athletes.

Keywords: ankle sprain, injury prevention, ankle support

Clinical Scenario

There is a high incidence of ankle injuries in adolescent athletes, with ankle sprains accounting for up to 40% of all reported injuries.¹ The frequency of ankle injuries places a monetary burden on the health care system and also stresses the need for clinicians to seek out prophylactic mediums to reduce ankle-injury incidence.¹ The application of ankle taping or ankle bracing is a frequently used strategy to prevent ankle injuries in adolescent athletes. However, taping can be costly and time consuming for athletic trainers, particularly in the secondary-school setting. Therefore, prophylactic ankle bracing may be an effective and efficient method to reduce the incidence of ankle injuries in adolescent athletes in the secondary-school setting.

Focused Clinical Question

Do prophylactic ankle braces reduce the incidence of acute ankle injuries in adolescent athletes?

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Summary of Search, “Best Evidence” Appraised, and Key Findings

- The literature was searched for studies of level 2 evidence or higher that investigated the effect of prophylactic ankle braces on acute ankle-injury incidence in adolescent athletes.
- The literature search returned 5 possible studies related to the clinical question; 3 studies met the inclusion criteria and were included.
- Two randomized control trials (RCTs) and 1 prospective cohort study were included.
- The 2 RCT studies reported that high school athletes who wore prophylactic ankle braces demonstrated a reduction in acute ankle-injury rates compared with those who did not wear a brace.
- Both RCT studies reported that the incidence of ankle injury was reduced but the severity of ankle injuries was not.
- The prospective cohort study did not find a reduction in acute ankle injury in adolescent male and female volleyball athletes who wore ankle braces compared with those who did not.

Clinical Bottom Line

There is moderate evidence to support the use of prophylactic ankle braces in adolescent athletes, particularly

those who participate in football and basketball, to reduce the incidence of acute ankle injuries.^{2,3} There is a need for additional studies to determine the strength of evidence to support the use of ankle braces in adolescent volleyball athletes.³

Strength of Recommendation: Grade B evidence exists that prophylactic ankle braces reduce the incidence of acute ankle injuries in adolescent athletes.

Search Strategy

Terms Used to Guide Search Strategy

- Patient/Client group: high school athletes or adolescent athletes
- Intervention/Assessment: lace-up ankle braces or prophylactic ankle braces
- Comparison: control group (no ankle brace)
- Outcome: occurrence of ankle sprains

Sources of Evidence Searched

- MEDLINE
- EBSCOHost
- CINAHL
- Cochrane Database
- SPORTDiscus
- Additional resources obtained via review of reference lists and hand search

Inclusion and Exclusion Criteria

Inclusion Criteria

- Studies that investigated acute ankle injuries in high school athletes
- Studies that used a form of prophylactic ankle brace for the duration of at least 1 high school sports season
- Level 2 evidence or higher
- Limited to English language
- Limited to the past 10 years (2003–2012)

Exclusion Criteria

- Participants who were not eligible to compete at the high school level

- Studies that did not include prophylactic ankle-brace interventions
- Studies that compared ankle braces with other prophylactic methods (eg, tape, rehabilitation, modalities)

Results of Search

Three relevant studies^{2–4} were located and categorized as described in Table 1 (based on Levels of Evidence, Oxford Centre for Evidence-Based Medicine, 2009).

Best Evidence

The studies in Table 2 were identified as the best evidence and selected for inclusion in this critically appraised topic (CAT). These studies were selected because they were considered level 2 evidence or higher, investigated the use of prophylactic ankle bracing among adolescent athletes, and described the effect of this intervention on incidence of acute ankle injuries.

Implications for Practice, Education, and Future Research

Two of the three studies found a significant reduction in acute ankle-injury incidence with the use of prophylactic ankle braces during a high school sport season.^{2,3} These results were consistent among adolescent athletes with and without a previous history of ankle injury.^{2,3} It is also important to note that none of the 3 studies demonstrated an increased incidence of acute ankle sprains in the ankle-brace group compared with the control group.^{2–4} Cumulatively, these findings indicate that the use of prophylactic ankle braces across an athletic season is effective in reducing acute ankle injuries in adolescent athletes.

Based on the included studies, adolescent football and basketball athletes may benefit more than volleyball athletes from using prophylactic ankle braces to reduce acute ankle injuries.^{2–4} While these findings may be the result of methodological differences across studies, such as study design or type of ankle brace used as the intervention, it may be due to the different demands of each sport on the athlete. Based on the nature of football and basketball, athletes have more frequent opportunities for direct physical contact with other players in comparison with volleyball athletes. Football (61.9%) and basketball

Table 1 Summary of Study Designs of Articles Retrieved

Level of evidence	Study design	Number located	Reference
1b	Cluster randomized controlled trial	2	McGuine et al ² McGuine et al ³
2b	Prospective cohort	1	Frey et al ⁴

Table 2 Characteristics of Included Studies

	McGuine et al²	McGuine et al³	Frey et al⁴
Study design	Cluster randomized controlled trial	Cluster randomized controlled trial	Cohort
Participants	2081 male high school freshman, JV, and varsity football athletes	1460 male and female high school freshman, JV, and varsity basketball athletes (724 male and 736 female).	999 high school varsity volleyball athletes (407 male, 592 female).
Intervention investigated	<p>During 1 football season 50 high schools were stratified based on student enrollments into 3 groups. Schools were then randomized into either brace group (21 schools) or control group (29 schools) within each stratification level. Athletes who were able to fully participate on the first day of practice were included: 993 braced group, 1088 control group.</p> <p>Don-Joy ankle-stabilizing braces were used. Athletes were instructed to wear the brace over a single pair of socks on both ankles for each team-organized conditioning session, practice, or competition throughout the season.</p> <p>Athletes were allowed to use tape in addition to ankle brace if they felt they needed it.</p> <p>Athletic trainers maintained daily exposure calendar and recorded onset of injuries, days lost due to injury, and daily use of external ankle support (brace and/or athletic tape) throughout entire season.</p> <p>Subjects and athletic trainers were not blinded to intervention.</p>	<p>During 1 basketball season 46 high schools were stratified based on student enrollments into 3 groups. Schools were then randomized into either braced group (21 schools) or control group (25 schools) within each stratification level.</p> <p>Athletes who were able to fully participate on the first day of practice were included: 740 braced group, 720 control group.</p> <p>McDavid Ultralight 195 braces were used. Athletes were instructed to wear the brace over a single pair of socks on both ankles for each team-organized conditioning session, practice, or competition throughout the season.</p> <p>Athletes were allowed to use tape in addition to ankle brace if they felt they needed it.</p> <p>Athletic trainers maintained daily exposure calendar and recorded onset of injuries, days lost due to injury, and daily use of external ankle support (brace and/or athletic tape) throughout entire season.</p> <p>Subjects and athletic trainers were not blinded to intervention.</p>	<p>During 1 volleyball season participants were broken into either braced group (957) or control group (42).</p> <p>Participants in the brace group received a blank envelope identifying assigned brace. Brace group was further broken into rigid Active Ankle Trainer II (304), semirigid Air-cast Sport Stirrup (193), Air-cast Airsport (26), Royce (161), and nonrigid HelyWeber (273).</p> <p>Five different types of ankle braces of various rigidity were compared with no bracing.</p> <p>Athletes wore a brace on their dominant ankle (opposite the hitting arm) for all practices and games.</p> <p>Athletic trainers recorded compliance of wearing the brace, injuries sustained, and time lost due to injury.</p> <p>Subjects and athletic trainers were not blinded to intervention.</p>

(continued)

Table 2 (continued)

	McGuine et al ²	McGuine et al ³	Frey et al ⁴
Outcome measures	<p>Athlete exposure was defined as any coach-directed competition, practice, or conditioning session monitored with the assistance of the football coaching staff.</p> <p>Injury was defined as an event that occurred during a football exposure that forced the athlete to stop participation and prevented the athlete from participating in football activities the following day.</p> <p>Injury severity was defined as number of days an athlete was prohibited from participating in football because of the injury.</p> <p><i>Primary outcome:</i> Acute ankle injuries in both groups</p> <p><i>Secondary outcome:</i> Acute knee injuries, other lower extremity injuries, and severity of injuries.</p> <p><i>Baseline data:</i> sex, grade level, dominant leg, expected playing position (offense, defense), expected level of competition (freshman, JV, varsity), history of lower extremity injury in past 12 months, surgical history, previous use of ankle tape or braces, height of shoe athlete elected to wear (midtop, low-top), cleat type (molded and detachable), and FAAM.</p>	<p>Athlete exposure was defined as any coach-directed competition, practice, or conditioning session monitored with the assistance of the basketball coaching staff.</p> <p>Injury was defined as an event that occurred during a basketball exposure that forced the athlete to stop participation and prevented the athlete from participating in basketball activities the following day.</p> <p>Injury severity was defined as number of days an athlete was prohibited from participating in basketball because of the injury.</p> <p><i>Primary outcome:</i> Acute ankle injuries in both groups.</p> <p><i>Secondary outcome:</i> Acute knee injuries, other lower extremity injuries, and severity of injuries.</p> <p><i>Baseline data:</i> sex, grade level, dominant leg, level of competition (freshman, JV, varsity), history of lower extremity injury within last 12 months, surgical history, previous use of ankle tape or braces, type of shoe athlete elected to wear (midtop or low-top), and FAAM.</p>	<p>Athlete exposure was defined as all practices and games.</p> <p>Injury was defined as any injury to the ankle that occurred during a scheduled game or practice that required medical attention and resulted in the player missing the next game or practice session (NCAA Injury Surveillance System).</p> <p>Injury severity was not reported.</p> <p><i>Primary outcome:</i> Acute ankle injuries in both groups.</p> <p><i>Secondary outcome:</i> Difference in acute ankle injuries between various brace types.</p> <p><i>Baseline data:</i> gender, history of previous injury, incidence of ankle injury, amount of missed games or practices, previous history.</p>

Main findings	125,419 total exposure hours; 16% competition, 84% practice. Acute ankle injuries: N = 95; 27 braced, 68 control. Acute ankle injury was 61% lower in braced group than in control. Median number of exposures before ankle injury: 34 braced, 25.5 control. Incidence rate of acute ankle injury was 0.435 in the braced group (95% CI, 0.281–0.674). Control group's incidence not reported. Number needed to treat to benefit: 28.3 (95% CI, 18.6–59.7) In the braced group, those with previous history were reduced by 70%; those with no previous history were reduced by 57. Hazard ratio: 0.39 (95% CI, 0.24–0.65)	112,439 total exposure hours; 24% competition, 76% practice. Acute ankle injuries: N = 105; 27 braced, 78 control. Acute ankle injury was 68% less in braced group than in control. Median number of exposures before ankle injury: 49.5 braced, 24 control. Incidence rate of acute ankle injury was 0.47 in the braced group (95% CI, 0.30–0.74), 1.41 in the control group (95% CI, 1.05–1.89) Number needed to treat to benefit: 14.5 (95% CI, 10.4–24.0). Previous history: 60% fewer ankle injuries in braced group. No previous history: 70% fewer in braced group. Hazard ratio: 0.32 (95% CI, 0.20–0.52)	Total exposure hours not reported. Acute ankle injuries: N = 93; 89 braced, 4 control; 42 to males, 51 to females. Acute ankle injuries by brace group: Active Ankle Trainer II, 25—12 with no history of injury (NH), 13 with history of injury (H); Aircast Stirrup, 16 (7 NH, 9 H); Aircast Aircast Sport, 3 (2 NH, 1 H); Royce, 14 (7 H, 7 NH); HelyWeber, 31 (18 NH, 13 H). Median number of exposures not reported. Incidence rate and number needed to treat to benefit not reported. Subjects with a previous history who sustained an acute ankle injury: 44 braced, 1 control.
Level of evidence	1b	1b	2b
Validity score	PEDro 6/10	PEDro 6/10	NA
Conclusion	The use of a lace-up ankle brace reduced the incidence but not severity of acute ankle injuries by 61% in high school football athletes regardless of their age, level of competition, BMI, shoe height, or cleat design compared with wearing no brace. In addition, injury reduction was similar for braced athletes both with and without a previous ankle injury.	The use of a lace-up ankle brace reduced the incidence but not severity of acute ankle injuries in male and female high school basketball athletes by 68% regardless of sex, age, level of competition, or BMI compared with wearing no brace. In addition, injury reduction was similar for braced athletes both with and without a previous ankle injury.	Regardless of the type used, the use of a prophylactic ankle brace did not significantly alter the incidence of ankle injuries in high school volleyball athletes compared with the control group. In athletes with no previous history of ankle injury, the Active Ankle Trainer II and Aircast Sports Stirrup braces did show a significant reduction in ankle sprains.

Abbreviations: JV indicates junior varsity; FAAM, Foot and Ankle Ability Measure; BMI, body-mass index.

(40.5%) athletes have a larger percentage of total injuries due to player-to-player contact than do volleyball athletes (23.1%).⁵ Therefore, the different demands in each sport could be a reason why football and basketball athletes may benefit more from ankle braces than volleyball athletes would.

Two of the included studies^{2,3} performed an analysis of numbers needed to treat to benefit (NNTB) to identify how many athletes would need to use a brace to prevent an ankle injury. These studies determined that approximately 29 football athletes² and 15 basketball athletes³ need to be braced during an entire season to prevent 1 ankle injury. Comparatively, previous research that implemented a balance-training program before and during a high school soccer and basketball season determined that 27 athletes needed to participate in the program to prevent a single ankle injury.⁶ Although the NNTB for balance training is similar to the numbers reported with the use of ankle bracing, factors such as time, compliance, and direct supervision should be considered in a secondary school setting. While it is beyond the scope of this CAT to determine which intervention is more effective, prophylactic ankle bracing may be more efficient for high school athletic trainers to use, as this intervention may not require the time and personnel necessary to implement a balance-training program.

Future research should explore the use of prophylactic ankle braces among a variety of different high school athletics, as the studies in this CAT only targeted football, basketball, and volleyball. Furthermore, identifying specific athletes who may benefit most from bracing would

enhance the overall feasibility of this intervention. In addition, the studies included in this CAT only examined a single athletic season. Examining the effectiveness of ankle braces across multiple seasons may provide more robust evidence to complement the existing research in this area. This CAT should be reviewed in 2 years or when additional best evidence becomes available that may change the clinical bottom line for this clinical question.

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