Dynamic Balance Measures in Healthy and Chronic Ankle Instability Participants While Wearing Ankle Braces: Systematic Review With Meta-Analysis

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Context: Ankle braces have been theorized to augment dynamic balance. **Objectives:** To complete a systematic review with meta-analysis of the available literature assessing the effect of ankle braces on dynamic balance in individuals with and without chronic ankle instability (CAI). **Evidence Acquisition:** Electronic databases (PubMed, MEDLINE, CINAHL, and SPORTDiscus) were searched from inception to October 2019 using combinations of keywords related to dynamic balance, ankle braces, Star Excursion Balance Test (SEBT), Y-Balance Test (YBT), and Time to Stabilization. Inclusion criteria required that studies examined the effects of ankle braces on dynamic balance. Studies were excluded if they evaluated other conditions besides CAI, did not assess dynamic balance, or did not use an ankle brace. Methodological quality was assessed using the Physiotherapy Evidence Database scale. The level of evidence was assessed using the Strength of Recommendation Taxonomy. The magnitude of brace effects on dynamic balance was examined using Hedges g effect sizes (ESs) and 95% confidence intervals (CIs). Random-effects meta-analysis was performed to synthesize SEBT/YBT and Time to Stabilization data separately. **Data Synthesis:** Seven studies were included with a median Physiotherapy Evidence Database score of 60% (range 50%–60%), and 4 were classified as high quality. Overall meta-analysis indicated a weak to no effect of braces on SEBT/YBT (ES = 0.117; 95% CI, –0.080 to 0.433; $P = .177$) and Time to Stabilization (ES = –0.064; 95% CI, –0.211 to 0.083, $P = .083$). Subanalysis of SEBT/YBT measures indicated a weak negative effect in healthy participants (ES = –0.116; 95% CI, –0.209 to –0.022, $P = .015$) and a strong positive effect in individuals with CAI (ES = 0.777; 95% CI, 0.418 to 1.136; $P < .001$). **Conclusion:** The current literature supports a strong effect of ankle braces on the SEBT/YBT in those with CAI. However, little to no dynamic balance changes were noted in healthy participants. Future research should include consistent ankle brace types, pathologic populations, and the examination of dynamic balance changes contribution to injury risk reduction.

Keywords: postural control, Star Excursion Balance Test, time to stabilization, Y-balance test

Ankle sprains are often viewed by athletic populations as minor injuries with limited impacts. However, acute ankle sprains result in immediate effects such as pain, swelling, weakness, giving way, and time missed from work/activity.¹ Individuals who suffer an ankle sprain report a continuation of symptoms 2 years after injury.¹ Furthermore, 40% to 70% of individuals who suffer an acute ankle sprain will go on to develop a condition such as chronic ankle instability (CAI).^{2,3} The CAI is characterized by repetitive episodes of “giving way,” diminished functional ability and recurrent sprains.³ The repetitive trauma associated with CAI leads to long-term impairment of the ankle joint and health-related quality of life deficits.² Specifically, those with CAI report self-perceived functional deficits and increased fear of reinjury,⁴ which may contribute to the reports of decreased physical activity levels within the population.⁵ These long-term consequences place those with CAI at an increased risk of developing posttraumatic osteoarthritis.⁶ This health concern is further exacerbated by the high incidence rate of acute ankle sprains, 7.2 sprains per 1000 person hours, in the United States. This equates to hundreds of thousands of ankle sprains each year.⁷ Overall, the abundance of acute and recurrent ankle

sprains in combination with their short- and long-term impacts demonstrates the importance of preventative measures.

Prophylactic ankle bracing is a potential prevention strategy to reduce the incidence of ankle sprains. Within the literature, ankle bracing has reduced the rate of ankle sprains within high school athletes.^{8–10} Specifically, their use resulted in a reduction in injury rate from 1.12 to 0.48 injuries per 1000 exposures.¹⁰ While, ankle bracing has proven effective, there is a lack of evidence for the mechanism of effect.¹¹ The proposed prophylactic mechanisms of ankle braces are thought to be due to mechanical range of motion reductions, effects on balance, and proprioceptive changes.¹² Mechanically, ankle braces have proven their ability to restrict range of motion, and this has been proposed to reduce the chance of inversion injury moments.¹³ Proprioceptive effects of ankle braces are thought to be due to the stimulation of cutaneous sensors to provide enhanced sensory feedback at the ankle and allow for greater awareness of the ankle in space and time.¹³ Finally, dynamic balance is the body’s ability to maintain a stable upright posture during movement.^{14,15} Ankle braces may affect dynamic balance through a collection of mechanical and sensory effects.^{14,15} Furthermore, dynamic balance has been cited as a predictor of lower-extremity injuries.¹⁶ Exploring the effect that ankle braces have on dynamic balance is useful due to the connection with injury risk.

There are currently several studies that assess dynamic balance under different stabilization conditions.^{15,17–22} These studies include a variety of ankle stabilizing techniques, such as taping and bracing

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during different functional tasks such as walking or running. Dynamic balance has been examined in participants wearing ankle braces using the Star Excursion Balance Test/Y-balance Test (SEBT/YBT) and Time to Stabilization (TTS) measures. However, there has been no comprehensive study that has examined the overall effect of ankle braces on dynamic balance to aid in clinical decision making. Synthesizing the available literature will help to provide evidence on best practices regarding the use of ankle braces in active individuals.

Objectives

The purpose of this systematic review is to collect, critically appraise, and synthesize the available literature on how ankle braces influence dynamic balance measures in healthy participants and those with CAI.

Evidence Acquisition

Search Strategy

A systematic search of the literature was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis guidelines²³ to find articles evaluating the effect of ankle braces on dynamic balance. Electronic databases PubMed and EBSCO Host (CINHAL, MEDLINE, and SPORTDiscus) were searched from inception through October 2019. These were searched using combinations of keywords related to the SEBT, YBT, TTS, dynamic balance, and ankle braces (Table 1). Boolean operators “OR” and “AND” were employed to combine search terms. The Boolean phrase and systematic search were derived and completed by investigators (C.J.P. and R.J.R.).

Eligibility Criteria

Investigators (C.J.P. and R.J.R.) reviewed identified studies against eligibility criteria. Initially, potential eligibility was determined by titles and abstracts. In cases in which eligibility was uncertain, the full text of the manuscript was reviewed for inclusion. Eligibility criteria are provided below.

Inclusion Criteria

The following inclusion criteria were used to screen studies:

1. Study purpose: studies were included if the primary aim was to evaluate the effects of ankle braces on dynamic balance (ie, TTS, SEBT, YBT, etc).
2. Type of participants: studies on adult (≥ 18 y of age) human participants who were classified as either being free of injury (healthy) or with having CAI were included.
3. Type of outcome measures: studies that assessed dynamic balance and postural control using measures such as TTS, SEBT, and/or YBT were included.

Exclusion Criteria

The following exclusion criteria were used to screen studies:

1. Studies that didn't assess dynamic balance or postural control were excluded.
2. Studies which included participants who were under the age of 18 years were excluded.
3. Studies that included participants with preexisting conditions other than CAI were excluded.
4. Studies not published in English were excluded.

Assessing Quality of Studies

The methodological quality of the included studies was assessed using the Physiotherapy Evidence Database (PEDro) scale. The PEDro is designed to measure methodological quality of clinical trials.²⁴ The PEDro is scored using 1 if present and 0 if not present with a total score of 0 to 10.²⁴ Included studies were considered to be of high quality if they met 60% of the criteria or higher. Initially, 2 reviewers (C.J.P. and R.J.R.) scored the selected studies independently. Reviewers then met to develop a consensus for each study. Any disagreements that could not be brought to consensus through discussions were resolved using an independent reviewer.

Data Extraction

Two reviewers (C.J.P. and R.J.R.) extracted data during the primary review. The extracted data included the following: study design, aims, population, type of ankle brace used, and outcome measures. Discussion and an independent reviewer were used to resolve any discrepancies in interpretation if needed.

After extraction, data were further categorized based on outcome measure. The primary outcomes for this review were the SEBT/YBT and TTS. Means, SDs, and number of participants

Table 1 Search Strategy, Keywords, and Search Terms Used

Step	Search terms	Boolean operator	EBSCO Host	PubMed
1	Ankle		114,192	70,681
2	Brace Orthosis	OR	31,784	18,495
3	Dynamic balance Y-Balance Test Star Excursion Balance Test Time to Stabilization	OR	9591	29,115
4	1,2	AND	5836	3006
5	1,2,3	AND	56	97
Duplicates				35 ^a
Total identified				118

^aTotal number of duplicates between EBSCO and PubMed.

were extracted for both outcome measures. During extraction, scores for each reach direction of the SEBT/YBT were extracted separately. To further categorize the data, the moderator variable of participant group was created to separate point estimates into either healthy or CAI participants.

Data Analysis and Synthesis

Separate summary meta-analyses were performed for each outcome variable (SEBT/YBT and TTS). A total of 2 summary meta-analyses were completed. For summary analyses, multiple point estimates from the same study were pooled to reduce sample size inflation. A subanalysis was conducted to examine ankle brace's effects on the SEBT/YBT in healthy and CAI participant groups separately. Similar subanalysis was not completed for TTS due to a lack of participant groups.

Each meta-analysis was completed by using either random-effects or fixed-effects models, in which individual point estimates were pooled from the included studies using bias-corrected Hedges *g* effect sizes (ESs) and 95% confidence intervals (CIs) to determine the magnitude of effect. Given substantial levels of heterogeneity within SEBT/YBT measures ($I^2 = 87.91\%$, Q value = 82.71, $P < .001$) and CAI-specific SEBT/YBT measures ($I^2 = 74.14\%$, Q value = 11.60, $P = .009$) random-effects models were used. No heterogeneity was observed in the TTS measures ($I^2 = 0.00\%$, Q value = 2.85, $P = .581$) and healthy specific SEBT/YBT measures ($I^2 = 0.00\%$, Q value = 2.53, $P \leq .865$); thus, a fixed-effect model was used. Positive ESs indicated greater levels of dynamic balance in the brace group compared with nonbraced. All meta-analysis procedures were completed in Comprehensive Meta-Analysis (version 3.3.070; Biostat Inc, Englewood, NJ). We interpreted ESs as weak (≤ 0.40), moderate (0.41–0.69), or strong (≥ 0.70). The alpha level was set a priori at .05. To further examine the data, we performed a qualitative assessment of ESs and CIs by assessing the differences in ES estimates between groups and determining whether the CIs crossed 0.

Sensitivity Analysis

A 1-study-removed analysis was completed to examine the influence of a single-participant group on the observed summary effect of each summary analysis. This method explores the effect of removing single-participant groups on the observed summary effect. In addition, the effect of quality criteria on the assumptions of level of evidence for high-quality studies ($\geq 60\%$) was tested by subjecting the criteria to changes of $\pm 10\%$ and determining the subsequent level of evidence change.

Level of Evidence and Grade of Recommendation

The Strength of Recommendation Taxonomy (SORT) was used to categorize the data. Quality, quantity, and consistency of the assessed body of literature allows a grade of recommendation based on the evidence.²⁵ Individual studies were categorized as level 1, level 2, and level 3 evidence.²⁵ That evidence was used to determine the strength of recommendations. A-level recommendations are based on good quality patient-oriented evidence. B-Level recommendations are based on limited quality patient-oriented evidence. C-Level recommendations are based on consensus, usual practice, opinion, and disease-oriented evidence.²⁵

Evidence Synthesis

Literature Search

A total of 118 studies were retrieved from electronic and hand searches. Figure 1 displays a diagram outlining the results of the search and study review process. Of those, 7 studies were identified as meeting the selection criteria. Six studies were identified through electronic search.^{15,17,18,20–22} One study was identified through hand search.¹⁷

General Characteristics

The study characteristics of included studies are displayed in Table 2. All studies included had examined dynamic balance with and without ankle braces in individuals with and/or without CAI. One study included soft,¹⁷ 5 studies included semi-rigid,^{15,17,19,20,22} 5 studies included lace-up ankle braces,^{15,18,20–22} and one study included combined mechanism ankle support.¹⁹ Four studies included participants with CAI,^{17,19–21} while 5 included healthy participants.^{15,17–19,22} Four studies examined dynamic balance using the SEBT/YBT.^{15,17–19} Three studies examined dynamic balance using TTS.^{20–22}

Methodological Quality

The 2 reviewers (C.J.P. and R.J.R.) agreed on 69/70 (99%) items on the PEDro checklist. The one difference in PEDro score was resolved by discussion between the reviewers. Seven level 2 studies with quality scores that ranged from 50% to 60% with a median PEDro score of 60% were included in the summary data (Table 3). Four studies assessing dynamic balance with SEBT/YBT had PEDro scores of 60% were included in summary data.^{15,17–20} Three studies assessing dynamic balance with TTS ranged from 50% to 60% with a median PEDro score of 50% were also included in this study.^{20–22}

Data Synthesis

All individual ES and summary effects are presented in Figures 2 and 3.

Summary Analyses. For the SEBT/YBT, there was an overall weak summary effect for ankle braces improving SEBT/YBT measures (ES = 0.177; 95% CI, –0.080 to 0.433) that was not significant ($P = .177$). For TTS, there was a null summary effect for ankle braces influencing TTS measures (ES = –0.064; 95% CI, –0.211 to 0.083) that was not significant ($P = .392$).

Participant Group. The results of the subanalysis of participant group for increasing SEBT/YBT measures indicated that there was a weak negative effect in healthy participants (ES = –0.116; 95% CI, –0.209 to –0.022; $P = .015$) and a strong positive effect in individuals with CAI (ES = 0.777; 95% CI, 0.418 to 1.136; $P < .001$). It is important to note that results of the CAI analysis were derived from 2 studies^{17,19} completed by one research group 5 years apart. In addition, a total of 4 unique ankle braces were used in these studies with no 1 brace being used in both studies.

Sensitivity Analysis

The 1-study-removed analysis for SEBT/YBT demonstrated that the overall ES remained weak and ranged from 0.100 to 0.227

Figure 1 — Flow chart of literature review.

(95% CI, -0.120 to 0.527). There were no significant removals ($P > .099$) indicating that no single participant group meaningfully influenced the summary effect. The 1-study-removed analysis for TTS demonstrated that the overall ES remained weak and ranged from 0.121 to 0.204 (95% CI, -0.174 to 0.582). There were no significant removals ($P > .086$) indicating that no single participant group meaningfully influenced the summary effect.

Changing the quality criterion for determining high- or low-quality studies by $\pm 10\%$ would change recommendations based on quality evidence. An increase by 10% would cause a change from 5 high-quality studies to 0 high-quality studies. A decrease in the quality criterion by 10% would change the number of high-quality studies from 5 to 7.^{15,17–22} This analysis implies that the findings of this systemic review are based on articles at the lower end of high-quality evidence.

Level of Evidence

The results of this review indicate that there is grade B evidence to support nonsignificant weak effect of ankle braces on dynamic balance demonstrated through either SEBT/YBT or TTS in

participants with or without CAI. This recommendation for the SEBT/YBT is based on the finding from 7 level 2 studies. The recommendation for TTS is based on finding from those 7 level 2 studies.^{15,17–22}

Discussion

The purpose of this systematic review was to summarize the literature investigating the effect of ankle braces on dynamic postural control in participants with and without CAI. The results demonstrate that there is grade B evidence of a nonsignificant weak overall effect on SEBT/YBT with the application of ankle braces. However, there is grade B evidence that a strong dynamic balance improvement occurs during SEBT/YBT tasks with the application of ankle braces in those with CAI. Some caution should be taken with this finding, however, as it was derived from a single research laboratory. There was a weak negative effect within the healthy population. The results of the subanalysis were associated with 95% CIs that did not cross 0. Finally, there was grade B evidence of nonsignificant weak dynamic balance improvement during TTS

Table 2 Characteristics of Included Studies

Author	Measurement technique	Brace information	Participants	Key results
Hadadi et al ¹⁷	SEBT (cm) A, PM, PL	Soft (Arizona Ankle Orthosis), semi-rigid (Active Ankle Brace)	16 FAI 10 M and 6 F 22.9 (2.2) y 169.3 (8.6) cm 61.8 (10.1) kg 16 healthy 10 M, 6 F 22.2 (2.4) y 170.3 (8.4) cm 60.2 (9.3) kg	No difference with ankle brace in healthy people. No brace, semirigid, and soft ankle braces each increased in reach distance in FAI participants
Hardy et al ¹⁵	SEBT (cm) A, AM, AL, P, PM, PL, L, M	Semirigid (Active Ankle Brace) and lace up (Ankle Stabilizer Orthosis)	36 healthy 18 M and 18 F 23.6 (2.7) y 173.8 (9.3) cm 74.4 (12.7) kg 91.9 (5.1) cm	No differences in the reach distances for either brace condition compared with the nonbraced healthy participants
Willeford et al ¹⁸	YBT (cm) A, PM, PL	Lace-up Brace (McDavid 195 T Ultralight)	29 healthy 29 M 19.2 (1.1) y 187.5 (20.5) cm 106.4 (20.5) kg	No significant difference with brace before and after football practice
Hadadi and Abbasi ¹⁹	SEBT (cm) AM, PM, M	Combined mechanism ankle support, custom foot orthosis, and soft ankle support	22 CAI 10 M and 12 F 22.7 (2.6) y 171.8 (8.9) cm 68.9 (17.3) kg 22 healthy 10 M and 12 F 23.1 (2.9) y 172.1 (8.6) cm 68.2 (10.9) kg	Statistically significant differences were found for the main effects of the groups in all COP parameters and reach distances in M, AM, and PM directions. The main effect of the orthotics for all evaluated parameters, except reach distance in the PM direction, was statistically different. All COP parameters were significantly lower with the CMAS compared with other orthotic conditions in CAI patients. Also, the higher reach distances with the CMAS were obtained in the AM and M directions of the SEBT
Wikstrom et al ²⁰	TTS: Dynamic Postural Stability Index M, A, V	Lace-up (Mueller lace-up ankle brace) and semirigid (McDavid Ultra Ankle Brace)	28 CAI 13 M 21.5 (1.2) y 181.5 (10.5) cm 77.6 (17.2) kg 15 W 20.5 (1.1) y 169.4 (8.2) cm 67.9 (8.8) kg	Only vertical stability as a component of the DPSI was improved with wearing ankle braces
Gribble et al ²¹	TTS: resultant vector (force) AP, ML	Lace-up brace (Swede-O Universal)	15 CAI 7 M and 8 F 18.9 (1.2) y 170.8 (10.2) cm 66.9 (6.9) kg	Participants with CAI did not demonstrate significant differences in TTS between brace and nonbraced conditions
Shaw et al ²²	TTS: resultant vector (force) AP, ML	Lace-up (Swede-O Universal lace-up ankle brace) and semirigid (Active Ankle Brace)	10 healthy 10 F 19.5 (1.27) y 179.07 (7.6) cm 69.86 (5.42) kg	Lace-up brace provides quicker TTS in the anterior-posterior direction

Abbreviations: A, anterior; AL, anterior lateral; AM, anterior-medial; CMAS, combined mechanism ankle support; COP, center of pressure; DPSI, dynamic postural stability index; F, female; FAI, functional ankle instability; L, lateral; M, male; M, medial; P, posterior; PL, posterolateral; PM, posteromedial; SEBT, Star Excursion Balance Test; TTS, time to stabilization; V, vertical; Y, years of age; YBT, Y-Balance Test.

Table 3 PEDro Individual Items and Quality Index Scores for the Included Articles

Questions	Hardy et al ¹⁵	Hadadi et al ¹⁷	Willeford et al ¹⁸	Hadadi and Abbasi ¹⁹	Wikstrom et al ²⁰	Gribble et al ²¹	Shaw et al ²²
1. Random allocation	Yes	Yes	Yes	No	Yes	No	No
2. Allocation concealed	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
3. Similar at baseline	Yes	Yes	Yes	Yes	Yes	Yes	Yes
4. Blinding of all subjects	No	No	No	No	No	No	No
5. Blinding of all therapists	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
6. Blinding of all assessors	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
7. More than 85% of follow-up	Yes	Yes	Yes	Yes	Yes	Yes	Yes
8. Intention to treat	Yes	Yes	Yes	Yes	Yes	Yes	Yes
9. Between-groups statistical comparison	Yes	Yes	Yes	Yes	Yes	Yes	Yes
10. Point measures and variability	Yes	Yes	Yes	Yes	Yes	Yes	Yes
11. Eligibility criteria indicated	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Percentage of yes, %	6/10 = 60.00	6/10 = 60.00	6/10 = 60.00	6/10 = 60.00	6/10 = 60.00	5/10 = 50.00	5/10 = 50.00
Level of evidence	2	2	2	2	2	2	2

Figure 2 — Forest plot of Hedges *g* effects sizes and 95% confidence intervals for SEBT/YBT. CAI indicates chronic ankle instability; SEBT, Star Excursion Balance Test; YBT, Y-Balance Test.

tasks. The overall analyses were associated with 95% CIs that crossed 0.

Findings from this systematic review indicate that there is a weak overall effect of ankle braces on SEBT/YBT. However, subanalysis demonstrated a negative weak ES in the healthy participants and a strong effect in those with CAI. The CAI is a condition associated with sensorimotor alterations that contribute to dynamic balance impairments.²⁶ Perhaps these alterations produce conditions where ankle braces can make an impact unlike in healthy individuals. In addition, there is literature to suggest ankle braces enhance dynamic balance during states of fatigue.²² States of fatigue are similar to CAI in that both conditions cause sensorimotor alterations.^{22,26} In combination, these findings may indicate that ankle braces only effect dynamic balance in states of impairment. Furthermore, fatigue is common in the latter half of competitions,

which is typically when ankle sprains are most likely to occur.²⁷ This may indicate that the greatest effect of the ankle braces on injury risk, through augmenting dynamic balance, is during periods when ankle sprains are most common. Further research is needed to explore effect of ankle braces on dynamic balance during various impairment conditions.

Overall, summary SEBT/YBT and TTS data demonstrated a weak effect of ankle braces on dynamic balance. However, there were variations within the included studies regarding ankle brace composition. Ankle braces used in articles for this review include semirigid ankle braces, lace-up ankle braces, soft ankle braces, and combined mechanism ankle braces. Regardless of the ankle brace used, effect on dynamic balance seemed to be consistent. Within the SEBT/YBT, ESs ranged from -0.317 to -0.077 for healthy and 0.313 to 1.177 for CAI participants. TTS data had similar results

Figure 3 — Forest plot of Hedges g effects sizes and 95% confidence intervals for TTS. CAI indicates chronic ankle instability; TTS, Time to Stabilization.

with ESs that ranged from -0.118 to 0.303 . This indicates that at this time there is not 1 ankle brace style that impacts dynamic balance more than another. Finally, we identified greater trends toward improvement of the SEBT/YBT compared with TTS. Based on this systematic review, we are unsure as to why differences were seen between the 2 balance tasks with regards to ankle braces. However, differences may be due to variations in physical demand between the 2 tasks such as muscle recruitment, speed, and coordination. For example, TTS is inherently a more demanding and expedient task that does not give the participant ample time to adjust while completing the task to enhance their score. The SEBT/YBT on the other hand is a slower and more deliberate dynamic balance task where there may be more opportunities to take advantage of enhanced feedback or ankle restrictions during the task. Further research is needed to determine differences between tasks and on the effect of different ankle braces.

Practical Implications

Ankle braces have been used as effective tools for both the treatment and the primary and secondary prevention of ankle sprains.^{11,28} Proposed mechanisms suggest that ankle braces may reduce injury incidence through mechanical, sensory, and balance changes. The results of this review demonstrate that individuals with CAI have improved dynamic balance while using a variety of ankle braces. Although ankle braces had the greatest effect on dynamic balance in those with diminished ankle function such as with CAI, they should potentially be used in anticipation of fatigued states that cause similar impairments to dynamic balance. However, more research is needed to elucidate the mechanism of how this benefit occurs.

Limitations of Review

There were several different types of ankle braces and a lack of ankle brace consistency within the included articles. This makes it difficult to assess the effect of individual braces and provide recommendations as to the optimal brace to effect dynamic balance. Future research is needed that includes consistent braces to allow for comparison. In addition, only healthy or CAI participants were examined under dynamic balance conditions. This makes it difficult to assess the effect of ankle braces in a variety of other

lower-extremity impairments that could impact dynamic balance and injury risk. Research is needed that includes a variety of lower-extremity impairments in order to make recommendations for ankle braces in different situations. Furthermore, the investigation of ankle braces effects on those with CAI was limited to 2 studies^{17,19} completed by one research group 5 years apart. Due to this, caution should be taken when evaluating the CAI finding as it has not been reproduced by other groups. The effect of ankle braces on dynamic balance is not directly related to injury prevention. Researchers and clinicians are still unsure of the mechanism for ankle braces effect on injury prevention. Prospective research designs are needed to evaluate ankle braces effect on dynamic balance changes and its relationship to injury risk reduction.

Conclusion

The results of this systematic review demonstrate that there is grade B evidence to support weak to no overall effect of prophylactic ankle braces on SEBT/YBT and TTS. However, subanalysis shows that there is grade B evidence from one research laboratory to support a strong effect of prophylactic ankle braces on SEBT/YBT in those with CAI. These results infer that ankle braces are a contributing factor to changes in dynamic balance when measured through the SEBT/YBT but not TTS among those with CAI. Therefore, dynamic balance may be a contributing factor to ankle sprain reduction in those with CAI with ankle brace use. The direction of future research should include studies with consistent ankle brace type, various pathologic populations, and the examination of dynamic balance changes due to the effect of ankle braces on injury risk.

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