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# The Effect of Different Balance Training Protocols on Athletes with Chronic Ankle Instability: A Systematic Review

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# The Effect of Balance Training on Athletes with Chronic Ankle Instability: A Systematic Review

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## INTRODUCTION

- Chronic Ankle Instability (CAI) describes a cluster of symptoms caused by mechanical and functional instability of the ankle.[1]
- CAI symptoms include persistent pain, decreased balance, reduced ankle range of motion, persistent edema, and "giving way"sensation.[1]
- CAI occurs in 40% of individuals who sustain a lateral ankle sprain.[2]
- Ankle sprains account for nearly 40% of all sports related injuries.[3]
- Lateral ankle sprains cause damage to stabilizing components of the ankle leading to decreased proprioception, decreased static and dynamic postural control, impaired motor coordination of the peroneal musculature, and decreased strength of global ankle musculature.[4,5]
- Impairments from CAI result in lower scores on ankle functional outcome measures[6] and athletes missing considerable time playing their sport.
- There is limited research on the effectiveness of different balance training protocols for the rehabilitation of athletes with CAI.
- Determining the most effective treatment strategy to improve ankle stability is essential for the reduction of sports-related ankle sprains.

## PROBLEM

- Previous research has found that balance training in individuals with CAI can improve ankle function and postural control.[7]
- However, no known systematic review explores the effectiveness of different balance training protocols for athletes with CAI.

## PURPOSE

- The purpose of this systematic review is to examine the effect of different balance-based interventions at improving balance and ankle stability/function in athletes with CAI.

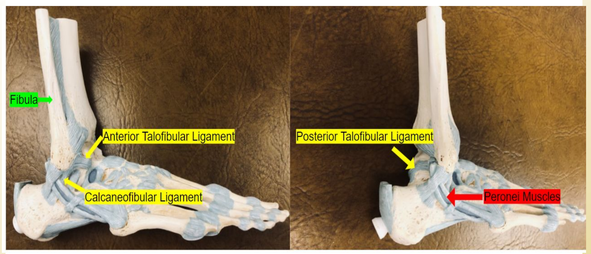
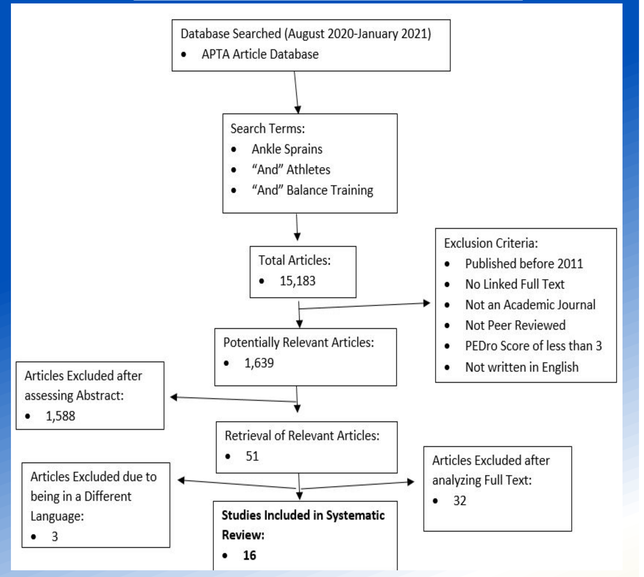



Figure 1. Anatomy of Lateral Ankle

## SEARCH METHODOLOGY

- Two literature searches were conducted using the American Physical Therapy Association Article Search (formerly known as PTNow) between August 20, 2020 and January 27, 2021.
- See Figure 2 for Search Method Flow Chart .

Figure 2. Search Method Flow Chart




## RESULTS

- Sixteen articles met inclusion criteria and were included in this systematic review.
- Mean PEDro score for all articles was 5.8/10.
- Eight hundred and seven participants were included in this systematic review (58.5% male and 41.5% female).
- Average age of participants was 22.4 years old.
- Participants range of physical activity consisted of physically active individuals (61.2%), recreational athletes (8.6%), high school athletes (15.5%), collegiate athletes (16.2%), and professional athletes (2.6%).
- The diagnosis of CAI was determined objectively through an examination by a medical professional and by self-reported outcome measures in 7 out of the 16 included studies.
- Self-reported outcome measures included the Cumberland Ankle Instability Tool and Foot and Ankle Outcome Score.
- After analysis of the articles, the intervention themes were identified: unstable base training, plyometric/hop stabilization with balance, resistance training with balance, and combined interventions.

## DISCUSSION

Figure 3. Study Example Exercises

- A trend of improvement in perceived ankle stability/function and balance in the analysis of the included articles
- *Unstable Base Training*
  - Defined as subjects who completed balance exercises on unstable surfaces to improve perceived ankle stability, ankle proprioception, and balance.
  - Out of the 8 articles that included an unstable base, 7 of them showed improvements in ankle stability and static/dynamic balance.[1,8,9,10,11,12,13]
- *Plyometric and Hop Stabilization Balance Training*
  - Defined as subjects who performed dynamic balance exercises that focused on proper jumping/landing mechanics to improve ankle stability and postural control.
  - Two of these studies reported improved ankle stability and function,[14,15] while all 3 studies saw improvements in balance.[14,15,16]
- *Resistance Training with Balance Exercises*
  - Defined as the participants that performed resistance training with balance training to improve perceived ankle stability and balance.
  - The one study involving resistance and proprioception training saw significant improvements in both ankle stability and overall balance.[17]
- *Combined Intervention*
  - Defined as participants who performed a training protocol that incorporated at least 3 different training methods as part of balance training to improve postural control and ankle stability.
  - Three of the 4 studies involving combined intervention protocols, found significant improvements in postural stability,[18,19,20] while 2 of them also found improvements in evertor strength and ankle stability.[18,19] Janssen et al[21] only saw minor improvements in ankle stability.

## IMPLICATIONS

- Balance based rehabilitation programs involving unstable base training, plyometric/hop stabilization, and resistance training are an effective treatment method for physical therapists to use with athletes with CAI.
- Significant improvements in balance and ankle stability/function have been identified.
- A well-designed CAI treatment program by physical therapists and athletic trainers should include a combination of different balance based exercises included in this systematic review.
- All four treatment subgroups discussed in this systematic review have been shown to be effective at improving both balance and perceived ankle function/stability in athletes with CAI.

## FUTURE RESEARCH

- To determine which intervention is the most effective at improving balance and perceived ankle function/stability in athletes with CAI.
- To determine the long-term effectiveness of balance training and the rate of recurrence of ankle-related injuries.
- To determine the time frame and frequency of balance training for optimal improvements for athletes with CAI.

## CONCLUSIONS

- Chronic Ankle Instability (CAI) in athletes has become a prevalent topic in research. This systematic review indicates that balance-based exercise programs performed by healthcare professionals can greatly improve ankle stability/function and balance in athletes with CAI.
- After analyzing the current literature, it was determined that rehabilitation protocols including unstable base, plyometric / hop stabilization, resistance training with balance, or combined interventions are effective at improving balance and perceived ankle function/stability in athletes with CAI.
- Further research is needed to determine the most effective rehabilitation protocol including treatment duration and frequency for athletes with CAI.

## REFERENCES

https://docs.google.com/document/d/1KQgxY4nqec7zLzi0H3aI4dD0v1PBbyjJcAypuv0yEvs/edit?usp=sharing

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