

PROPRIOCEPTIVE EXERCISES IN ANKLE SPRAIN IN SPORTS PERSON-AN EVIDENCE BASED SEMINAR

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ABSTRACT

INTRODUCTION: Ankle injuries is one of the most prevalent sports related injuries. Proprioception is a complex neuromuscular process concerned with the internal kinesthetic awareness of body position and movement. It plays an important role in joint stability and injury prevention. Examples of proprioceptive exercises include balancing on a wobble board, throwing-catching or dribbling a ball whilst in single leg stance, etc.

NEED OF THE STUDY: Chronic ankle instability, associated with multiple ankle sprains, can lead to difficulty with walking, running & jumping. Proprioceptive exercise helps with overall balance.

CONCLUSION: Physical training strengthens muscles and reduces risk of reinjury. Proprioceptive deficiencies can be improved through balance exercises that help to increase muscle reaction time and the contraction patterns that favor the correction of excessive inversion.

KEYWORDS: proprioceptive exercises; ankle sprain

INTRODUCTION

Proprioception is a specialized variation of the sensory modality and encompasses the sensations of joint movement and joint position¹.

Kinesthesia

The ability to sense active or passive movement of the limbs and body.

Joint Position Sense

The sense of position of a specific segment^{2,3}.

Often determined though measuring the accuracy of a patient to replicate a joint angle either actively or passively in open or closed kinetic chains⁴.

Injuries to the ankle joint are among the most common of all sport-related injuries¹.

Sports that register the highest incidence of ankle sprains are those requiring sudden, stops and pivoting, such as soccer, volleyball, and basketball¹.

These specific movements often result in ankle inversion during plantar flexion, which is the most common type of ankle sprain¹. (Figure 1)

Research has shown that 25–40% of athletes who suffer from an ankle sprain will experience a recurrent sprain due to acquired instability. However, more recent research points out the importance of restoring proprioception to the damaged muscles and ligaments following an ankle sprain¹.

Ankle sprains are caused by sudden inversion or eversion of the ankle, causing the

ligamentous structures to be stretched beyond their normal physiological and functional lengths⁵.



Figure 1: Ankle inversion leading to ankle sprain

Ankle sprains have three grades of severity⁵. (Figure 2)

Grade 1 is a mild sprain with slight stretching and some damage to the fibrils of the ligament, there is little to no instability, minimal swelling, and ability to bear weight is intact.

Grade 2 is a moderate sprain with partial tearing of the involved ligaments, some instability, moderate pain, swelling, minimal bruising, and difficulty weight-bearing.

Grade 3 is a severe ankle sprain with ligament rupture, gross instability, severe pain, swelling, extensive bruising, and inability to bear weight.

Ankle proprioception provides essential information to enable adjustment of ankle positions and movements of the upper body, in order to successfully perform the complex motor tasks required in elite sport⁶.

Methods of proprioceptive rehabilitation include single-leg stance, balance, and coordination exercises and ankle disk training

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(Figure 3). These help to improve the neuromuscular control in athletes¹.

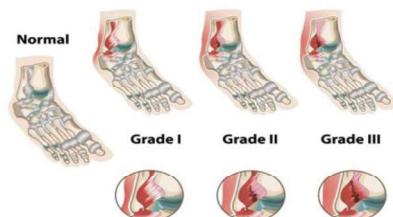


Figure 2: Grades of ankle sprain

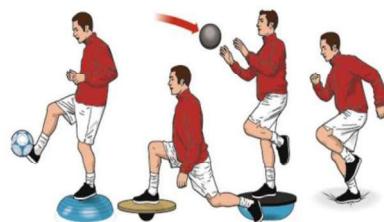


Figure 3: Proprioceptive rehabilitation exercises

METHODOLOGY

Proponents of an evidence-based approach define evidence very broadly as any empirical observation about the apparent relation between events. Thus, sources of evidence can range from unsystematic clinical observations of individual clinicians to systematic reviews of multiple randomized clinical trials (RCT).

The different forms of evidence may each provide recommendations that result in good outcomes for patients, but it is clear that some forms of evidence are more reliable than others in giving guidance to clinicians and their patients.

Organizations and authors have used various systems to grade the levels of evidence and strength of recommendations, Oxford Centre for Evidence-based Medicine Grades of Recommendations as well as the GRADE system of recommendations².

Level of evidence for treatment effectiveness².

Level-1	Systemic review of RCT of study that substantially agree.
Level-2	Individual RCT with narrow confidence window Observational study with dramatic effect
Level-3	Nonrandomized controlled cohort study
Level-4	Case control, case series, or historically studies
Level-5	Mechanism –based reasoning

DISCUSSION

In 2014, Mehdi Kasparast, Hamidreza Keshavarzi, Shahnaz Molaei, Omid Yaghoobpour Yekani did a pilot study on The effectiveness of proprioceptive balance board training program: an

intervention mechanism in the reduction of ankle sprain on 47 subjects. 28 were included in the experimental group and 19 in the control group by simple random sampling. The program consisted of 10 basic exercises on and off the balance board, with variations on each exercise and a gradual increase in difficulty and intensity during the 7 week. The exercise program included (1) maintaining a single leg stance on a flat surface with eyes open and closed; (2) performing functional sport activities such as throwing, catching, and dribbling on 1 leg; (3) maintaining double-leg stance while rotating the balance board; (4) maintaining a single-leg stance on the balance board with eyes open and closed; (5) performing functional sport activities while in single-leg stance on the board; (6) and (7) were the repeated phase of 4 & 5 with longer time (15 minutes). The functional sport activities included dribbling and catching a ball with hand and kicking. The results of this study revealed that proprioceptive balance board training is affected on reduction of ankle sprain¹⁰.

In 2013, A. Ben Moussa Zouita, O. Majdoub, H. Ferchichi , K. Grandy, C. Dziri, F.Z. Ben Salah conducted a pilot study on The effect of 8-weeks proprioceptive exercise program in postural sway and isokinetic strength of ankle sprains of Tunisian athletes on 16 subjects. 8 had unilateral ankle sprain symptoms (experimental group) and 8 had bilateral non injured ankles (control group). The program includes 24 sessions displayed over 8 weeks (3 sessions/ week). Every session lasts between 20 and 30 minutes. The results of tests–retest and between both groups (injured vs. healthy) show that after eight weeks of proprioceptive work, significant increase of maximal strength, decrease in times of acceleration and deceleration at the level of plantar flexors and better stability of the injured limb at slow and average ($P < 0.05$). The study concluded that proprioceptive training exercises can effectively stabilize an unstable ankle above for muscular and postural control. However, 8 weeks does not assess whether we have achieved maximum effect¹.

In 2010, Eric Eils, Ralf Schroter, Marc Schröder, Joachim Gerss, Dieter Rosenbaum did a randomized controlled trial on Multistation proprioceptive exercise program prevents ankle injuries in basketball over 232 subjects. Subjects were randomly divided into training or control group. 102 were allocated to controlled group and 96 to training group. Control group continued with their normal work out routines. The training group consisted of 96 players who performed a multistation proprioceptive exercise program. The result of the study shows that during the season, 21 ankle injuries occurred in the control group and 7 injuries in the training group. The risk for

sustaining an ankle injury was significantly reduced in the training group by approximately 35%. Additional biomechanical tests revealed significant improvements in joint position sense and single-limb stance in the training group. The study concluded that the multistation proprioceptive exercise program effectively prevented ankle injuries in basketball players⁹.

In 2006, Timothy A. McGuine, James S. Keene did a randomized controlled trial on The Effect of a balance training program on the risk of ankle sprains in high school athletes. Seven hundred and sixty-five high school soccer and basketball players (523 girls and 242 boys) were randomly assigned to either an intervention group (27 teams, 373 subjects) that participated in a balance training program or to a control group (28 teams, 392 subjects) that performed only standard conditioning exercises. Subjects in the intervention group performed a 5-phase balance training program. Phases 1 through 4 consisted of 5 exercise sessions per week for 4 weeks before the start of the season. In phase 5 (maintenance phase), the subjects performed the program 3 times per week for 10 minutes throughout the competitive season. In all phases, each exercise was performed for 30 seconds, and the legs were alternated during a 30-second rest interval between each exercise. The exercises included maintaining a single leg stance on a flat surface with eyes open and closed, performing functional sport activities such as throwing, catching, and dribbling on 1 leg; maintaining double-leg stance while rotating the balance board; maintaining a single-leg stance on the balance board with eyes open and closed; performing functional sport activities while in single-leg stance on the board. The results of the study states that the rate of ankle sprains was significantly lower for subjects in the intervention group ($p=.04$). Athletes with a history of an ankle sprain had a 2-fold increased risk of sustaining a sprain (risk ratio, 2.14), whereas athletes who performed the intervention program decreased their risk of a sprain by one half (risk ratio, 0.56). The ankle sprain rate for athletes without previous sprains was 4.3% in the intervention group and 7.7% in the control group, but this difference was not significant ($P = .059$). The study concluded that the balance training program will significantly reduce the risk of ankle sprains in high school soccer and basketball players⁸.

In 2004, Michael E. Powers, Bernadette D. Buckley, Thomas W. Kaminski, Tricia Hubbard, Cindy Ortiz did a pilot study on Six Weeks of strength and proprioception training does not affect muscle fatigue and static balance in functional ankle instability on 38 subjects (22 male and 16 female). Muscle fatigue was determined using the median power frequency

from an electromyographic signal, and static balance was assessed using center-of-pressure values obtained from a triaxial force plate. The result shows that there were no significant effects of the strength or proprioception training on our measures of muscle fatigue and static balance. Strength training, proprioception training, and the combination of the 2 failed to improve postural-stability characteristics in a group of subjects with FAI¹¹.

LEVEL OF EVIDENCE

Author	Title of study	Type of study	Level of evidence
Mehdi Kasparastet al.,(2014)	The effectiveness of proprioceptive balance board training program: an intervention mechanism in the reduction of ankle sprain	Pilot study	Level-4
A. Ben Moussa Zouita et al.,(2013)	The effect of 8-weeks proprioceptive exercise program in postural sway and isokinetic strength of ankle sprains of Tunisian athletes	Pilot study	Level-4
Eric Eils et al.,(2010)	Multistation proprioceptive exercise program prevents ankle injuries in basketball	Randomized controlled trial	Level-2
Timothy A. McGuine et al.,(2006)	The Effect of a balance training program on the risk of ankle sprains in high school athletes.	Randomized controlled trial	Level-2
Michael E. Powers et al.,(2004)	Six Weeks of strength and proprioception training does not affect muscle fatigue and static balance in functional ankle instability	Pilot study	Level-4

CONCLUSION FROM EVIDENCES

Based on all supporting evidences which were reviewed from data bases, it can be concluded that Proprioceptive exercises are effective in treatment of ankle sprain in sports injuries.

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CONFLICT OF INTEREST

There was no personal or institutional conflict of interest for this study.

SOURCE OF FUNDING

No fund was needed.

ETHICAL CLEARANCE

From K. K. Sheth Physiotherapy College, RAJKOT.

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