Effectiveness of proprioceptive exercises for ankle ligament injury in adults: a systematic literature and meta-analysis

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CRD summary
This review concluded that proprioceptive exercises may reduce subjective instability and improve functional outcomes as part of a rehabilitation programme for individuals with ankle ligament injury. Their effect on other outcomes remains unclear. This was a generally well-conducted review but the limitations of the small evidence base do not permit firm conclusions and the findings should be considered preliminary.

Authors' objectives
To assess the effectiveness of proprioceptive exercise for rehabilitation of adults with ankle ligament injury.

Searching
Twelve electronic databases (including MEDLINE, The Cochrane Library and Current Controlled Trials) were searched up to July 2011 for published and unpublished data in English. Reference lists were screened manually and experts were contacted for additional data. Search terms were presented.

Study selection
Eligible studies were randomised controlled trials (RCTs) that assessed the effectiveness on clinical and functional outcomes of exercise that allows a personal sense of the body (proprioceptive exercise). The primary outcome was recurrent injury at 12 months. Secondary outcomes were functional outcomes such as Foot and Ankle Disability Index and postural sway/joint position sense. Eligible participants were athletes and non-athletes (aged at least 16 years) with first-time or recurrent acute or chronic ankle ligament injury. Participants who had undergone ankle surgery were excluded.

Included participants had chronic ankle instability, repeat ankle inversion sprain or ankle sprain. The mean age of participants was 24 years and (where reported) the mean weight of participants was 72.5kg. Proprioceptive exercise differed across trials and included, for example, balance boards or co-ordination training. Exercise durations varied from once a week to seven times a week for a total of four to 12 weeks. Control groups received sham electrical stimulation, no intervention, usual care or co-ordination training with stimulation.

Two reviewers independently screened studies for inclusion until consensus was reached.

Assessment of study quality
One reviewer assessed trials for methodological quality using the Critical Appraisal Skills Programme tool. Quality assessment gave a score out of 10 using criteria such as complete follow-up, appropriate data presentation and blinding. A second reviewer verified the quality assessment.

Data extraction
Two reviewers independently extracted data to calculate differences between patients receiving rehabilitation with or without additional proprioceptive exercises. A third reviewer verified data extraction.

Methods of synthesis
Where meta-analysis was considered appropriate, a fixed-effect model was used to combine studies; a random-effects model was used where statistical heterogeneity was evident. Pooled standardised mean differences (SMD) or odds ratios (OR) and their 95% confidence intervals (CI) were calculated. Where there was evidence of clinical heterogeneity, a narrative synthesis was presented by outcome.

Statistical heterogeneity was assessed using the $X^2$ test and $I^2$ statistic; an $I^2$ value greater than 20% indicated statistical heterogeneity.
Results of the review
Eight RCTs (840 participants) were included in the review. Trials scored between 4 and 9 out of 10 on quality. Where reported, follow-up ranged from four weeks to one year.

Recurrent injury (two RCTs): The odds of recurrent ankle injury for individuals not prescribed proprioceptive exercises was twice as high as those prescribed proprioceptive exercises but the difference was not statistically significant (OR 2.27, 95% CI 0.08 to 66.31; I²=81%).

Postural sway/joint position sense (five RCTs): Three of four RCTs reported improvements with proprioceptive exercises. Results for the fifth RCT were not reported.

One RCT each reported improvements in subjective instability and functional outcomes in participants receiving proprioceptive exercises compared to controls. One RCT reported no statistically significant difference in swelling between treatment groups.

Authors’ conclusions
Proprioceptive exercises may reduce subjective instability and improve functional outcomes as part of a rehabilitation programme for individuals with ankle ligament injury. Their effect on other outcomes remains unclear.

CRD commentary
The review question and supporting inclusion criteria were clearly stated. There was a comprehensive search of the literature but as this was restricted by language, potentially relevant studies may have been missed. Quality assessment suggested that most trials had some methodological problems. Each stage of the review process was conducted in duplicate, thereby minimising the potential for reviewer error and bias.

Appropriate methods appear to have been used to synthesise the evidence. The evidence base was small and heterogeneous. Only two trials were included in the meta-analysis and the confidence intervals were very wide, which reduced the robustness of the findings.

The authors highlighted some limitations of the evidence including lack of blinding, loss to follow-up and limited reporting in the trials. The authors stated that the evidence did not permit conclusions regarding differences in potential treatment benefit between individuals who do and do not participate in sporting activities. They also stated that it was unclear whether benefit differed across age groups.

This was a generally well-conducted review and the authors’ conclusions are fairly cautious. However, the limitations of the small evidence base suggest that these conclusions should be considered preliminary as the findings for subjective instability and functional outcomes may not be reliable.

Implications of the review for practice and research
Practice: The authors did not state any implications for practice.

Research: The authors stated various implications for research, including the need for further more rigorous studies that assess the effectiveness of proprioceptive exercises and studies that identify which exercises are optimal. The authors also stated that cost-effectiveness studies are warranted.

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