The efficacy of stretching for prevention of exercise-related injury: a systematic review of the literature
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CRD summary
The aim of this review was to assess the effectiveness of stretching for the prevention of exercise-related injury. Clinical differences between the primary studies, as well as their overall poor quality, limited firm conclusions from the available evidence. The authors reasonably suggest that further research is necessary.

Authors' objectives
To assess the effectiveness of stretching for the prevention of exercise-related injury.

Searching
MEDLINE, EMBASE, AMED, SPORTDiscus, CINAHL, and SIGLE were searched for articles published from 1970 onwards; the search terms were reported. The authors did not indicate whether they restricted their search by language. In addition, the references of relevant publications were checked and key journals were handsearched. Abstracts and unpublished material were excluded from the review.

Study selection
Study designs of evaluations included in the review
Randomised controlled studies (RCTs) and controlled clinical trials (CCTs) were eligible for inclusion.

Specific interventions included in the review
Studies that examined stretching for the prevention of exercise-related injury were eligible for inclusion. A variety of stretching techniques, performed prior to exercise as part of warm-up practice, or as part of a daily routine, were described in the primary studies. Usual warm-up practice was used as the comparator; in at least 3 studies this also included some form of stretching. The intervention programmes lasted between 11 weeks and 1 year.

Participants included in the review
No a priori inclusion criteria were reported, and no participant characteristics were presented.

Outcomes assessed in the review
No a priori inclusion criteria were reported. The outcomes reported in the review included the incidence of any injury, soft-tissue injury, bone injury, lower extremity overuse injury, and lower third-quarter sprains.

How were decisions on the relevance of primary studies made?
The authors did not state how the papers were selected for the review, or how many reviewers performed the selection.

Assessment of study quality
The methodological quality of the primary studies was assessed using an author-generated 41-item checklist. This covered four core categories: study population, intervention, effect and data analysis. A maximum score of 100 could be awarded. Two reviewers independently assessed the validity of the primary studies, and any disagreements were resolved by consensus.

Data extraction
The authors did not state how the data were extracted for the review, or how many reviewers performed the data extraction.
Methods of synthesis
How were the studies combined?
The studies were combined in a narrative.

How were differences between studies investigated?
The studies were grouped by study design in the tables presented and within the body of the text. In addition, the study results were discussed with regard to their methodological quality. A sensitivity analysis of the checklist and distribution weights was performed.

Results of the review
Seven studies were included in the review: 4 RCTs and 3 CCTs (the total number of participants was unclear).

One of the 4 RCTs demonstrated a statistically significant difference in the incidence of injury between the intervention and control groups. All 3 CCTs reported statistically significant results in favour of the hypothesis that stretching reduces exercise-related injury.

When summarised by methodological quality, the 4 positive trials were shown to receive the lowest scores. The quality scores for all included trials ranged between 12 and 68, with 2 RCTs receiving scores over 50.

The sensitivity analysis revealed no change in the hierarchical order of the primary studies according to methodological quality.

Authors' conclusions
The authors stated that no definitive conclusions could be drawn from the available evidence, and that further research was needed.

CRD commentary
This review addressed a broad question relating to the benefits of stretching on exercise-related injury. Several sources were searched for relevant trials, but the authors did not report whether any language restrictions were applied. In addition, the exclusion of abstracts and unpublished material could mean that some trials were missed and bias consequently introduced. The methods used to select the studies and extract the data were not described; therefore, the possibility of reviewer error or bias could not be assessed. The authors performed an extensive quality assessment. This suggested that the overall quality of the primary studies was low, limiting confidence in their results.

The authors performed a narrative synthesis of the data, which seemed appropriate given the variety of interventions and outcomes assessed within the primary studies. However, for a narrative synthesis to be transparent, the individual studies must be presented in sufficient detail for the reader to assess the robustness of the synthesis. In this review, with the exception of methodological scores, details of the included studies were sparse. The authors acknowledged that the 'vote-count method' they employed in their synthesis could fail to detect small but important differences, owing to its reliance on traditional statistical significance. On the basis of this review, the efficacy of stretching for the prevention of exercise-related injury was inconclusive. The authors' conclusion that further research is needed seems justified.

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

Research: The authors suggested that carefully designed and conducted RCTs are needed to assess whether stretching could reduce injury risk. This may help the development of an effective injury prevention programme.

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