Authors' objectives
To determine whether stretching produces long-lasting increases in the mobility of joints not directly affected by surgery, trauma or disease.

Searching
MEDLINE, EMBASE, the Cochrane Controlled Trials Register and PEDro were searched from inception. In addition, the bibliographies of relevant publications were checked. Abstracts, unpublished material and non-English papers were excluded from the review.

Study selection
Study designs of evaluations included in the review
Only randomised controlled trials (RCTs) were eligible for inclusion. Two studies included a within-subject design.

Specific interventions included in the review
Stretching (either self-administered, administered manually by therapists or by some external device such as a splint) for the purpose of changing or preventing change in joint range of motion (ROM). Stretching could be of any duration, frequency or intensity, but only studies where the intervention was administered over more than one day were included. The included studies were of between 3 and 20 minutes stretching per day, with a median of eight treatments (range: 3 to 56) over 21 days (range: 3 to 42). No study quantified the intensity of the stretching. All of the studies included a no-stretch control.

Participants included in the review
Studies that involved individuals receiving a stretching intervention, which was administered to a joint or tissues not directly affected by surgery, trauma or disease, were eligible for review. None examined the effect of stretching in patients with clinically significant contractures. In seven studies the participants were treated because they had tight or short muscles, but in none was it function-limiting.

Outcomes assessed in the review
Studies were eligible if they assessed any measure of joint ROM, joint compliance or flexibility, provided the outcome had been assessed at least one day after the last stretch intervention.

How were decisions on the relevance of primary studies made?
Potentially relevant articles were independently screened by two reviewers, with any disagreements resolved by negotiation.

Assessment of study quality
The methodological quality of the included studies was scored with the PEDro scale. This covered ten criteria: randomisation; concealment of allocation; blinding of the patients, therapist and assessors (3 criteria); statistical analysis; variability; intention-to treat analysis; and drop-outs. Full details were available from the authors. The PEDro score was used to rate each study as poor, moderate or high quality. Two reviewers scored each trial independently, with any disagreements resolved by negotiation.

Data extraction
The authors do not state how the data were extracted for the review, or how many of the reviewers performed the data extraction.
Methods of synthesis
How were the studies combined?
The four best quality studies (i.e. those of moderate quality) were combined in a meta-analysis using a fixed-effect model. The remaining (poor-quality) trials were combined in a meta-analysis using a random-effects model.

How were differences between studies investigated?
Homogeneity of the moderate-quality trials was determined by visual inspection of the weighted mean differences displayed on a forest plot. The authors did not state whether the poor quality trials were heterogeneous and if this was the reason for adopting a random-effects model for their meta-analysis.

Results of the review
Thirteen studies (n=504) were included.

Four of the studies were rated as moderate quality while the remainder were poor. The pooled result for the four moderate-quality studies (fixed-effect model) was a mean increase in ROM of 8 degrees (95% confidence interval, CI: 6, 9). The mean pooled estimate from the poor-quality trials (random-effects) was an increase of 6 degrees (95% CI: 5, 8). Ad hoc subgroup analyses found that for treatment applied over more than 3 weeks, the mean pooled estimate was an increase in ROM of 8 degrees (95% CI: 6, 10); the increase in ROM for treatment applied over less than 3 weeks was 5 degrees (95% CI: 3, 8). In addition, for treatment applied to muscles with limited extensibility, the mean pooled estimate was an increase in ROM of 8 degrees (95% CI: 6, 9); the increase in ROM for treatment applied to muscles with normal extensibility was 4 degrees (95% CI: 2, 7).

Authors' conclusions
The authors concluded that, although the trials indicate that stretching can produce increases in joint ROM that are still evident one or more days after the cessation of treatment in people without clinically significant contractures, these findings require confirmation in high-quality RCTs.

CRD commentary
This was a well-conducted review. The inclusion criteria for the review were clearly defined and the review methodology was generally good. The literature search was reasonably wide, although the exclusion of abstracts, unpublished studies and non-English articles could have meant that some trials were missed and bias could have been introduced. A meta-analysis was appropriate, although it was not clear from the paper why all 13 studies were not pooled. No statement of their overall heterogeneity was given, and the results presented did not indicate that the moderate and poor studies were different from one another. Overall, the authors' conclusions were supported by the review's findings.

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

Research: The authors state that the findings in people without clinically significant contractures need to be confirmed in high-quality RCTs, and that trials in patients with functionally significant contractures are needed. The effects of longer sessions of stretching over longer periods of time need investigating. In addition, the effects on joint ROM at least one week after the cessation of the intervention should be evaluated.

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Record Status
This is a critical abstract of a systematic review that meets the criteria for inclusion on DARE. Each critical abstract contains a brief summary of the review methods, results and conclusions followed by a detailed critical assessment on the reliability of the review and the conclusions drawn.