Update for Chapter 7: Does stretching help prevent injuries
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Since the publication of the first edition of this book, there has only been one clinical study that evaluated whether stretching affects the risk of injury. In the cohort study by Amako et al., the intervention was stretching both pre and post exercise. Although not statistically significant, the results suggested a decrease in muscle/tendon injuries with the stretching program, but an increase in other types of injuries, with an overall relative risk of injury of 0.77 (95%CI: 0.54,1.08) for the combined effect. Because the intervention included stretching both pre and post exercise, one cannot be sure if the observed beneficial effects (if not by chance) occur with pre-exercise stretching, post-exercise stretching, or both. There were some limitations to this study, the most important being that allocation to stretch or non-stretch group was done by the company commander, and different companies may train at different intensities, different levels of fatigue, etc.

There has also been one basic science study on the effects of regular stretching outside periods of exercise. In the first edition, I discussed stretch-induced hypertrophy as a mechanism whereby regular stretching could theoretically protect against injury (note: the 2 studies on non pre-exercise stretching showed decreased injuries or severity of injury). Although stretch-induced hypertrophy occurs, it had only been shown in studies using 24-hour/day stretching for a period of a couple of weeks. I suggested that it was theoretically possible that 2min stretching per day for longer periods of time could theoretically induce the same effect. However, Black and Stevens recently found that 2min stretching of the mouse extensor digitorum longus muscle per day for 12 days did not reduce the force or work deficit created by an acute eccentric-induced injury. This finding does not support my proposed hypothesis from the first edition, but the duration of the stretching period was only 12 days. Incidentally, using similar methodology (again in mice) Black and Stevens found a similar “non-effect” of stretching just prior to exercise.

Finally, I have received numerous comments from readers of the first edition or from audience members following presentations, and I would like to clarify two things: warm-up and dynamic stretching. In the colloquial sense, warm-up means any activity performed before participating in sport. Used in this sense, stretching is one component of warm-up. The other component of warm-up is performing activity similar to the sport, but performed at a lower intensity (e.g. jogging slow before starting a running race). The word “warm-up” is often used to specifically describe this activity because the activity increases the temperature of the working muscles. I prefer to restrict the term warm-up to performing activity at low intensity. If stretching is included in the pre-exercise activity, I explicitly state that stretching was used. In this way, we minimize confusion by using one term for each possible type of intervention. Of course, warm-up activity does more than just increase the temperature of the working muscles and the reader should be aware that the physiological mechanisms behind the effects of warm-up activity may or may not be related to temperature changes.
With respect to “dynamic stretching”, the term is currently used differently by different people, but in essence, refers to the stretching of a muscle by contracting and relaxing the antagonist muscle. For example, if a subject uses the hip abductor muscles to swing the lower limb laterally until the adductor muscles are stretched and then relaxes the abductors and contracts the adductors to swing the lower limb medially, and repeats this several times, some would consider this a dynamic stretch of the adductor and abductor muscles. There is no research on injury rates with this type of stretching and so no definitive statements can be made. However, one should note that this type of activity includes both classical stretching and warm-up at the same time. Therefore, the effects would be expected to be intermediate between those obtained by only stretching, and those obtained by only warm-up activity. Those who promote dynamic stretching as a method to prevent injury should provide some evidence that supports their claim, and the control group should be warm-up activity (which may decrease the risk of injury) and not stretching (which does not decrease the risk of injury).

Reference List


## Updated evidence summary table

<table>
<thead>
<tr>
<th>Comparison</th>
<th>Results</th>
<th>Level of evidence *</th>
</tr>
</thead>
<tbody>
<tr>
<td>Does Stretching Before Exercise Prevent Injury</td>
<td>5 RCTs, 3 Propective Cohorts, 1 historical cohort, 6 cross-sectional studies. Conflicting results explained in Tables 2 and 3. <strong>Overall,</strong> stretching before exercise does not prevent injury. There was an additional prospective cohort study but it used an intervention of pre- and post-exercise stretching. Note that most studies done on recreational athletes or military personnel. According to the basic science of injury, there is no reason why elite athletes would be expected to have different results.</td>
<td>grade A1</td>
</tr>
<tr>
<td>Does Stretching Outside Periods of Exercise Prevent Injury</td>
<td>2 RCTs (n=300-470) weaknesses in follow-up and differences in baseline characteristics. One study suggested a decreased injury rate and the other only decreased severity of injury. There was an additional prospective cohort study but it used an intervention of pre- and post-exercise stretching.</td>
<td>grade A1</td>
</tr>
</tbody>
</table>

* grade A1: evidence from large RCTs or systematic review (including meta-analysis) †
  grade A2: evidence from at least one high quality cohort
  grade A3: evidence from at least one moderate size RCT or systematic review †
  grade A4: evidence from at least one RCT
  grade B: evidence from at least one high quality study of non-randomized cohorts
  grade C: expert opinions

† Arbitrarily, the following cut-off points have been used; large study size: ≥100 patients per intervention group; moderate study size ≥ 50 patients per intervention group.