

EFFECT OF STATIC AND DYNAMIC STRETCHING DURING A FULL WARM-UP ON ATHLETIC PERFORMANCE IN ATHLETES

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Introduction: Significant evidence indicates that static muscle stretching can acutely reduce muscle force/power production whilst dynamic stretching may increase it. However, study designs have not been appropriate in the majority of studies to determine whether muscle stretching affects performance when it is performed within a full, sports-specific warm-up (Behm et al. 2016). We aimed to determine the effects of static and dynamic stretching during a 'sport-specific warm-up' on running, jumping, agility and flexibility performances in athletes. **Methods:** Twenty men competing in running-based sports completed a familiarization and four weekly testing sessions. Using a randomized, cross-over design the subjects performed 5-s static passive stretches of lower limb muscles, 3x10-s static stretches, dynamic stretches (5 reps/leg, identical body positions to static stretches) or a non-stretch control condition within a warm-up (5-min general warm-up before stretch, and test-specific, progressive warm-up including maximal efforts after stretch). Researchers were blinded to the warm-up condition, and subjects nominated which condition they believed would yield best performance before the study (subject-level bias) as well as their perception of 'preparedness' (1-10 scale) after each warm-up condition. **Results:** Eighteen of 20 subjects believed that dynamic stretching would yield best performances, however no between-condition differences ($p=0.23-0.99$) were detected in: (1) 5 m, 20 m or 10-20 m sprint times, (2) squat, countermovement or 3-step running jump heights, or (3) agility T-test time. Magnitude-based inference statistics showed a high likelihood of 'trivial' changes. Small and equal post-warm-up increases in sit-and-reach flexibility (1.9-2.4 cm, $p<0.01$) were achieved in the stretch conditions compared to no stretch. Subjects typically felt more prepared ($>5.2/10$) for testing when some stretching was performed (no stretch=3.9/10), with no differences between conditions. **Discussion:** No stretch-specific effect on performance was observed when a warm-up protocol that included low-intensity exercise before muscle stretching was followed by a progressive, test-specific warm-up to maximum exercise intensity in athletes. Thus, although subjects felt better prepared for exercise, short- (5 s) or moderate-duration (30 s) static stretching or dynamic stretching had no group-level effect on performance when used in a full warm-up. Subject belief (i.e. subject-level bias) also did not influence test performances. Based on current and previous data, and contradictory to (some) current recommendations, muscle stretching appears not to influence physical performance when used as part of a full 'sport-specific warm-up' in athletes.

Reference

Behm D., Blazevich A.J., Kay A.D., McHugh M. (2016). *Appl Physiol Nutr Metab*, 41, 1-11.

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