ACUTE EFFECTS OF LAB- AND FIELD-BASED CONTRACT-RELAX (CR) AND MODIFIED CR STRETCHING ON KNEE FLEXOR MUSCLE-TENDON MECHANICS

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Introduction: Similar mechanical and neurological changes have recently been reported at the ankle following traditional contract-relax (CR) stretching and a modified contract-relax (MCR) technique where the contraction phase was performed 'off stretch' (Kay et al., 2016). However, as these techniques were performed in a dynamometer, the efficacy of the modified technique in an athletic environment remains unknown. Therefore, the acute effects of both techniques were examined in lab- and field-based environments. **Methods:** Using a randomised, cross-over design, 17 recreationally active subjects performed the CR_{lab}, CR_{field}, MCR_{lab} and MCR_{field} hamstring stretches (4 x 10-s stretches + 5-s contractions) on separate days. Before and after the stretches, maximal isometric and passive knee flexor moment and knee extension range of motion (ROM) were recorded on an isokinetic dynamometer. Semitendinosus electromyographic (EMG) activity was recorded simultaneously, whilst ultrasound imaging was used to record biceps femoris tendon elongation. **Results:** Significant increases in knee extension ROM (4.6-5.2°; $P < 0.01$) and elastic energy potential (12.0-23.6%; $P < 0.05$), and decreases in the slope of the passive moment curve (8.9-12.2%; $P < 0.05$) and tendon stiffness (10.8-15.1%; $P < 0.05$) were observed in all conditions. A significant increase in peak passive moment (i.e. stretch tolerance) was observed after field-based stretches only (14.3-14.8%; $P < 0.01$). No significant change ($P > 0.05$) in maximal isometric strength, or volitional or reflexive EMG was observed in any condition. A significantly greater increase in elastic energy potential was observed following field- than lab-based stretches ($P < 0.05$); however no difference in between-condition changes was found in any other measure ($P > 0.05$). **Conclusion:** The similar mechanical changes observed after CR and MCR stretching in lab- and field-based environments are indicative of common underlying mechanisms explaining the analogous ROM improvements. These data confirm both the efficacy of the MCR stretch technique to enhance knee flexor ROM and the ecological validity of performing this technique in an athletic environment. The implications for current practice are substantial as subjects completed the MCR technique without partner assistance, yet achieved similar acute increases in ROM as traditional CR stretching (i.e. the most effective stretching mode). Thus, the MCR stretching technique represents an equally effective yet more practical stretching paradigm.

References

Kay AD, Dods S, Blazevich AJ. (2016). Acute effects of contract-relax (CR) stretch versus a modified CR technique. *Eur J Appl Physiol*. doi: 10.1007/s00421-015-3320-8

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