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THE EFFECT OF PERIPHERAL FATIGUE ON KNEE JOINT POSITION SENSE.

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Introduction and Objectives: Muscular fatigue is the inability to maintain a power output or force during repeated muscular contractions due to changes in physiological processes. Joint position sense (JPS) is the awareness of position in space. Exercising when fatigued increases the risk of injury, which may be due to a reduction in knee position sense. Indeed, evidence suggests more injuries occur in the final third of sports matches than in earlier periods. The aim of this study was to measure the effect of peripheral muscular fatigue on knee JPS.

Methods: 20 healthy participants provided informed consent. Knee JPS was recorded before and after a fatiguing protocol. The JPS measurements were taken using a previously validated method (Relph and Herrington, 2014a, 2014b). This involved open chain, passive-active reproduction of a target angle into both flexion and extension. Absolute error scores (AES) were taken as the absolute difference between target and reproduction angles. Angles were measured using image capture and manual digitising techniques. Fatiguing protocol was conducted on an isokinetic dynamometer and involved concentrically extensions and flexions of the dominant knee maximally at 60°/s until they reached 50% of their maximum voluntary contraction on three consecutive trials in both flexor and extensor muscle groups.

Results: The mean (±SD) maximum voluntary contraction into knee flexion and extension was 78.7N.m (±22.8) and 177.1N.m (±39.0) respectively. Results of the analysis revealed no effect of the fatiguing protocol on either JPS flexion ($p=0.729$) or JPS extension ($p=0.492$). Knee JPS flexion error scores reduced by 0.17° and JPS extension error scores reduced by 0.14°. Discussion - One viable explanation of the results of this study is the fatiguing protocol was not severe enough to induce a fatigued state. For example the anterior shear loads imposed on the knee joint during isokinetic contraction at 180°/s are equivocal to that of walking and compressive loads equivalent to stair climbing. This suggests studies using isokinetic fatiguing may not create representative fatiguing of the joint as would occur during exercise. The method of measuring fatigue levels using 50% of MVC may also have limitations. It may be more appropriate to use blood analysis techniques to confirm fatigue. However, it would appear peripheral fatigue occurred to some extent as MVC performance did reduce. Another explanation for the lack of JPS decline may be compensatory techniques in the central nervous system, central processing may have adjusted efferent information to ensure continued to provide accurate joint position sense.

Conclusion: In conclusion, peripheral fatiguing protocols may not induce fatigue to an appropriate level to illustrate the effects on knee JPS. Alternatively, knee JPS may not be affected by fatigue and hence a reduction in knee static proprioception may not be a mechanism of the increased risk of injury during the latter stage of exercise and sport. Future research should consider the effect of central fatiguing on knee proprioception. Disclosure -This data is new and has not been submitted elsewhere.

References: Reference 1

Relph et al. (2014a). Inter-Examiner, Intra-Examiner and Test-Retest Reliability of Clinical Knee Joint Position Sense Measurements Using an Image Capture Technique. J. Sport Rehabil., In Press.

Reference 2
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