



A study into the optimal contraction intensity for maximal increase of range of movement following the application of proprioceptive neuromuscular facilitation

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University of Bedfordshire **Background** Proprioceptive Neuromuscular Facilitation (PNF) is a widely utilised and accepted method of achieving increases in flexibility. Much research has already been carried out on the effects of PNF on power output and comparisons with other forms of stretching.

Introduction A survey of literature on the use of proprioceptive neuromuscular facilitation (PNF) indicates that the force of contraction requested from the athlete ranges from 20 to 100% of maximum voluntary isometric contraction (MVIC). The aim of the project was therefore to determine the optimal contraction intensity to elicit maximum increase in range of motion (Δ ROM).

Methodology A convenience sample of 56 university athletes (male $n=37$, 21.1 ± 1.3 years, 179.9 ± 9.0 cm, 78.6 ± 9.7 kg; female $n=19$, 21.5 ± 1.0 years, 168.1 ± 7.8 cm, 64.5 ± 10.7 kg) was recruited from the student population at the University of Bedfordshire. After completing ethical consent and medical screening, MVIC was established at the hip extensors. The higher of two contractions, measured by a strain gauge dynamometer (ErgoMeter, Globus, Codogno, Italy), was taken to be representative of MVIC.

Target contractions were set at 20, 50 and 100% MVIC, assigned via a Latin Square design, and monitored throughout the contraction with the dynamometer. Athletes were blind to the force generated. The following post-isometric relaxation (PIR) stretch protocol was used: active motion to first bind point; build to target contraction over 5 seconds; hold target contraction for 7 seconds; active re-set to new bind point; relax for 12 seconds; repeat sequence for 3 contractions.

Results At target MVIC of 20, 50 and 100% the athletes generated mean forces of 30.5, 55.2 and 78.3% MVIC, eliciting mean Δ ROM of 8.4, 12.9 and 11.6°, respectively. Differences in Δ ROM elicited by the three target intensities were significant ($P = 0.034$ to < 0.001).

Discussion Our results indicate that for the PIR-PNF protocol tested, an optimum contraction force of 64.3% MVIC elicits a peak mean Δ ROM of 13.3° of hip flexion. Previously suggested Golgi tendon organ activation and muscle spindle fibre inhibition during PIR-PNF may explain the distribution of Δ ROM against %MVIC demonstrated by the athletes investigated.

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