muscle provoked by the execution of four FNP motor irradiation maneuvers.
Methods: A cross-sectional observational study was conducted with 33 healthy participants (19 women and 14 men, with 27 ± 5 years of age, 1.70 ± 0.09 m in height, 68.6 ± 14.47 kg in body mass, and BMI of 23.64 ± 3.90 kg/m^2). Inclusion criteria were age between 18 and 45 years and agreement to sign the Free and Informed Consent Form. Individuals with uncontrolled cardiovascular conditions, musculoskeletal alterations, post-COVID sequelae, and other contraindications to the use of EMG were excluded. After signing the consent form, a screening session was held to identify the demographic characteristics of the sample and identify the non-dominant side. Next, the maximum voluntary contraction of each participant was measured. Then, surface electromyography (EMG) (Delsys trigno) of the biceps brachii on the non-dominant side was obtained, while the patterns of (i) flexion, adduction and external rotation with knee flexion in lateral decubitus; (ii) extension, adduction and internal rotation of the upper limb in dorsal decubitus; (iii) rotation of the lower trunk in prone; and (iv) pre-bridge position on the elbows (upper limb along the body without supporting it on the stretcher) in an adapted position (standing with the knees semi-flexed) were applied on the dominant side against manual resistance. Each pattern was repeated 3x and the contraction maintained for 5s on each attempt, with a 10s rest interval. Abdominal strength tests were performed according to the American College of Sports Medicine protocol.
Results: The amplitude of the EMG of the biceps brachii was significantly different between the irradiation maneuvers applied, but there was no group effect (divided according to performance in the abdominal test), nor any significant interaction between group and maneuver.
Conclusion: The data indicate that the level of performance in the abdominal test may not significantly influence the specific recruitment of the biceps brachii during the application of irradiation maneuvers. Future studies should consider a larger sample size, with different age groups and body composition, and with different kind of diseases.
Implications: This study challenges the assumption that stronger abdominal muscles decrease recruitment of distal muscles through irradiation techniques. If future studies confirm these findings, abdominal strength will not need to be considered when healing weakness of a segment with motor irradiation.
Keywords: Rehabilitation, Muscle Contraction, Electromyography

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182

BICEPS BRACHII ACTIVATION DURING MOTOR IRRADIATION: A CROSS-SECTIONAL STUDY IN HEALTHY INDIVIDUALS

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Background: Motor irradiation is a basic procedure of proprioceptive neuromuscular facilitation (PNF) in which a manual resistance is applied to one body part to generate muscle activation in another segment, aiming at improving strength. Few studies have investigated whether the targeted muscle exhibits a relevant electromyographic (EMG) pattern of muscle activation during the application of motor irradiation. Moreover, no study analyzed motor irradiation targeted to the biceps brachii muscle, an essential muscle in various daily activities evolving upper limbs.
Objectives: To analyze the muscle activation patterns of the biceps brachii in healthy individuals during different PNF irradiation maneuvers.
Methods: This was a cross-sectional study in which 33 healthy individuals were assessed, 19 women, 26 years old (min 20, max 43), 67kg (min 42, max 97), 1.70m (min 1.51, max 1.88). After signing the consent form, a screening session was carried out immediately before the intervention, consisting of identifying the sample, the non-preferred side and maximum voluntary contraction measurements. EMG (Delsys trigno) of the biceps brachii were performed during 4 randomized FNP irradiation techniques (flexion, adduction, and external rotation of the lower limb [FAR]; extension, adduction and internal rotation of the upper limb [EAR]; inferior rotation of the trunk [ROT] and prone on the adapted elbow [PRO]). The techniques were applied 3 times for 5 seconds with a 10-second interval.
Results: There was electromyographic activation of the biceps brachii for the 4 FNP motor irradiation maneuvers. In the post hoc analysis, the upper limb extensor pattern showed less activation when compared to the other three patterns ($P < 0.006$). EMG amplitude was consistently higher in maneuvers than EAR when compared with other maneuvers. Group analysis revealed significant differences in EMG amplitude (in % of MVC) among motor irradiation maneuvers ($P < 0.001$). Posttest analysis reveals significant differences between EAR maneuver and FAR ($P < 0.001$), PRO ($P = 0.006$) and ROT ($P < 0.001$), with no differences among FAR, PRO and ROT (P always > 0.875). EMG amplitude in EAR was smaller than in other PNF maneuvers. There were also significant differences in active EMG duration (in % of total duration) among PNF maneuvers ($P < 0.001$). Posttest analysis reveals significant differences between EAR and FAR ($P = 0.006$), PRO ($P = 0.002$) and ROT ($P < 0.001$), with no differences among FAR, PRO and ROT (P always > 0.506). EAR exhibited the shorter active EMG duration compared with other PNF maneuvers.
Conclusion: There was activation of the biceps brachii for all four FNP irradiation techniques, with the upper limb extensor pattern showing the least activation. Future studies should explore clinical applications, long-term effects, and functional benefits of different muscles and PNF irradiation maneuvers.
Implication: These findings can help guide rehabilitation strategies, emphasizing the importance of selecting appropriate PNF techniques for targeted muscle activation. Clinicians can use this information to optimize treatment for patients with upper limb weakness or neuromuscular impairments.
Keywords: manual therapy, proprioceptive neuromuscular facilitation, electromyography

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