

correlations of weak magnitude were observed between AIR and LCADL ( $\rho=0.39$ ), AIR and CAT ( $\rho=0.10$ ), and AIR and MRC ( $\rho=0.17$ ).

**Conclusion:** The study's preliminary results indicate that the AIR demonstrates adequate measurement properties for assessing anxiety symptoms in patients with COPD. The study will be continued to expand the sample number.

**Implications:** This study will provide a measurement instrument for investigating anxiety symptoms in patients with COPD with appropriate measurement properties, which may facilitate early identification and proper treatment.

**Keywords:** Chronic Obstructive Pulmonary Disease, Anxiety, Reproducibility of Tests

**Conflict of interest:** The authors declare no conflict of interest.

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## ANALYSIS OF THE RELATIONSHIP BETWEEN FUNCTIONAL TESTS PERFORMANCE AND LOWER LIMB STRENGTH

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**Background:** Lower limb stabilizing muscle strength imbalance and changes in functional performance and dynamic balance have been reported as predictors of lower extremity injuries. Lower limb functional tests are commonly applied in clinical practice to assess functional performance as well as used as a measure of progression during rehabilitation. Among them, the Star Excursion Balance Test (SEBT) and the Single Leg Hop Test (SLHT) stand out as easy-to-apply and low-cost tools.

**Objectives:** To evaluate the relationship between lower limb stabilizing muscle strength and performance in functional tests in individuals without history of injury.

**Methods:** This is a quantitative cross-sectional study. As eligibility criteria, male individuals, aged 18 to 30 years, with no history of previous injury to the lower limbs were included. The data collection was divided into two days. On the first day, anamnesis was performed, anthropometric data were collected, familiarization with the muscle strength test was carried out and the functional tests SLHT and SEBT were applied to the Dominant Limb (DL) and Non-Dominant Limb (NDL). On the second day, the strength of the stabilizing muscles of the hip (lateral rotators and abductors), knee (quadriceps and hamstrings) and ankle (inverters and evertors) were assessed using a portable Lafayette® dynamometer stabilized by an inelastic band. Three maximal voluntary isometric contractions were performed, lasting five seconds, with a thirty-second interval between each contraction, bilaterally. The peak strength of each movement was recorded and later normalized by body mass. Statistical analysis was performed using the SPSS 18.0® software, applying the Shapiro-Wilk normality test and the Pearson correlation test. A significance level of  $\alpha<0.05$  was adopted.

**Results:** 20 male individuals were collected. A moderate positive correlation was observed between peak strength of the NDL lateral rotators and hip abductors with performance in the DL SLHT and posteromedial SEBT. In addition, the strength of the knee extensors of both limbs was positively correlated with performance in the SLHT of the NDL. Furthermore, a correlation was observed between peak strength of NDL lateral rotators, DL ankle inverters and hip abductors with NDL posteromedial SEBT.

**Conclusion:** The maximum isometric strength of the lower limbs stabilizing muscles is related to the performance in functional tests.

**Implications:** The weakness of the stabilizing muscles of the hip and knee is directly related to a lower performance in functional tests, which may cause instability during movements, resulting in biomechanical changes that increase the risk of injury to the lower limbs. Still, the findings of this study elucidate that the performance analysis should take into account the bilateral force for the parameters of rehabilitation and injury prevention.

**Keywords:** Muscle Strength, Physical Functional Performance, Muscle Strength Dynamometer

**Conflict of interest:** The authors declare no conflict of interest.

**Acknowledgment:** Not applicable.

**Ethics committee approval:** Study approved by the Research Ethics Committee of the Faculty of Philosophy and Sciences - São Paulo State University, under protocol n° 5.502.514.

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## EFFECTS OF TRAINING WITH BLOOD FLOW RESTRICTION ASSOCIATED TO ELECTROSTIMULATION ON MUSCLE THICKNESS AND PERFORMANCE: CLINICAL TRIAL PROTOCOL

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**Background:** Among the factors that can influence an athlete's performance, muscle strength stands out in relation to performance and risk of injuries in sports. As an alternative to quadriceps strength training, blood flow restriction (BFR) and neuromuscular electrical stimulation (NMES) are two techniques used to enhance muscle recruitment with less risk of mechanical damage and joint overload.

**Objectives:** Evaluate the effects of strength training with BFR and BFR associated with NMES of the quadriceps muscle in physically active subjects on parameters of muscle thickness and lower limb performance.

**Methods:** This is a randomized clinical trial. The volunteers will sign the informed consent form. Will be recruited 60 individuals of both sexes, aged between 18 and 35 years, physically active according to the International Physical Activity Questionnaire (IPAQ). An initial anamnesis will be carried out to characterize the sample and anthropometric data will be collected, as well as thigh cytometry. Then, the volunteers will be randomized into three groups: Blood Flow Restriction Group (BFRG), Blood Flow Restriction Associated with Electrostimulation Group (BFREG) and Conventional Exercise Group (CEG). The evaluators will be blind in relation to the group that the individual was allocated, as well as the person responsible for the statistical analysis. Ultrasonography will be used in vascular

Doppler mode to measure Total Occlusion Pressure (TOP) and in two-dimensional mode with a linear transducer to assess quadriceps muscle thickness. The performance of the lower limb will be evaluated from the height of the jump on the contact platform in the Counter Movement Jump (CMJ), Squat Jump (SJ) and Drop Jump (DJ) modes from an elevation of 30 and 60cm. The test of a maximum repetition (1MR) unilateral in the extension chair will be used to quantify the load during the interventions. The flow restriction protocols and the same combined with electrostimulation will have four sets of 30, 15, 15, 15 repetitions, with 1 minute of rest between sets of knee extension, with a load of 30% 1MR and 50% of the TOP, which will be adjusted by 5% each week of the protocol until reaching a TOP of 80%. In the CEG, conventional strengthening will be performed, with 70% 1MR in the leg extension, which will have three sets of 10 repetitions, with a 1-minute rest interval between sets. The training will be carried out twice a week, for a period of eight weeks, with reassessment of the 1RM test in the fourth week. At the end of the protocol, individuals will be reassessed.

**Conclusion:** It is expected that the findings of this study confirm the effectiveness of training with blood flow restriction compared to conventional exercise and that there is superiority in results when associated with neuromuscular electrostimulation.

**Implications:** In clinical practice, if proven effective, this strengthening program can be proposed as a muscle strengthening option for individuals who cannot tolerate high loads during conventional training.

**Keywords:** Muscle Strength, Blood Flow Restriction Therapy, Electric Stimulation Therapy

**Conflicts of interest:** The authors declare no conflict of interest.

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**Ethics committee approval:** Universidade Estadual Paulista – UNESP Faculdade de Filosofia e Ciências - Campus de Marília nº 5.809.107.

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## INTERSEGMENTAL COORDINATION BETWEEN HUMERUS AND SCAPULA DURING ARM ELEVATION IN YOUNG ADULTS

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**Background:** The intersegmental coordination between humerus and scapula and its variability are inherent to the functional movements of the shoulder. The literature is vast in the characterization of this relationship in discrete angles such as 30, 60, 90 and 120 degrees. Despite the great importance of these specific points of arm elevation amplitude, it is possible to describe coordination by another approach that provides information on the entire time series of arm elevation to the maximum amplitude, as well as on the intra and inter subject variability of the arm elevation coordination pattern. Therefore, exploring the pattern of coordination between humerus and scapula might be relevant to better understand motor variability of the individual and throughout the arc of arm movement.

**Objectives:** Explore the coordination pattern between humerus and scapula and its variability in asymptomatic individuals during arm elevation movement.

**Methods:** This is an observational cross-sectional study, in which the coordination between humerus and scapula was evaluated in fifteen individuals without shoulder pain during the maximum arm elevation movement in the self-selected plane. The evaluation was performed by 3D analysis of the scapular kinematics in a laboratory environment, using the hardware (Ascension Technology Corporation, Burlington, VT) TrakSTAR (miniBird®) integrated with the software MotionMonitor™ (Innovative Sports Training, Inc. Chicago, IL).

**Results:** The angle diagrams with the relationship between the humerus and the scapula during the entire time series with 3 trials for each subject of the arm raise in a self-selected plane show different patterns of coordination. Some subjects have a linear and continuous relationship between the two segments throughout the movement, while others have a greater contribution from a specific segment at different amplitudes. This difference was identified mainly in the last degrees of movement. A variability between the three attempts was also observed in some subjects, while others showed great consistency between the trials. Finally, different patterns of coordination were observed between the up and down movements of the arm among the subjects.

**Conclusion:** The observation of coordination between humerus and scapula throughout the time series suggests that there are different patterns of coordination between attempts, between individuals and between the phases of the arm raising movement.

**Implications:** The intersegmental coordination between humerus and scapula during arm elevation shows important information for the characterization of the individual's motor behavior that go beyond discrete points of arm elevation movement. The variability observed in the motor pattern may be related to the inherent variability of shoulder movement and the individual's ability to adapt their motor strategies to functional demands, which possibly has repercussions on cases of shoulder dysfunction, its management and prognosis.

**Keywords:** Shoulder Joint, Kinematics, Biomechanical Phenomena

**Conflict of interest:** The authors declare no conflict of interest.

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## INTRA- AND INTER-RATER RELIABILITY AND AGREEMENT OF STIMULUS ELECTRODIAGNOSTIC TESTS IN POST-COVID-19 PATIENTS WHO EXPERIENCED MODERATE OR SEVERE INFECTION

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**Background:** Post-COVID-19 patients may have several sequelae, such as neuromuscular electrophysiological disorders (NED), which can be evaluated using the stimulus electrodiagnosis test (SET). However, no information is available about the reliability and agreement of SET in diagnosing NED in COVID-19 patients.