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RESPIRATORY TRAINING AND RESISTANCE COMBINED WITH BLOOD FLOW RESTRICTION IN IMPROVING RESPIRATORY VARIABLES IN PEOPLE WITH COPD

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Background: Chronic Obstructive Pulmonary Disease (COPD) is an inflammatory and progressive condition that causes ventilation limitation, reducing the quality of life of individuals due to decreased exercise tolerance. Due to the characteristics of the disease, resistance exercise for this population is limited to low (LB) or moderate (MB) loads. In this context, resistance training (RT) + blood flow restriction (BFR) can provide gains similar to those of training with high loads and has been incorporated into inspiratory muscle training (IMT) as an intervention strategy for COPD management.
Objectives: Evaluate the acute effects of IMT and RT with or without BFR on: maximum inspiratory pressure (MIP), respiratory rate (RR), peripheral oxygen saturation (SpO_2), and dyspnea in individuals with COPD.
Methods: This is an experimental clinical trial with a crossover design. The sample consisted of 14 elderly individuals (67.5 $\pm$ 1.76 years) of both sexes, diagnosed with mild, moderate, or severe COPD, who were initially evaluated for body composition, ankle-brachial index (ABI), determination of arterial occlusion pressure (AOP), evaluation of inspiratory muscle strength, and 1RM test. They were then subjected to 3 experimental protocols: 1) RT with low load (30% 1RM) + IMT (30% MIP); 2) RT with low load (30% 1RM) + BFR (50% of AOP) + IMT (30% MIP); and 3) RT with moderate load (50% 1RM) + IMT (50% MIP), with a wash-out period of 48-72 hours. Respiratory rate (RR), SpO_2, and dyspnea were assessed before, immediately after, and 10 minutes post-exercise, while MIP was measured after each protocol. Data were analyzed using the Statistical Package for the Social Sciences (SPSS — 26.0), with a significance level set at P = 0.05.
Results: There was a significant reduction in respiratory rate (RR) when comparing pre- and 10-minute post-intervention in all protocols, and in the intergroup comparison, the TRCB+RFS+IMT protocol showed a lower value than TRCB+IMT (P = 0.001). No differences were found in SpO_2 between the groups; however, an increase was observed in the intragroup comparison between pre- and 10-minute post-intervention in all protocols. No difference was found between pre- and post-MIP values in the protocols (P > 0.05), but in the intergroup analysis, an increase was observed in TRCB+RFS+IMT (P = 0.010) compared to TRCB+IMT. A significant reduction in dyspnea was observed in the TRCM+IMT group (P = 0.001) compared to TRCB+IMT and TRCB+RFS+IMT.
Conclusion: IMT associated with RT, with or without BFR, was able to reduce respiratory rate (RR) and dyspnea, as well as increase SpO_2 in individuals with COPD. However, the only protocol that showed a significant increase in MIP was TRCB+RFS+IMT, demonstrating greater effectiveness. Further studies are needed to explore the potential of these protocols in specific samples according to the severity of symptoms, for better homogenization of results.
Implications: This study demonstrates that IMT combined with RT, with or without BFR, effectively improves dyspnea and respiratory variables, highlighting its potential application in physiotherapy for COPD treatment.
Keywords: COPD, BFR, Dyspnea

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RELIABILITY AND LEARNING EFFECT OF THE TWO-MINUTE STEP TEST

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Background: The two-minute step test (2MST) is a submaximal test to assess functional capacity, but few studies analyze its reliability and learning effect.
Objectives: To verify the reliability and learning effect of the two-minute step test in healthy individuals.
Methods: Observational and methodological study, approved by local ethics committee, carried out from March to October 2024 using a non-probabilistic convenience sample. Individuals aged 18 to 80 years of both sexes were invited. The exclusion criteria were: untreated and/or unstable chronic diseases, previous diagnosis of lung and/or heart diseases, diseases and/or dysfunctions that interfered with walking, and Charlson Comorbidity Index > 4. Individuals who reached 85% of maximum heart rate (HR) and did not attend all assessments were also excluded. The test consists of marching in place for two minutes. The steps consisted of the number of times the right knee reached the predetermined height (midpoint between the iliac crest and the upper edge of the patella). Step counting was performed by two evaluators (randomized order). The test was performed twice on the same day (with 30-minute intervals) and repeated after a 7-day interval between the first and second assessment, resulting in a total of four tests. Vital signs (heart rate, blood pressure, and peripheral oxygen saturation) were monitored. Quantitative variables were described as mean (standard error), or 95% confidence interval (95% CI), and qualitative variables were expressed as absolute (relative) frequency. Intra-rater and inter-rater reliability was determined by the intraclass correlation method (ICC), considering the classification: < 0.50 (low reliability), 0.50 to 0.75 (moderate reliability), 0.76 to 0.90 (good reliability) and > 0.90 (excellent reliability). The learning effect was verified using the paired t-test (comparing the difference between the first and the last test). The significance level considered was 5% ($p < 0.05$).
Results: Thirty-one individuals aged 26 (24-34) years were included, of whom 16 (51.6%) were male. The ICC showed good inter-rater reliability on the first day [ICC = 0.838 (95% CI: 0.668-0.922); p = 0.000] and excellent inter-rater reliability on the second day [ICC = 0.911; (95%CI: 0.811-0.958); p = 0.000]. The intra-rater analyses for Evaluator 1 [ICC = 0.801 (95% CI: 0.587-0.904); p = 0.000] and Evaluator 2 [ICC = 0.758 (95% CI:0.506-0.883); p = 0.000] demonstrated good reliability. The number of steps of the last 2MST [107.6(2.3)] was significantly greater (p = 0.009) than the

number of steps of the first TME2 [101.3(2,7)]. The mean difference between the two tests was 6.3 steps.
Conclusion: The two-minute step test presented good and excellent reliability and a significant learning effect.
Implications: The 2MST has proven to be a reliable tool for assessing functional capacity. Additionally, it demonstrated a significant learning effect, suggesting that repeated testing can enhance performance.
Keywords: Physical fitness, Physical Functional Performance, Exercise test

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HEEL-RAISE TEST FOR CALF MUSCLE ASSESSMENT IN CVI: CORRELATION WITH STRENGTH AND FUNCTIONAL PERFORMANCE TESTS

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Background: Chronic venous insufficiency (CVI) is a progressive condition affecting the venous system, involving superficial, deep, or both venous networks. The pathophysiology is primarily attributed to valvular incompetence and dysfunction of the calf muscle pump, which includes deficits in lower limb muscle strength. Given the pivotal role of the calf muscles in venous return, their functional assessment should be integrated into the routine clinical evaluation of patients with CVI. The Heel-Raise Test (HRT) has been proposed as a method to evaluate calf muscle function; however, its correlation with other validated strength and functional performance assessments remains underexplored.
Objectives: To determine the applicability of the HRT in assessing calf muscle strength and endurance in CVI patients through its association with other muscle strength and endurance tests, as well as functional performance measures.
Methods: A cross-sectional study was conducted involving 40 patients diagnosed with CVI (mean age 67.4 $\pm$ 11.3 years, 37% females). Participants underwent the HRT, where they performed maximal plantar flexion repetitions until exhaustion. The total number of repetitions and the time taken to complete the test were recorded. Additionally, participants were subjected to the Five-Times Sit-to-Stand Test (STS-5), Ten-Times Sit-to-Stand Test (STS-10), 30-Second Sit-to-Stand Test (STS-30), and 1-Minute Sit-to-Stand Test (STS-60), which evaluated lower limb strength (STS-5 and STS-10) and muscular endurance (STS-30 and STS-60). Complementary assessments included handgrip dynamometry and the Human Activity Profile (HAP) questionnaire. Pearson and Spearman correlation analyses were performed to examine associations between the HRT and other measures.
Results: The number of HRT repetitions demonstrated significant correlations with STS-5 ($r = -0.751$; $p < 0.001$), STS-10 ($r = -0.741$; $p < 0.001$), STS-30 ($r = 0.724$; $p < 0.001$), STS-60 ($r = 0.765$; $p < 0.001$), handgrip dynamometry ($r = 0.325$; $p = 0.041$), maximum HAP score ($r = 0.401$; $p = 0.014$), and adjusted HAP score ($r = 0.330$; $p = 0.046$). Similarly, the time required to complete the HRT correlated with the STS-5 ($r = -0.386$; $p = 0.005$), STS-10 ($r = -0.399$; $p = 0.003$), STS-30 ($r = 0.347$; $p = 0.012$), STS-60 ($r = 0.406$; $p = 0.003$), maximum HAP score ($r = 0.427$; $p = 0.002$), and adjusted HAP score ($r = 0.360$; $p = 0.011$), but not with handgrip dynamometry ($r = 0.236$; $p = 0.092$).
Conclusion: The number of repetitions and time spent in the HRT are indicators of calf muscle strength, endurance, and functional capacity in individuals with CVI. Its inclusion in functional assessments can enhance the clinical evaluation of these patients.
Implications: The HRT emerges as a viable, practical tool for complementing clinical and functional assessments, particularly in the early to moderate stages of CVI, facilitating targeted interventions and patient management strategies.
Keywords: Chronic venous insufficiency, Muscle strength, Muscle weakness

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ACUTE HEMODYNAMIC EFFECTS PROMOTED BY RESPIRATORY AND RESISTANCE MUSCLE TRAINING WITH BLOOD FLOW RESTRICTION IN INDIVIDUALS WITH COPD

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Background: Chronic Obstructive Pulmonary Disease (COPD) is a chronic airflow limitation that impairs the cardiovascular and respiratory systems, reducing the functional capacity of individuals. As a result, this group has low tolerance for physical exercise with high loads. In this context, intervention strategies such as low-load (LL) and moderate-load (ML) resistance training (RT), inspiratory muscle training (IMT), and blood flow restriction (BFR) have emerged as therapeutic potentials, capable of eliciting acute hemodynamic responses similar to those observed in high-load training.
Objectives: To assess the effects of IMT and RT with or without BFR on: blood pressure (BP) and heart rate (HR) in individuals with COPD.
Methods: This study is a randomized crossover experimental clinical trial. The sample consisted of 14 elderly individuals (67.5 $\pm$ 1.76 years) of both sexes, diagnosed with mild, moderate, or severe COPD. Initially, they were evaluated for body composition, ankle-brachial index (ABI), arterial occlusion pressure (AOP), inspiratory muscle strength (MIP), dynamometry, and 1RM test. Then, they performed 3 experimental protocols: 1) RT with low load (30% 1RM) + IMT (30% MIP); 2) RT with low load (30% 1RM) + BFR (50% AOP) + IMT; 3) RT with moderate load (50% 1RM) + IMT (50% MIP), with a wash-out period of 48 to 72 hours. BP and HR were measured before, immediately after, and 10 minutes after the exercises. Data