WHEY PROTEIN SUPPLEMENTATION IMPROVES LUNG FUNCTION, FUNCTIONAL CAPACITY, AND RESPIRATORY AND PERIPHERAL MUSCLE STRENGTH IN HEALTHY ELDERLY INDIVIDUALS

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INTRODUCTION

The elderly population frequently faces a decrease in calorie and protein intake, a phenomenon that plays a fundamental role in the sharp loss of muscle mass and strength. This nutritional decline is directly associated with the weakening of muscle reserves, which can manifest in various adverse health consequences. The reduction in the intake of essential nutrients compromises not only the structural integrity of the muscles but also their functional capacity (CHEN et al, 2022).

The effects of this muscle loss are comprehensive and affect various dimensions of physical and respiratory function. The decrease in muscle mass has direct implications on respiratory and peripheral strength, significantly affecting the efficiency with which the body performs vital functions. This deterioration in strength and functional capacity can lead to a generalized impairment of pulmonary function, highlighting the importance of maintaining adequate nutrition to preserve the health and well-being of the elderly (CHEN et al, 2022).

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In addition to the physical impacts, the reduction in muscle mass and the consequent loss of strength can have far-reaching repercussions on the quality of life of elderly individuals. The reduced capacity to perform daily activities and the increased vulnerability to respiratory diseases underscore the urgent need for targeted nutritional strategies and public health interventions to mitigate the adverse effects of malnutrition in this age group (AHMED AND HABOUBI, 2010). Therefore, the objective of this study was to evaluate the effects of isolated whey protein supplementation over 12 weeks on pulmonary function, respiratory and peripheral muscle strength, and functional capacity.

MATERIALS AND METHODS

49 elderly volunteers were recruited through social media and the social project of UniEVANGÉLICA, Open University for the Elderly (UniAPI). After informed consent, the participants were randomly allocated into two groups: a control group (22 elderly individuals, with an average age of 69.46±6.24 years) without specific interventions, and a supplementation group (27 elderly individuals, with an average age of 69.10±6.28 years). This randomization ensured impartiality and comparability of the results.

Exclusion criteria were established to protect the integrity of the data and the safety of the participants, excluding individuals with neurological diseases that could interfere with the assessments or participation in the research. The inclusion criteria were aimed at elderly individuals aged 60 to 85, who signed the TCLE (Free and Informed Consent Form), completed all assessments, and used the supplementation.

The protein supplementation was carried out using isolated whey protein, commonly known as whey protein isolate, which was provided free of charge by the

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Heroes Science Institute (HSI). It is an isolated whey protein, vanilla flavor, which was provided in 25-gram sachets, delivering a total of 20 grams of protein per dose/sachet.

For body composition, Bioelectrical Impedance Analysis (BIA) technology was used to evaluate the % of lean mass, % of fat mass (Moraes-Ferreira et al., 2022).

The palmar grip strength of the upper limbs was evaluated using the Jamar brand Palm Dynamometer (Moraes-Ferreira et al., 2022).

Respiratory muscle strength was assessed through the manovacuometry test, for the evaluation of maximum inspiratory pressures (PIMax) and maximum expiratory pressures (PEMax) (Moraes-Ferreira et al., 2022).

Lung function was assessed using a Master Screen spirometer (Jaeger, Germany), employing the forced maneuver, following the standards proposed by the Brazilian Society of Pneumology and Phthisiology. All volunteers underwent pre- and post-bronchodilator spirometry testing with a rapid-acting bronchodilator (Salbutamol 400 mcg). The parameters evaluated were FVC, FEV1, FEV1/FVC, PEFR, and FEF25-75.

Functional capacity was assessed using the sit-to-stand test for one minute (Bohannon 1995).

For data analysis, the software GraphPad Prism 5.0 was used for statistical analysis and graph construction. The parametric t-test was used to compare measurements within the same group, and the non-parametric t-test was used to compare different measurements. The value from $p<0.05$ will be considered statistically different.

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RESULTS

The results of the study show that supplementation with whey protein provided significant improvements in various pulmonary function parameters. The analysis revealed an increase in forced expiratory volume in the first second (FEV1), with a value of ($p < 0.0480$). Similarly, the ratio between FEV1 and forced vital capacity (FEV1/FVC) showed a statistically significant improvement ($p < 0.0013$). Respiratory function was also improved, as evidenced by the increase in forced expiratory flow rate between 25% and 75% of vital capacity (FEF25-75%) and peak expiratory flow (PEF), with p-values of < (0.0409) and ($p < 0.0027$), respectively.

Regarding the functional capacity of the elderly, the sit-to-stand test in one minute revealed that individuals who received whey protein supplementation performed a greater number of repetitions, with $p <$ (0.0031). Furthermore, a significant decrease in oxygen saturation (SpO2) was observed during the test, with a value of ($p < 0.0050$). These results suggest that supplementation not only improved muscle strength and endurance but also affected the efficiency of oxygen use during physical activities.

The positive effects of whey protein supplementation were also reflected in changes in body composition. A significant increase in muscle mass ($p < 0.0322$) and a reduction in body fat ($p < 0.0027$) were observed. Additionally, improvements were recorded in inspiratory pressure (PImáx $p < 0.0425$) and maximum expiratory pressure (PEmáx, with $p < 0.0004$), as well as in handgrip strength ($p < 0.0453$), indicating comprehensive benefits in both respiratory function and overall muscle strength.

CONCLUSION

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Thus, we conclude that the supplementation of isolated whey protein for 12 weeks results in improved pulmonary function, respiratory and peripheral muscle strength, and functional capacity in healthy elderly individuals.

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REFERENCES

Bohannon, R. W. (1995). Sit-to-Stand Test for Measuring Performance of Lower Extremity Muscles. **Perceptual and Motor Skills**, 80(1), 163–166. https://doi.org/10.2466/pms.1995.80.1.163.

MORAES-FERREIRA, R. et al. O treinamento físico reduz a inflamação crônica das vias aéreas e os mediadores da remodelação na asma. *Medicina Oxidativa e Longevidade Celular*, v. 2022, p. 5037553, 2022. Disponível em: https://doi.org/10.1155/2022/5037553.

AHMED, T.; HABOUBI, N. Avaliação e gestão da nutrição em idosos e sua importância para a saúde. *Clinical Interventions in Aging*, v. 5, p. 207–216, 2010. Disponível em: https://doi.org/10.2147/cia.s9664.

CHEN, W. et al. Association of sarcopenia with ideal cardiovascular health metrics among US adults: a cross-sectional study of NHANES data from 2011 to 2018. *BMJ Open*, v. 12, n. 9, 2022. Disponível em: https://doi.org/10.1136/bmjopen-2022-061789.

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