

Relationships between respiratory parameters and quadriceps strength in subjects with chronic obstructive pulmonary disease

Gabriel Mahassine¹, Tiago Vargas¹, Renato Rito¹ Diogo Lopes¹ and Ângela Maria Pereira^{1,2,3}

¹Physiotherapy Department, Escola Superior de Saúde Egas Moniz, Monte da Caparica; ²Centro de investigação interdisciplinar Egas Moniz, Monte da Caparica; ³Hospital Garcia de Orta, Almada, Portugal

Introduction

Exercise capacity in chronic obstructive pulmonary disease (COPD) patients depends on the degree of airflow obstruction, the severity of the hypoxaemia and skeletal muscle function. Muscle atrophy and weakness are considered systemic consequences of COPD and are associated with reduced exercise capacity (1). Peripheral muscle weakness is a systemic manifestation of COPD which influences exercise limitation, quality of life and prognosis in most of the patients (2).

Purpose

The purpose of this study was to assess respiratory parameters, maximum voluntary contraction quadriceps muscle and their relations, in COPD subjects.

Methods

Thirty men with moderate COPD, FEV₁, 46.5±12.6%, 64.4±6.3 years old; weight, 76.4±12.8 kg; height, 170.9±4.9 cm, effort subjective perception (ESP) 17.1±1.5, and dyspnoea subjective perception (DSP) 5.27±2.4. Spirometry and 1-RM were used as evaluation methods. Before initiation all subjects performed spirometry (DATOSPIR-120 Sibelmed, Spain) according to American Thoracic Society (ATS) guidelines and FEV₁ was measured. The maximum voluntary contraction was assessed by the one repetition maximum (1-RM) strength test, which was performed using a resistance weight-lifting machine (Leg Extension, Salter®, Commercial Salter, S.A. Spain). The study was approved by the Ethics Committee of the Garcia de Orta Hospital and all participants gave their informed consent.

Results

Our results showed that as quadriceps muscle strength increases, FEV₁ and ESP also increase, with Pearson correlation values of (r=0.585) and (r = 0.577), meaning significant increases (p<0.01). On the other hand, for higher values of 1- RM, lower values of DSP were observed, with Pearson coefficient (r=-0.413). In relation to FEV₁, as it increases, ESP and DSP tend to decrease their values, as evidenced by the values obtained in Pearson's coefficients of (r=-0.623) and (r=-0.670) respectively (p<0.01).

Discussion and Conclusions

In this study, we can verify that quadriceps strength is related to the severity of airflow obstruction as measured by FEV₁. We found significant correlations between quadriceps strength and FEV₁. These findings are consistent with some previous studies finding a significant association between exercise capacity and lung function (3). So we can also conclude that as quadriceps strength increase, dyspnea and effort subjective perceptions decrease.

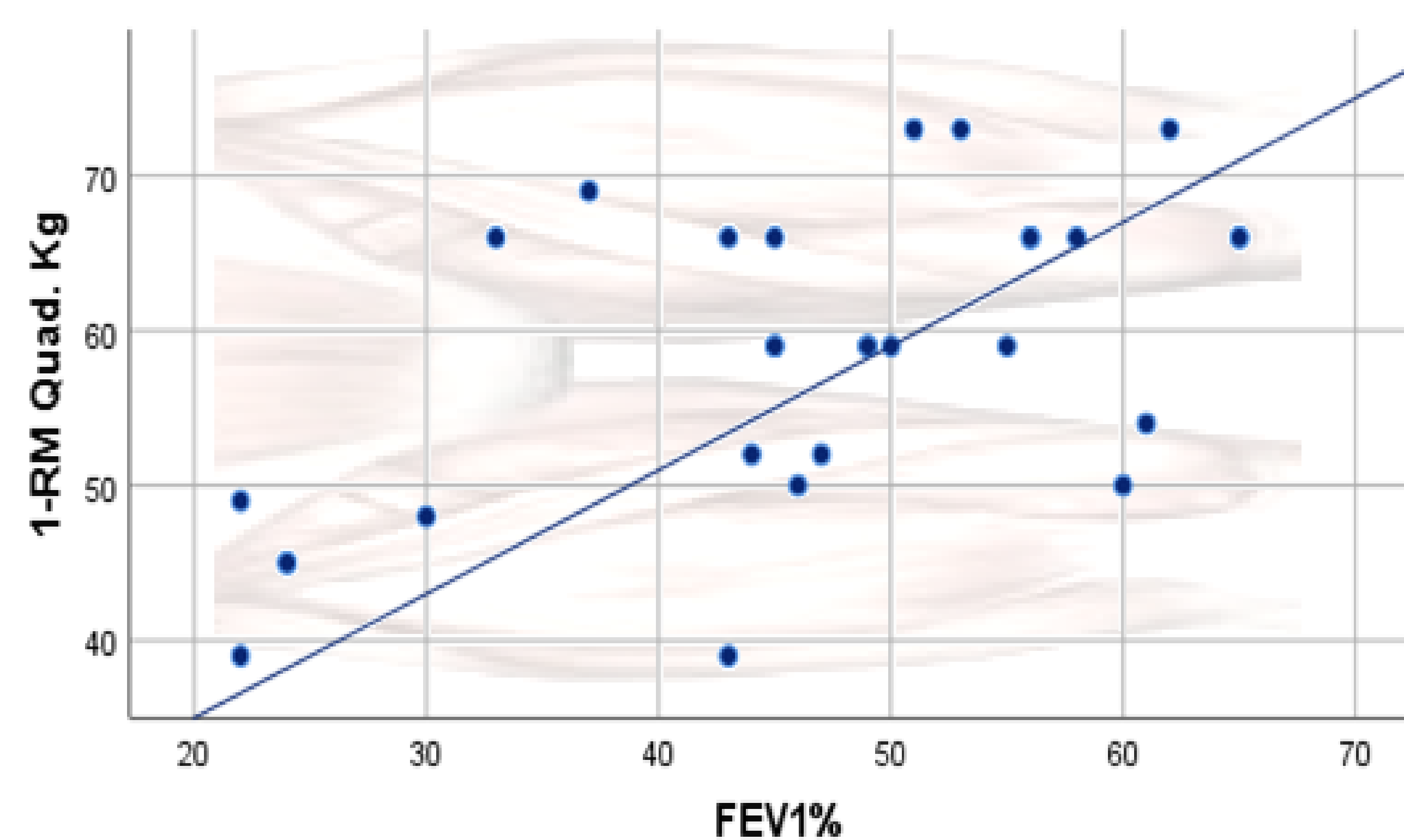


Fig. 1 - Correlation between FEV₁ and 1-RM Quadriceps

References

- (1) Mirza S, Clay RD, Koslow MA, Scanlon PD. COPD Guidelines: A Review of the 2018 GOLD Report. Mayo Clinic Proceedings. 2018;93(10):1488-502.
- (2) Gea J, Casadevall C, Pascual S, Orozco-Levi M, Barreiro E. Clinical management of chronic obstructive pulmonary disease patients with muscle dysfunction. Journal of thoracic disease. 2016;8(11):3379-400.
- (3) Alahmari AD, Kowlessar BS, Patel ARC, Mackay AJ, Allinson JP, Wedzicha JA, et al. Physical activity and exercise capacity in patients with moderate COPD exacerbations. Eur Respir J. 2016;48(2):340-9.