

Muscular power training: a new perspective in physical therapy approach of Parkinson's disease

Treinamento da potência muscular: uma nova perspectiva na abordagem fisioterápica da doença de Parkinson

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The development and search for treatment strategies in different neurological disorders have been based upon the identification of muscle deficits arising from such disorders, mainly in those that concern the capacity to generate muscle power. This deficit of muscle strength has been therapeutically prioritized so that the intervention addressed for the body structure and function level may modify the functional performance of these patients, in a process denominated "bottom-up". Thus, muscle strengthening has been used in the treatment of different disorders which involves the upper motor neuron, as in Parkinson's disease (PD), for example. From mid 90's, it was suggested that muscle weakness, along with tremor, stiffness, bradykinesia and postural instability could contribute to a worse functional performance of patients with PD. Ever since, researchers started to investigate the contribution of muscle weakness as well as the impact of strengthening exercises in activities such as gait of these patients. The results of these studies demonstrated small effect sizes after intervention. Such aspects, associated to important methodological limitations prevented the establishment of a clear causal relationship between strength gains and better gait performance. More recently, factors such as muscular power have explained more of the variance in the gait of patients with PD than muscle strength. In other words, it is possible that changes in muscular power have greater impact on gait than modifications of muscular strength on this population.

Muscular power is the product of muscle strength by speed and can be defined as the capacity of the muscle to produce strength quickly. Any limitation in the production of one or both aspects will interfere in the generation of muscular power¹. The study of Allen et al.² showed that patients with PD had lower muscle power than people without the disease, mainly in low and moderate loads test conditions. According to these authors, this reduction in muscle power may be attributed to bradykinesia and may influence the capacity to quickly generate muscle strength requested to perform different daily activities². Besides, Allen et al.³ demonstrated that muscular power is a more important predictor than strength on the functional performance of gait and on the risk of falls in patients with PD.

The importance of the findings mentioned above is due to the fact that possibly bradykinesia or motor slowness are the key issues to be targeted in PD. Bradykinesia along with deficits in gait represent an important part of the clinical manifestations of PD^{4,5}. Approximately 10 years ago, Berardelli et al.⁴ published in their article *Pathophysiology of bradykinesia in Parkinson's disease* that bradykinesia would not be resulting only from the incapacity in recruiting muscle strength, but rather from an inability in recruiting it quickly according to the context demand⁴. This understanding may be the starting point in the development of therapeutic approaches which meet the real needs of patients with PD.

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Recently, muscular power training by performing explosive exercises has been proposed as an intervention strategy to improve movement speed in the elderly⁶. Exercises programs involving quick concentric muscle contractions of approximately 40% of the maximum resistance, demonstrated an increase in muscular power, which can be attributed to gains in the speed component of power^{7,8}. Such results suggest that speed should be trained and it may contribute to improvements in the individuals' agility in more complex activities such as during gait and in situations of instability. These findings are exciting and bring a new treatment possibility for physical therapy in PD. It is possible that strategies aimed to improve muscular power by performing high speed and low load exercises may minimize the motor slowness and the deficits on the gait of patients with PD. Therefore, new studies should investigate the effects of this type of training in PD in order to search for treatments that may truly influence the specific motor deficits on this population.

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