Strategies for exercise assessment and training in patients with chronic obstructive pulmonary disease.

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Akademisk avhandling

som med vederbörligt tillstånd av Rektor vid Umeå universitet för avläggande av medicine doktorsexamen framläggs till offentligt försvaret i Aulan, Vårdvetarhuset, onsdagen den 15 september 2010, kl. 13:00. Avhandlingen kommer att försvaras på engelska.

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Abstract

Rationale: Chronic obstructive pulmonary disease (COPD) is not only a common lung disease but is a major cause of morbidity and mortality worldwide. Pulmonary rehabilitation (PR) helps optimize function and independence by increasing exercise capacity, reducing symptoms and improving health related quality of life (HRQL). Exercise training is certainly a key component of the PR programs; however, many of its aspects still need to be better defined such as optimal exercise assessment and training modality for these patients. The general purpose of this thesis was to generate new knowledge that could contribute to new strategies for exercise assessment and training in patients with COPD.

Methods and results: This thesis is comprised of four independent studies. Thigh muscle strength, endurance and fatigue were compared between 42 patients with moderate to severe COPD and 53 healthy controls (Study I). Impaired thigh muscle strength and endurance in patients with COPD was found, except for muscle strength in knee extension in male patients. Female patients had higher fatigue index than female controls while no difference was found between male patients and controls. The six-minute walk test (6MWD) performed on a non-motorized treadmill (6MWD-T) was compared with the 6MWD performed in a corridor (6MWD-C) in 16 healthy elderly subjects (Study II). They performed twelve tests (six 6MWD-C and six 6MWD-T) on two different days in a randomized order. An average discrepancy was found between the two methods with the subjects walking a shorter distance on the non-motorized treadmill. However, the results showed good test-retest reliability between days and test repetitions. A systematic review (Study III) was done of studies that investigated the effects of an arm training program in patients with COPD. The findings of this review indicated that there is evidence that an arm training program improves arm exercise capacity, but its effects on dyspnea, arm fatigue and healthy-related quality of life is unclear. Finally, a two-armed randomized controlled trial examined the effects of an arm training program on arm function, arm exercise capacity, muscle strength, symptoms and HRQL in patients with COPD (Study IV). The groups were randomized to arm training or sham. Compared with the changes observed in the control group, the magnitude of change in the intervention group was greater for arm function, arm exercise capacity and muscle strength. There was no difference between groups in HRQL or symptoms.

Conclusions: Upper extremity resistance training improves arm exercise capacity, arm function and muscle strength in patients with COPD. Training and assessment of upper and lower limb muscles should be included into PR programs. The 6MWD performed on a non-motorized treadmill may offer an alternative option to the standard 6MWD when a 30-meter corridor is not available.

Keywords
COPD, exercise assessment, physical training, muscle strength, arm function.