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ORIGINAL ARTICLE

Physical and Psychosocial Factors Associated With Physical Activity in Patients With Chronic Obstructive Pulmonary Disease

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Abstract

Objectives: To assess physical activity and sitting time in patients with chronic obstructive pulmonary disease (COPD) and to investigate which physical and psychosocial factors are associated with physical activity and sitting time.

Design: Cross-sectional study.

Setting: Patients were recruited at outpatient clinics of general hospitals and from general practitioners.

Participants: Patients (N=113) with mild to very severe COPD.

Interventions: Not applicable.

Main Outcome Measures: Physical activity and sitting time were measured with a triaxial accelerometer (24h/d).

Results: Mean locomotion time per 24 hours was 6.8% (range, 0.7%−20.4%). Elevated physical activity was independently associated with higher self-efficacy, higher functional exercise capacity, and lower lung hyperinflation. Decreased physical activity was strongest in more severe stages of COPD, in which the patients were mainly limited by physical disease-specific factors (higher lung hyperinflation, worse dyspnea severity, worse leg muscle function, and oxygen use). In less severe patients, physical activity was independently associated with more generic factors (higher self-efficacy and the spring/summer season). Sitting time did not differ between severity stages, and longer sitting time in the total group was independently associated with more positive perception of treatment control, less autonomous motivation to exercise, not using sleep medication, and oxygen use.

Conclusions: Both physical and psychosocial factors were associated with physical activity in patients with COPD. The factors associated with physical activity differed between disease severity stages, raising the question of whether physical activity enhancement programs should differ as well. Sitting time should be investigated further.

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Physical inactivity has been shown to be a predictor of mortality in patients with chronic obstructive pulmonary disease (COPD).[1] Unfortunately, many patients with COPD have sedentary lifestyles.[2] Physical activity is a modifiable factor and hence an interesting potential treatment goal in COPD. Increasing physical activity has been shown to decrease dyspnea severity and improve muscle function and quality of life.[3] Therefore, physical activity may break the vicious circle of dyspnea-induced immobility and subsequent deconditioning.[4] The variation in physical activity between patients with COPD is high[2]; and to be able to reduce physical inactivity, it would be useful to explore the factors that are associated with physical activity.

In the last decade, knowledge on the factors associated with physical activity in patients with COPD has increased significantly. However, many studies underlying our knowledge had small sample sizes or specific COPD populations, contributing to discrepant findings.[5] Furthermore, mainly COPD-specific physical

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factors have been investigated. For example, significant associations were found between physical activity and lung function, lung hyperinflation, dyspnea severity, exercise capacity, muscle function, use of long-term oxygen therapy (LTOT), and comorbidities.[5-7] However, those physical factors only incompletely reflect the physical activity level because psychosocial factors most likely affect physical activity as well. Unfortunately, psychosocial factors are less frequently investigated in COPD. Potential psychosocial factors could be social support, motivation to be physically active, illness perception, self-efficacy, and sleep quality. The few studies available in the literature found a significant association between physical activity and self-efficacy in physical activity and no association with depression.[5]

Most studies on COPD have investigated physical activity and not sedentary behavior, such as sitting time. Sedentary time has been shown to be an independent risk factor for several health outcomes, such as cardiovascular diseases, independent of physical activity,[8,9] and could also be an important potential treatment target.

We hypothesize that both physical and psychosocial factors are associated with physical activity and sitting time in patients with COPD. Furthermore, we hypothesize that these factors could differ between patients with different severities of COPD. The aims of this study are to assess (1) the level and variation of physical activity and sitting time in patients with COPD and (2) the independent factors associated with physical activity and sitting time, including physical and psychosocial variables.

Methods

Participants

Patients with mild to very severe COPD were recruited at outpatient clinics of general hospitals and from general practitioners in the northern part of The Netherlands. Patients were enrolled in this cross-sectional study between February 2009 and February 2012. Patients were included if they had a COPD diagnosis according to the Global Initiative for Chronic Obstructive Lung Disease (GOLD).[10] Patients were excluded if they had a serious active disease that needed medical treatment (eg, recent myocardial infarction) or treatment for a COPD exacerbation in the past 2 months. The study was approved by the ethics committee of the University Medical Center Groningen, and all patients provided informed consent.

Potential factors associated with physical activity

We have searched the literature to identify potential factors associated with physical activity or sitting time in patients with COPD. Physical activity could be associated with generic and COPD-specific factors. The factors that were shown to be associated with physical activity in patients with COPD have been previously described. In general adult populations, being a woman, being older, having higher body weight, having lower education, having health problems, having lower self-efficacy, and poor weather conditions were shown to be associated with lower physical activity.[11-13] Furthermore, there is some evidence that social support, motivation to exercise, depression, and sleep quality were associated with physical activity.[14-16]

List of abbreviations:

BMI	body mass index
COPD	chronic obstructive pulmonary disease
FEV_1	forced expiratory volume in 1 second
GOLD	Global Initiative for Chronic Obstructive Lung Disease
IPQ-R	Illness Perception Questionnaire-revised
LTOT	long-term oxygen therapy
RV	residual volume
6MWD	6-minute walk distance
SRQ-E	Exercise Self-Regulation Questionnaire

Measurements

Physical activity was measured with a triaxial accelerometer (DynaPort),[a] which has shown to be an accurate instrument for evaluating physical activity in patients with COPD.[17] The device is worn around the waist at the lower back, and patients were instructed to wear it day and night, for 1 week, except during showering and swimming.

Biographic factors

Data on medication use, LTOT, number of exacerbations in the past year, smoking status, living situation, and education level were reported. These data were self-reported and, if possible, verified in medical records. Seasons were split in 2: spring and summer (April−September) and autumn and winter (October−March). During the study period (February 2009−February 2012), the mean temperature during spring and summer was 15.1°C (range, 4.7−27.6°C) and 5.9°C (range, 0.7−14.7°C) during autumn and winter (data were obtained from the Royal Netherlands Meteorological Institute, www.knmi.nl). Comorbidity was assessed by the Cumulative Illness Rating Scale for Geriatrics.[18]

Physical factors

Pulmonary function

Forced expiratory volume in 1 second (FEV_1) and forced vital capacity were measured using a spirometer (Masterscreen pulmonary function testing system; Viasys)[b]; residual volume (RV), total lung capacity, and intrathoracic gas volume were measured by body plethysmograpy (MasterScreen boydplethysmography).[b] Both methods were according to European Respiratory Society/American Thoracic Society guidelines.[19,20]

Dyspnea severity

Dyspnea severity was registered by the modified Medical Research Council dyspnea index.[21]

Exercise capacity

Maximal exercise capacity was measured by an incremental cycle ergometer test (bicycle ergometer: Jaeger ER 900L[c]; Oxycon Pro, CareFusion[b]) in line with the American Thoracic Society/American College of Chest Physicians statement.[22] Functional exercise capacity was measured by a 6-minute walk distance (6MWD) test according to the American Thoracic Society guidelines.[23]

Leg muscle function

Leg muscle function was measured by a 30-second chair stand test.[24] This test involves counting the number of times, within 30