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Effect of symptoms on physical performance in COPD

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) patients experience multiple symptoms including dyspnea, anxiety, depression, and fatigue, which are highly correlated with each other. Together, those symptoms may contribute to impaired physical performance.
Objectives: The purpose of this study was to examine interrelationships among dyspnea, anxiety, depressive symptoms, and fatigue as contributing factors to physical performance in COPD.
Methods: This study used baseline data of 282 COPD patients from a longitudinal observational study to explore the relationship between depression, inflammation, and functional status. Data analyses included confirmatory factor analyses and structural equation modeling.
Results: Dyspnea, anxiety and depression had direct effects on fatigue, and both dyspnea and anxiety had direct effects on physical performance. Higher levels of dyspnea were significantly associated with impaired physical performance whereas higher levels of anxiety were significantly associated with enhanced physical performance.
Conclusion: Dyspnea was the strongest predictor of impaired physical performance in patients with COPD.
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Introduction

The majority of people with chronic obstructive pulmonary disease (COPD) experience multiple symptoms including dyspnea, anxiety, depression, and fatigue. These common symptoms are interrelated.[1–3] For COPD patients, dyspnea is the most frequent and bothersome symptom, requiring daily management. This experience of breathing discomfort is not only shaped by physiology but is also influenced by psychological, social, and environmental factors.[4,5] Fatigue is the second most prevalent symptom after dyspnea, and becomes a major complaint of COPD patients as the disease progresses.[2,6] Although the prevalence of fatigue is 50–71% in people with COPD,[2,3,7] the clinical relevance of fatigue has received less investigation.[8] Patients described fatigue as unrelenting tiredness and exhaustion that is always present, and thus limiting their function capacity.[9,10] Fatigue is common for COPD patients, and contributes to functional impairment in addition to respiratory symptoms.[3,10] Anxiety and depressive symptoms are also common psychological symptoms in COPD. Psychological distress has negative impacts on fatigue and physical functioning. It also predicts hospitalization due to exacerbation and mortality.[11,12]

The Theory of Unpleasant Symptoms (TOUS) provides a framework for understanding how multiple concurrent symptoms are interrelated and can impact outcomes.[13] It has three major components: the symptoms themselves, the factors that can influence the symptom burden (physiologic, psychological, and situational), and the consequences of the symptom experience. Reciprocal relationships may exist among three major components. The experience of the interrelated symptoms can affect the patient performance in both functional and cognitive activities.[14]

In COPD, the symptoms of dyspnea, anxiety, depression, and fatigue interact with each other. Complex, bi-directional relationships exist among these common symptoms of COPD were founded in recent studies.[2,15–17] Dyspnea is associated with increased levels of anxiety and depressive symptoms. Although not consistent across all COPD studies, it has been reported that respiratory and psychological symptoms are independent predictors of fatigue in COPD patients.[1,18,19] Patients with moderate to severe COPD report experiencing notable dyspnea and fatigue with activities of daily living.[20] Psychological stress may result from dyspnea, and

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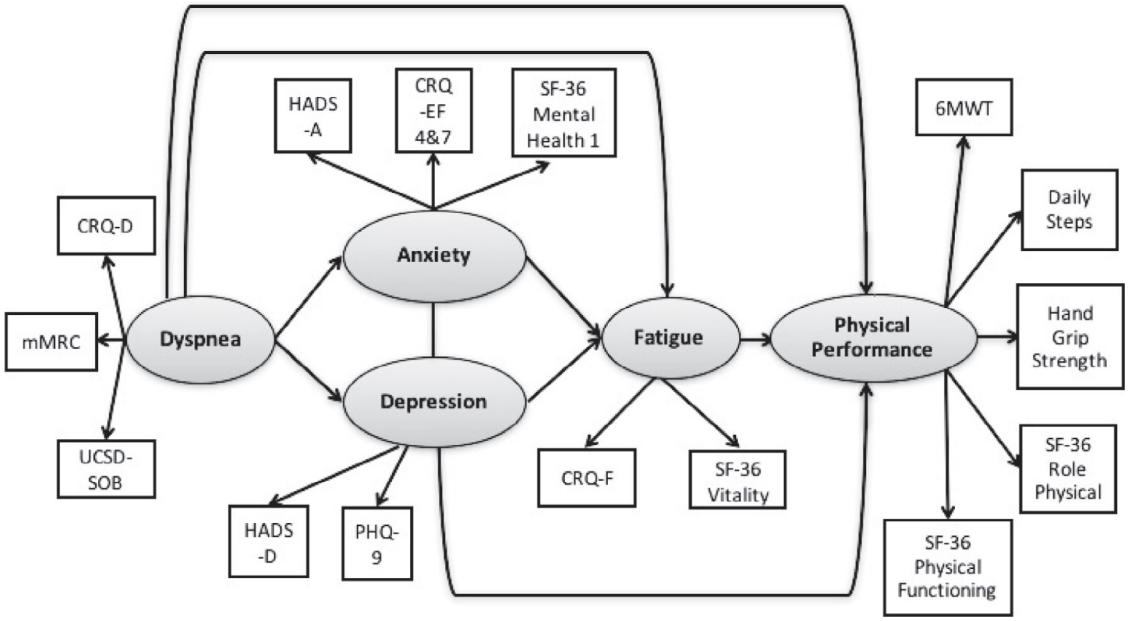

Fig. 1. Hypothesized model of the effect of symptoms on physical performance in COPD. *Note.* CRQ-D = Chronic Respiratory Questionnaire – Dyspnea subscale; mMRC = the modified Medical Research Council dyspnea score; UCSD-SOB = University of California, San Diego Shortness of Breath Questionnaire; HADS-A = the Hospital Anxiety and Depression Scale – Anxiety; CRQ-EF4 = Chronic Respiratory Questionnaire – Emotional Function subscale question 4; CRQ-EF7 = Chronic Respiratory Questionnaire – Emotional Function subscale question 7; SF36-MH1 = the Medical Outcomes Study Short Form-36 - Mental Health subscale question 1; HADS-D = the Hospital Anxiety and Depression Scale – Depression; PHQ-9 = the Patient Health Questionnaire-9; CRQ-F = Chronic Respiratory Questionnaire – Fatigue subscale; SF36-V = the Medical Outcomes Study Short Form-36 - Vitality subscale; 6MWT = the six minute walk test; SF36-RP = the Medical Outcomes Study Short Form-36 - Role Physical subscale; SF36-PF = the Medical Outcomes Study Short Form-36 - Physical Functioning subscale.

together with fatigue, may contribute to even worse physical performance.[1,2,8]

A better understanding of how symptoms contribute to worse physical performance has the potential to enhance symptom management for COPD patients. Structural equation modeling (SEM) is an analytical approach that allows researchers to examine the complex interrelationships among multiple variables.[21] In previous studies examining symptoms in COPD patients, different modeling approach was used.[1,22] Among them, multiple indicators for a construct were not included in a path analysis[1] or fatigue and the six minute walk test (6MWT) were treated as a single construct of functional capacity.[22] Although similar relationships among several symptoms have been explored by SEM in other studies of chronic illness such as multiple sclerosis[23] and rheumatoid arthritis,[24] our study may be the first to use a SEM approach to examine the interrelationships between symptoms and physical performance in COPD.

The aim of this paper was to examine a model describing the interrelationships among dyspnea, anxiety, depressive symptoms, fatigue, and physical performance in COPD (Figure 1). The model was developed based on qualitative studies of fatigue in COPD and the TOUS.[9,10] Dyspnea, anxiety, and depression were included as influencing factors on fatigue in the proposed model, and that when these symptoms are managed, physical performance as a consequence will be improved. SEM was used to test the direct and indirect effects of four major symptoms on physical performance. The following hypotheses were tested: 1) higher levels of dyspnea are associated with higher levels of anxiety, depression, and fatigue, and higher levels of anxiety and depression are associated with higher level of fatigue; 2) higher levels of dyspnea, anxiety, depression, and fatigue are associated with worse physical performance; and 3) greater dyspnea is indirectly associated with greater fatigue and worse physical performance through greater anxiety and depression, and greater anxiety and depression are indirectly associated with worse physical performance through fatigue.

Methods

This study was a part of a multi-site prospective observational study of COPD patients to explore the relationship between depression, inflammation, and functional status. The original study was supported by the National Institutes of Health [R01HL093146-01A2]. The data used in this study were collected at baseline. Written informed consent was obtained from all participants and the study was approved by the respective institutional review boards at three clinical sites.

Procedure

Participants were recruited from various sources including outpatient clinics from three medical centers, pulmonary rehabilitation programs, a research database maintained by the investigators, queries of medical records and pulmonary function tests, Better Breathers Club, community pulmonary practices, advertisements, study website, and other referrals. Baseline study assessments were conducted both in person (spirometry, six-minute walk test, activity monitoring, hand grip strength, and completion of questionnaires) and by telephone. Phone visits with a trained mental health professional were scheduled two days after the in-person visit and included assessment of depression and anxiety.

The inclusion criteria of this study were: 1) Diagnosis of COPD confirmed by the following: 1-a) post-bronchodilator Forced Expiratory Volume in one second to Forced Vital Capacity ratio (FEV1/FVC) < 70%; 1-b) moderate to very severe disease by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) criteria[25] (FEV1 < 80%), 2) Age ≥ 40 years, 3) A history of current or past cig-