



A Breathlessness Catastrophizing Scale for chronic obstructive pulmonary disease[☆]



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ABSTRACT

Objective: Catastrophizing about breathlessness may be related to disability in patients with chronic obstructive pulmonary disease (COPD), but assessment options are limited. This study reports the initial validation of a 13-item Breathlessness Catastrophizing Scale (BCS).

Method: Pulmonary rehabilitation inpatients completed spirometric, functional performance and questionnaire assessments at admission ($N = 242$) and discharge ($n = 186$).

Results: The BCS comprised a unifactorial scale that demonstrated excellent internal consistency (Cronbach's $\alpha = .96$) and correlated with measures of anxiety sensitivity, depression, and self-efficacy, but not with performance on walk and stair-climbing tests. BCS scores improved robustly with rehabilitation, approaching a medium effect size ($d = .43$), and demonstrated a modest association with enhanced performance in a stair-climbing test of exercise tolerance.

Conclusion: The BCS is a reliable measure of catastrophizing in severe COPD that has good convergent validity and sensitivity to change. Its association with functional performance requires further investigation. However, it appears that a high level of catastrophizing about breathlessness is not a barrier to functional improvement with inpatient pulmonary rehabilitation.

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Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a progressive degenerative lung disease that causes cough, sputum production, and disabling breathlessness [1]. As of 2010, COPD was identified as the fourth leading cause of death in the U.S. and the sixth leading cause of years lived with disability [2]. For those COPD patients who are limited functionally by dyspnea, the recommended treatment includes pulmonary rehabilitation to improve symptom management and participation in activities of daily living [1].

According to the WHO-endorsed standards outlined by Global Initiative for Chronic Obstructive Lung Disease (GOLD) [1], spirometric assessment of lung function is required to confirm a

diagnosis of COPD. Spirometry, however, is often a poor predictor of a patient's level of disability [3]. In contrast, psychological factors have often been related to functional outcomes in this population [4]. Depressive symptoms, for example, have been associated with decreased mobility and functional status [5–10], as well as more frequent and longer hospital admissions [9]. Similarly, anxiety has been related to decreased physical health, exercise performance [3], functional performance status [3,11,12], and more frequent hospitalization [3].

Recently, research has begun to expand beyond broad psychopathological constructs, such as depression and anxiety, into particular affective and cognitive processes that may influence how one attends and responds specifically to the symptom of dyspnea [13, 14]. It has been proposed that breathlessness catastrophizing is one such cognitive process that warrants further investigation [7, 15–17].

Catastrophizing is an exaggerated negative cognitive orientation toward noxious stimuli and experiences, characterized by rumination about those experiences, magnification of their threat value, and perceived inability to control them [18]. It has been associated with measures of disability in other chronic medical conditions,

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particularly chronic pain [19–23]. In some studies of individuals with chronic pain, catastrophizing has been found to be more strongly correlated with disability than the pain itself [24,25]. This has contributed to the development of a fear-avoidance model of disability [26]. The fear-avoidance model proposes that when a symptom is appraised as threatening, the individual may respond with fear, hypervigilance, and avoidance of activity that could trigger it. In the long term, these responses are counterproductive for rehabilitative efforts and can lead to further disability [26]. Indeed, catastrophizing has been identified as a prospective marker of risk for severe disability in chronic pain [27,28], in part leading to the recommendation that the assessment and treatment of catastrophizing should be a regular part of patient care [29,30].

The conceptual link between catastrophizing and disability can perhaps be extended to other medical conditions that feature a prominent primary symptom. In the case of COPD, for example, it would be expected that patients who catastrophize about dyspnea would similarly become fearful of, or hypervigilant to, the experience of breathlessness, perhaps leading to an avoidance of activities that might trigger shortness of breath [31–33]. To date, however, speculation about the importance of catastrophizing in COPD has focused largely on its relevance to the emergence of panic symptomatology that occurs in some patients [16,34].

More generally, a fear-avoidance model applied to COPD would suggest that individuals who catastrophize would engage in physical therapy at suboptimal levels and exhibit a more general unwillingness to engage in programs that are heavily focused on exercise [14]. However, there are limited options for assessing catastrophizing in individuals with COPD, so there has been little formal investigation of these hypotheses.

At present, the Interpretation of Breathing Problems Questionnaire (IBPQ) [35] is the sole catastrophizing measure available for use with individuals with COPD. Its format makes it difficult to complete in a clinical setting, however, and it has seldom been used since its development in 1999 [17,36–38]. The IBPQ presents 14 scenarios (e.g., “You are in a smoky pub and your chest begins to feel tight.”) and asks respondents to answer qualitative questions that are subsequently scored by raters for degree of catastrophizing. IBPQ items have been found to correlate with measures of anxiety [35], although not consistently [36]. Moreover, no studies have examined the association between IBPQ scores and functional measures. In the present study, the Breathlessness Catastrophizing Scale (BCS) is proposed as an alternative measure offering several advantages. First, the BCS items directly reflect experiential aspects of catastrophizing (e.g., “There’s nothing I can do to reduce the intensity of the breathlessness”). Second, qualification as catastrophic thinking is not limited to an increase in anxiety, illness, or death. Third, the BCS is practical for clinical use, with each item requiring only a single quantitative rating. Finally, the BCS is a modification of the well-established Pain Catastrophizing Scale (PCS) [18], which represents the standard in the assessment of catastrophizing among patients with chronic pain.

Given the emerging focus on catastrophizing and anxiety-related concerns in COPD, the goals of the present study were to: (1) validate the scores on the BCS in a relatively large sample of patients undergoing pulmonary rehabilitation for COPD; (2) examine the relationship between breathlessness catastrophizing and measures of anxiety sensitivity, depression, self-efficacy, lung function, and performance in structured physical tasks; (3) examine whether breathlessness catastrophizing changes with participation in a pulmonary rehabilitation program; and (4) evaluate whether breathlessness catastrophizing is related to change in other rehabilitation outcomes. Specifically, we hypothesized that individuals with high levels of catastrophizing would show less improvement in psychological and physical function following interdisciplinary treatment.

Method

Participants

The study was approved by the Ottawa Health Science Network Research Ethics Board. Participants were 242 patients with COPD admitted to an inpatient, interdisciplinary pulmonary rehabilitation program at The Ottawa Hospital Rehabilitation Centre (TOHRC; Ottawa, Canada). In order to be eligible for admission to the program, patients had to be referred by a physician, 18 years of age or older, seeking to improve quality of life limited by shortness of breath, cognitively able to learn how to better manage the condition, and meet at least one of the following criteria: (1) $FEV_1 \leq 70\%$; (2) hospitalized recently or visited an emergency department due to dyspnea; (3) willing and able to initiate and maintain an exercise program; (4) using supplemental oxygen. Patients admitted to the program were included in this study if they had completed a BCS at admission.

Design

Chart reviews were conducted for eligible patients who participated in the program between 2007 and 2011. Extracted data included assessment of lung function, functional measures of exercise performance, and psychometric measures of catastrophizing, anxiety sensitivity, depression, and COPD self-efficacy. Measures completed at both program admission and discharge were collected.

Pulmonary rehabilitation program

Patients participated in a structured inpatient interdisciplinary pulmonary rehabilitation program based on GOLD and Canadian Thoracic Society guidelines [39,40]. The program took place over four 5-day weeks, with patients returning home over weekends.

Measurements

Spirometry

Forced vital capacity (FVC) is the volume of air that can forcibly be exhaled after full inspiration, measured in liters. Forced expiratory volume in one second (FEV_1) is the volume of air that can be forcibly exhaled in 1 s, after full inspiration. These values were measured using a Profiler and CPSF/D spirometer (Medical Graphic Corporation; St. Paul, MN, US). Predicted values for these measurements ($FVC\%$, $FEV_1\%$) were based on reference values of pulmonary function tests of a Canadian sample [41].

Exercise performance

Six-Minute Walk Test

The Six-Minute Walk Test (6MWT) is the standard measure of functional capacity used in pulmonary and rehabilitation studies [42]. The test requires a 100-foot flat, hard surface on which individuals can walk unaccompanied. Patients are asked to walk as far as possible in 6 min, slowing, stopping, or resting, as needed. The primary outcome of interest is the distance walked. Contraindications include chest pain, intolerable dyspnea, leg cramps, staggering, diaphoresis, and pale or ashen appearance [42]. Contraindications were common in this sample, and only 98 patients completed the 6MWT at admission.

Non-Stop Walk Test

The Non-Stop Walk Test (NSWT) is an alternative measure used in the pulmonary rehabilitation program at TOHRC. In line with the

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