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Original Research

COPD

Patients With COPD With Higher Levels of Anxiety Are More Physically Active

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Background: **Physical activity (PA) has been found to be an excellent predictor of mortality beyond traditional measures in COPD. We aimed to determine the association between depression and anxiety with accelerometry-based PA in patients with COPD.**
Methods: **We performed a cross-sectional analysis of baseline data from 148 stable patients with COPD enrolled in an ongoing, longitudinal, observational study. We measured PA (total daily step count) with a Stepwatch Activity Monitor over 7 days, depression and anxiety with the Hospital Anxiety and Depression Scales (HADSs), dyspnea with the Shortness of Breath Questionnaire, and functional capacity with the 6-min walk test.**
Results: **Increased anxiety was associated with higher levels of PA such that for every one-point increase in the HADS-Anxiety score there was a corresponding increase of 288 step counts per day ($\beta = 288$ steps, $P < .001$), after adjusting for all other variables. Higher levels of depressive symptoms were associated with lower PA ($\beta = -176$ steps, $P = .02$) only when anxiety was in the model. The interaction term for anxiety and depression approached significance ($\beta = 26$, $P = .10$), suggesting that higher levels of anxiety mitigate the negative effects of depression on PA.**
Conclusions: **The increased PA associated with anxiety in COPD is, to our knowledge, a novel finding. However, it is unclear whether anxious patients with COPD are more restless, and use increased psychomotor activity as a coping mechanism, or whether those with COPD who push themselves to be more physically active experience more anxiety symptoms. Future studies should evaluate for anxiety and PA to better inform how to improve clinical outcomes.**
***Trial Registry*: Clinicaltrials.gov; No.: NCT01074515; URL: www.clinicaltrials.gov**

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Abbreviations: 6MWT = 6-min walk test; CASCADE = COPD Activity: Serotonin Transporter, Cytokine, and Depression Study; HADS = Hospital Anxiety and Depression Scale; HADS-A = Hospital Anxiety and Depression Scale-Anxiety; HADS-D = Hospital Anxiety and Depression Scale-Depression; PA = physical activity; SAM = Stepwatch 3 Activity Monitor

Epidemiologic studies based on self-reported physical activity (PA) show that higher levels of activity are associated with lower risk of incident COPD in smokers and in patients who already have COPD, and with lower risk of acute exacerbations, hospital admissions, and mortality.[1-3] A recent, 4-year, prospective study of patients with COPD showed that objectively measured PA was the best predictor of all-cause mortality compared with a broad range of other prognostic factors, including airflow obstruction, exercise performance, cardiovascular status, nutritional and muscular status, systemic inflammation, health status, depressive symptoms, and dyspnea. Each increase of 1,845 steps per day was associated with a 51% lower risk of death.[4] Objective measures of PA capture what patients actually do vs what they report doing or are capable of doing during a laboratory test.[5] Findings from these studies underscore the critical importance of PA in COPD and the need to better understand how modifiable factors such as psychologic well-being influence PA.

The prevalence of major depression in patients with moderate to severe COPD is approximately 40%.[6] Nearly 20% of patients had episodes of moderate to severe depression prior to their COPD diagnosis.[7] Anxiety disorders, which have considerable overlap

with depressive symptoms, are also prevalent in patients with COPD, with estimates ranging from 10% to 36%.[6,8,9] Patients with higher levels of depressive symptoms report worse physical functioning.[10-14] Similarly, studies that have measured functional capacity using laboratory exercise tests (eg, 6-min walk test [6MWT], symptom-limited cycle, or treadmill) have found that depression is associated with worse functional capacity.[12,15-17] In contrast to these earlier reports that measured functional capacity, a more recent, cross-sectional study from Germany of 170 patients with COPD found that depressive symptoms were not associated with worse PA as measured by accelerometry after adjustment for a number of relevant clinical correlates.[18] Unfortunately, anxiety was not measured in this study by Watz and colleagues,[18] thus, we know very little about the relationship between anxiety (with or without depression) and the level of PA in the daily lives of patients with COPD.

The vicious dyspnea-anxiety-deconditioning spiral has long been acknowledged for a subset of patients with COPD, yet the presumption that anxiety contributes to increased dyspnea with consequent reductions in PA has not been formally tested.[19,20] The relationship between anxiety in patients with COPD and functional capacity remains unclear. A similar number of studies have found that higher anxiety levels are associated with worse functional capacity,[21-23] and a similar number of studies report no relationship between anxiety and functional capacity.[24-26] We are not aware of any published report on the relationship between anxiety and objectively confirmed PA during the daily lives of patients with COPD.

Since recent findings suggest that comorbid anxiety is associated with a greater risk of mortality for patients with COPD,[27] more attention should be directed at understanding anxiety in relation to self-care behaviors and clinical outcomes. Therefore, the purpose of this cross-sectional study was to determine the association between depression and anxiety with accelerometry-based, free-living, ambulatory PA in patients with COPD.

Materials and Methods

Study Design and Settings

The COPD Activity: Serotonin Transporter, Cytokine, and Depression Study (CASCADE) is an ongoing, multisite, prospective, observational study of subjects with COPD who are being followed for 2 years to study the biologic causes and functional consequences of depression. This manuscript is a cross-sectional, descriptive analysis of data from 148 subjects collected at entry to CASCADE. This study was approved by the respective institutional review boards at three clinical sites: the University of Washington, Seattle (approval number 37332); the VA Puget Sound Health Care System (approval number 00240); and the University of Texas Health Science Center at San Antonio/South Texas Veterans Health Care System (approval number HSC20100373H), and was registered with ClinicalTrials.gov (NCT01074515).[28]

Participants

We recruited participants from queries of medical records and pulmonary function tests, chest clinics from the three medical centers, a research database maintained by the investigators, pulmonary rehabilitation programs, better-breathers groups, community pulmonary practices, advertisements, the CASCADE study website, and other referrals. The inclusion criteria were as follows: (1) diagnosis of COPD confirmed by the following: postbronchodilator $FEV_1/FVC < 70\%$, moderate to very severe disease as defined by the GOLD (Global Initiative for Chronic Obstructive Lung Disease) criteria ($FEV_1 < 80\%$), age ≥ 40 years, and a significant history of current or past cigarette smoking (> 10 pack-years); (2) stable disease with no acute exacerbations of COPD in the past 4 weeks; and (3) ability to speak, read, and write English. We excluded patients with any of the following conditions: other chronic obstructive lung diseases such as asthma, bronchiectasis, and cystic fibrosis; idiopathic pulmonary fibrosis; uncompensated congestive heart failure (left-sided ventricular dysfunction); primary pulmonary vascular disease; non-COPD-related chronic inflammatory diseases; infectious disease; autoimmune disease; lung cancer or metastatic cancer; chronic renal failure requiring dialysis; chronic uncompensated liver disease; HIV/AIDS; chronic antibiotic use or ongoing infection; chronic oral prednisone use; bipolar disease; psychotic disorders; and any dementia.

Procedures

Informed consent was obtained prior to clinic assessments, which included prebronchodilator and postbronchodilator spirometry, 6MWT, and completion of questionnaires. Participants were asked to wear an activity monitor for 7 days, beginning after their initial clinic visit. Two days after this clinic visit, a depression and anxiety assessment was completed via telephone by a trained mental-health professional.

Measures

Demographic data included self-reported age, sex, education, income, living situation, and marital status. Disease severity included self-report of chronic conditions (Charlson comorbidity index),

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