Brazilian Journal of Physical Therapy 2020;24(5):399–406

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Associação Brasileira de Pesquisa e Pós-Graduação em Fisioterapia

Brazilian Journal of Physical Therapy

https://www.journals.elsevier.com/brazilian-journal-of-physical-therapy

ORIGINAL RESEARCH

An observational study of self-reported sedentary behaviour in people with chronic obstructive pulmonary disease and bronchiectasis

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Received 24 January 2019; received in revised form 22 May 2019; accepted 28 May 2019
Available online 5 June 2019

KEYWORDS
Sedentary behaviour;
Chronic obstructive pulmonary disease;
Bronchiectasis;
Quality of life;
Functional performance

Abstract
Background: Few studies have examined sedentary behaviour in chronic respiratory disease. The limited evidence suggests that increased levels of sedentary behaviour are associated with increased mortality.
Objectives: This study aimed to compare the level of self-reported sedentary behaviour in people with chronic obstructive pulmonary disease (COPD) and bronchiectasis as well as to identify associations between sedentary time with functional performance measures and health-related quality of life in the chronic respiratory disease group.
Methods: An observational study design was used. Participants completed the Sedentary Behaviour Questionnaire from which average sedentary time (hours/day) was determined. Functional performance was measured using the six-minute walk test, the four-metre gait speed test and the five sit-to-stand test. Health-related quality of life was measured using the St George's Respiratory Questionnaire. Sedentary time was compared between groups using an unpaired *t*-test. Univariate analysis explored relationships amongst variables.
Results: The convenience sample consisted of 103 people with COPD [52% male; mean ± SD age: 73 ± 9 years, FEV_1% predicted: 56 ± 23] and 33 people with bronchiectasis [52% male; 74 ± 8 years, FEV_1% predicted: 69 ± 25]. Average self-reported sedentary time in COPD was 7.6 ± 2.7 hours/day and in bronchiectasis was 8.0 ± 4.1 hours/day, with no between-group difference (−0.4, 95% CI −1.7, 0.8). No associations were found between sedentary time and any functional performance outcome or with health-related quality of life.

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https://doi.org/10.1016/j.bjpt.2019.05.005

Conclusion: There was no difference in the high sedentary time between people with COPD and bronchiectasis. Sedentary behaviour was not associated with functional performance or disease-related health-related quality of life in people with chronic respiratory disease.

Introduction

Sedentary behaviour has become increasingly prevalent in modern day life. This behaviour is due to lifestyle factors, such as diet and physical activity, which influence the way we interact in physical and social environments.[1] Sedentary behaviour is characterised by a seated or reclined posture with a low energy expenditure of 1.0–1.5 metabolic equivalents (METS) during waking hours.[1] Traditionally, sedentary behaviour has not been considered when assessing an individual's function. However, with 46–59% of waking hours being spent sedentary by the healthy population,[2] increasing amounts of sedentary behaviour are concerning due to the health deficits associated with prolonged sitting.[1] It has previously been demonstrated that a high amount of sedentary behaviour is associated with an increased risk of all-cause mortality, some cancers and an increase in cardio-metabolic risk factors in the general adult population.[1] These major health risks underpin the importance of examining the low end of the activity spectrum, considering an individual's sedentary behaviour level as a valuable measure of health and function. It is also particularly important to examine sedentary behaviour levels in the older population and those with chronic disease, such as individuals living with chronic respiratory disease, who have less capacity to engage in appropriate physical activity levels.

On average, people with chronic obstructive pulmonary disease (COPD) spend nearly 25% more time sitting and 200% more time lying down compared to healthy age-matched adults.[3] This high amount of sedentary behaviour may be attributed to the disease-specific limitations that characterise this population, such as exertional dyspnoea and fatigue. A systematic review in 2014 examined how people with COPD spent their waking hours and found that the average time spent sitting was six hours per day with a further one and a half hours lying down.[4] Studies in COPD have also indicated that television watching is one of the activities accumulating the most sedentary time,[4,5] with those watching more than four hours of television per day more likely to die of COPD.[5] A recent study also found that, on average, people with COPD (when awake) spent a total of 7.52 hours per day sitting or lying down and that each sedentary hour per day increased mortality risk by 42%.[6] In combination with the knowledge regarding the deficits associated with high sedentary time in the general population, the relevance of measuring sedentary behaviour in diseased populations is apparent.

Whilst there is emerging research in sedentary behaviour in people with COPD, there is limited information in this area amongst other chronic respiratory disease groups, such as bronchiectasis. One study examining sedentary behaviour and physical activity in people with bronchiectasis, found that, on average, this population group accumulated 10.6 sedentary hours per awake day.[7] The study also highlighted that disease severity did not correlate to average daily sedentary time. This conclusion supports previous studies in COPD which have also identified that sedentary time is not significantly different based on disease severity.[8]

Despite the trends in sedentary behaviour indicated above, there is a lack of research on sedentary behaviour in people with COPD and bronchiectasis. This information is important to guide decision-making around the need for targeted interventions to reduce sedentary behaviour. Additionally, there is a paucity of research investigating the relationship between level of sedentary behaviour and other patient-relevant outcomes such as functional performance and health-related quality of life (HRQoL) in these populations. The primary aim of this study was to compare the levels of self-reported sedentary behaviour in people with COPD and in people with bronchiectasis. A secondary aim was to examine the associations between self-reported sedentary behaviour levels with functional outcomes and HRQoL. It was hypothesised that those with COPD and bronchiectasis would accumulate more sedentary time per day than the known standards in the aged general population with little to no difference between disease groups. It was also hypothesised that high levels of sedentary behaviour would be associated with low levels of performance on functional tests and poor HRQoL.

Methods

Sample and study design

This observational study was conducted within the pulmonary rehabilitation programmes across two metropolitan hospitals in Sydney, Australia from September 2016 to December 2017. A convenience sample of consecutive patients who completed the pulmonary rehabilitation assessment were recruited. Participants were included if they had a physician diagnosis of either COPD or bronchiectasis of any severity and were able to mobilise independently with or without a walking aid. Participants were excluded if they could not understand written or spoken English, required long-term oxygen therapy, or had been hospitalised in the last month due to a recent exacerbation of their respiratory condition. It was recorded if the participants had performed pulmonary rehabilitation previously.

This study was approved by the Sydney Local Health District Human Research Ethics Committee (RPAH Zone) (approval number HREC/16/RPAH/400).

Participant characteristics

Baseline characteristics included age, gender, height, weight, and lung function. Pulmonary function was measured using a spirometer (Niche EasyOne spirometer machine or the Micro Medical Microlab MK8 spirometer) according to standard procedures[9] and compared to normal predicted values.[10]

Outcomes

Sedentary behaviour

The Sedentary Behaviour Questionnaire (SBQ) was used to measure sedentary behaviour. The SBQ has previously been shown to be reliable and valid in overweight adults.[11] The questionnaire required participants to reflect on a typical weekday and typical weekend day and to select the most appropriate amount of time spent doing nine activities, assumed to be completed either in sitting or lying. The activities included: watching television, playing computer/video games, listening to music/radio, talking on the phone, doing paperwork or computer work, reading a book or magazine, playing a musical instrument, doing artwork/crafts, and sitting in the car, bus or train. For each SBQ activity item the following was recorded: weekday hours, weekend day hours, total weekly hours (weekday $\times$ 5 + weekend day $\times$ 2), and daily average hours (total hours per week/7). Measures of total sedentary time were then calculated for all nine SBQ activity items combined. This included: weekday total hours (sum of all weekday items), weekend day total hours (sum of all weekend items), total weekly hours (weekday $\times$ 5 + weekend day $\times$ 2), and daily average total hours (total hours per week/7).

Six-minute walk distance

All participants performed two six-minute walk tests (6MWTs) according to standardised protocols.[12] Pulse rate and oxygen saturation were measured using a pulse oximeter (Masimo, Irvine, California) to monitor participants before, every minute during, and for 2 min after the test. Dyspnoea and rate of perceived exertion (RPE) scores were measured from 0 to 10 (0 being ''nothing at all'' and 10 being ''maximal'') using the modified Borg Scale[13] before the test, immediately after the test, and again after 2 min' recovery time. The best six-minute walk distance (6MWD) of the two 6MWTs was used for analysis and compared to normative values.[14]

Four-metre gait speed test

The four-metre gait speed (4MGS) test is a valid and reliable assessment tool to evaluate functional performance in COPD.[15] It is simple and quick to perform over a 4 m flat, straight walking track with participants instructed to walk at their usual speed. Following a demonstration, participants performed the 4MGS test twice without rest, with the fastest time used to calculate the 4MGS expressed in metres per second (m/s). A walking aid was permitted.

Five sit-to-stand test

The five-repetition sit-to-stand test (5STS) is a simple, valid and reliable assessment of lower limb function that measures the time taken to stand five times as quickly as possible from an armless chair with arms folded across the chest. Participants were instructed to stand up all the way and sit down landing firmly on a seat (height of 48 cm). One practice stand ensured the participant could stand up all the way and sit down without using the upper limbs, and the test was then performed once with the time taken recorded in seconds.

Anxiety and depression

Levels of anxiety and depression were measured using the validated hospital anxiety and depression scale (HADS).[16]

Health-related quality of life

All participants completed the St George's Respiratory Questionnaire (SGRQ) as a measure of HRQoL. The questionnaire has been validated in people with COPD[17] and bronchiectasis.[18] Using the 53 items of the questionnaire, the domains of symptoms, activity and impact, as well as a total score were used in analysis.

Statistical analysis

Descriptive statistics were used to summarise characteristic information with mean and standard deviation to describe continuous data, and frequencies to describe categorical data. Between-group analysis using independent sample *t*-tests were used to explore differences in outcomes between disease groups. Univariate analysis was completed on the total group (i.e. combined COPD and bronchiectasis) with sedentary time (hours/day) and forced expiratory volume in one second (FEV_1) % predicted as independent variables. Dependent variables analysed were: 6MWD, 6MWD % predicted, SGRQ symptoms, activity, impact and total score, HADS anxiety and depression scores, speed in the 4MGS test, and time in the 5STS test. To identify correlation between these variables in the linear regression model, *r*-values were analysed and described in terms of strength.[19] The total group was also divided into two groups based on average daily sedentary time. The ''<8.5 hour/day sedentary group'' consisted of participants who were sedentary for less than 8.5 hours per awake day and the ''$\geq$8.5 hours/day sedentary group'' were those who were sedentary for greater than or equal to 8.5 hours per awake day. This cut-off of 8.5 hours was chosen based on the study which reported that risk of mortality was four times higher in people with COPD who spent $\geq$8.5 hours (out of 12 waking hours) in sedentary behaviours.[6] Independent *t*-tests were then carried out to examine any existing differences between these groups for

the outcomes. All statistical analyses were performed using SPSS version 24.0 (IBM). A p-value of <0.05 was considered significant.

Results

A total of 136 participants with either COPD or bronchiectasis were included in the analysis. Characteristics for both the total group and the different disease groups, COPD ($n = 103$) and bronchiectasis ($n = 33$), can be found in Table 1. The majority of the group ($n = 96$) had not undertaken pulmonary rehabilitation previously and were functionally limited with a mean ± SD 6MWD of 53 ± 16% predicted. There was no difference between groups for the majority of baseline characteristics. However, the bronchiectasis group had better lung function, with FEV_1% predicted values and FEV_1/FVC (Forced vital capacity) ratio significantly higher than the COPD group. While most participants completed all outcomes, the HADS, 4MGS test and 5STS test were only performed in 71%, 63% and 67% of the total cohort respectively as they were not standard tests across both pulmonary rehabilitation programmes.

Sedentary behaviour data from the SBQ is shown in Table 2. The sedentary time for the total cohort was 7.7 ± 3.1 hours/day with the activity contributing the most time to sedentary behaviour being watching television at an average of 3.2 ± 1.6 hours/day. There was no significant difference in total sedentary time between the COPD and bronchiectasis groups. The COPD group spent significantly less time listening to music, playing musical instruments, and doing arts and craft compared with the bronchiectasis group.

Table 3 presents the results of the linear regression models. No significant associations were found between sedentary time (hours/day) and the other outcomes. There were weak associations between FEV_1% predicted and absolute 6MWD and 6MWD % predicted (both $r = 0.22$, $p = 0.01$). When the total cohort was divided into the two different sedentary groups (≥8.5 hours/day and <8.5 hours/day), there were no significant differences in any outcomes between groups (Table 4).

Discussion

This is the first study to examine self-reported sedentary time in people with chronic respiratory disease, comparing the differences between COPD and bronchiectasis cohorts and assessing associations between self-reported sedentary time with functional performance and HRQoL within these populations. It was established that people with COPD and people with bronchiectasis spend on average 7.6 ± 2.7 hours and 8.0 ± 4.1 hours per awake day respectively, being sedentary, with no difference between groups. However, significant differences between disease groups were identified in the sedentary activities that participants engaged in. The COPD group reported less time playing musical instruments and less time doing arts and crafts on an average day compared to the bronchiectasis group. This study did not identify any significant associations between average daily sedentary time and 6MWD or HRQoL. However, a moderate association between FEV_1% predicted and 6MWD % predicted was found, further contributing to the existing evidence supporting that lung function has a moderate correlation to functional performance measures in people with COPD.

This study indicated a high level of sedentary behaviour in people with COPD based on a self-report measure. Data from studies objectively examining sedentary behaviour in people with COPD have indicated an average sedentary time of 7.5 hours to 12.5 hours per day.[3,6,8,20,21] Our results are at the low end of this range, possibly due to the tendency to underestimate activity with self-reported measures,[22] and may be due to participants having less severe lung function than previous studies.[3,6,8,20,21] The Pitta et al.[3] study compared people with COPD to healthy age-matched adults and reported a significantly higher sedentary time of 7.7 hours per day in people with COPD compared to 5.6 hours per day in the healthy adults. Our data was collected in an older population of COPD (mean age 73 years) but further contributes to the existing body of evidence, suggesting that the COPD population spend large amounts of their time being sedentary.

It is also clinically relevant to identify how the COPD population accumulate their sedentary time. It has previously been suggested that longer daily television viewing time is a marker of sedentary behaviour,[23] and screen time has been used as a variable for leisure-based sitting time in one COPD study where median screen time was 3.3 hours.[24] Interestingly, within the present study, television viewing time was the activity that accumulated the most sedentary time in people with chronic lung disease, with an average of 3.2 ± 1.6 hours per day. This is important to note, as a recent study concluded that men with COPD who watched television for greater than four hours per day were more likely to die due to COPD than those who watched less than two hours per day.[5] This finding is particularly relevant as 48 participants with chronic respiratory disease (35%) in the present study reported spending four or more hours per day watching television. Television viewing could be an activity to be targeted through interventions to reduce overall daily sedentary time in people with COPD and bronchiectasis.

There has been little research examining sedentary levels in people with bronchiectasis. One study has reported an average of 10.6 ± 1.3 sedentary hours per day in a sample of 63 people with bronchiectasis,[7] which is higher than the current study of 8.0 ± 4.1 hours sedentary hours per awake day. The different measurement tools used (i.e. objective versus subjective) may account for the difference in reported sedentary time. While Bradley et al.[7] compared people with bronchiectasis to a COPD dataset from the USA and showed similar sedentary behaviour across groups, no studies have directly compared sedentary levels between people with bronchiectasis and COPD, so our study is the first to support the Bradley et al.[7] study in showing no significant differences between these two chronic respiratory disease groups.

In comparison to accelerometer devices, self-report questionnaires can identify the types of activities people engage in whilst sitting, rather than being limited to the value of sedentary time only. In this study, the SBQ measured leisure-time activities such as playing musical instruments and doing arts and crafts. Within the study, the COPD group reported less time playing musical instruments on an average day (mean difference: −0.1, 95% CI −0.1, −0) and

Table 1 Participant characteristics of the total cohort, COPD and bronchiectasis.

	All ($n = 136$)	COPD ($n = 103$)	Bronchiectasis ($n = 33$)	p value
Age, year	73 ± 9	73 ± 9	74 ± 8	0.7
Gender				0.9
Males, *n* (%)	71 (52)	54 (52)	17 (52)	
Females, *n* (%)	65 (48)	49 (48)	16 (48)	
BMI, kg/m^2	27 ± 6	27 ± 6	27 ± 6	0.9
Smoking status				0.4
Former/never, *n* (%)	128 (94)	96 (93)	32 (97)	
Current, *n* (%)	8 (6)	7 (7)	1 (3)	
Lung function				
FEV_1, L	1.4 ± 0.6	1.3 ± 0.6	1.5 ± 0.5	0.07
FEV_1, % pred	60 ± 24	56 ± 23	69 ± 25	0.01*
FVC, L	2.5 ± 0.8	2.5 ± 0.8	2.3 ± 0.7	0.2
FVC, % pred	78 ± 22	79 ± 22	75 ± 23	0.4
FEV_1/FVC	0.6 ± 0.2	0.5 ± 0.2	0.7 ± 0.1	<0.01*
Previously completed PR				0.4
No, *n* (%)	98 (72)	74 (72)	24 (73)	
Yes, *n* (%)	38 (28)	29 (28)	9 (27)	
6MWT				
6MWD, m	357 ± 114	353 ± 116	370 ± 107	0.4
6MWD, % pred	53 ± 16	52 ± 17	55 ± 15	0.8
SGRQ, score				
Symptoms	56 ± 24	54 ± 24	61 ± 23	0.1
Activity	62 ± 20	63 ± 20	58 ± 22	0.3
Impact	31 ± 18	30 ± 17	33 ± 19	0.4
Total	44 ± 17	44 ± 16	45 ± 17	0.7
HADS, score				
Anxiety	6 ± 4	7 ± 4	5 ± 3	0.2
Depression	6 ± 4	6 ± 4	5 ± 3	0.3
4MGS, m/s	1.02 ± 0.2	1.02 ± 0.2	1.03 ± 0.2	0.9
5STS, s	18 ± 12	18 ± 14	16 ± 7	0.4

Data are presented as mean ± standard deviation.

* Significantly different between COPD and bronchiectasis ($p < 0.05$).

All, every participant; cm, centimetres; COPD, chronic obstructive pulmonary disease; FEV_1, forced expiratory volume in one second; FVC, forced vital capacity; HADS, hospital anxiety and depression scale; kg, kilograms; kg/m^2, kilograms per metre squared; m, metres; m/s, metres per second; *n*, number; %, percent; % pred, percentage of predicted; s, seconds; PR, pulmonary rehabilitation; 6MWT, six minute walk test; 6MWD, six minute walk distance; SGRQ, St George's Respiratory Questionnaire; 4MGS, four metre gait speed test; 5STS, five sit to stand test.

HAD $n = 96$ (All), $n = 70$ (COPD), $n = 26$ (bronchiectasis); 4MGS $n = 85$ (All), $n = 63$ (COPD), $n = 22$ (bronchiectasis); 5STS $n = 91$ (All), $n = 66$ (COPD), $n = 25$ (bronchiectasis).

less time doing arts and crafts on an average day (mean difference: −0.4, 95% CI −0.8, −0.1) than the bronchiectasis group. These differences may reflect the better lung function in the bronchiectasis group in being able to undertake such hobbies rather than represent a true difference in sedentary levels.

There has been little research demonstrating an association between sedentary behaviour and functional performance in people with COPD or bronchiectasis. This relationship was not present in the current study (6MWD: $r = 0.14$, $p = 0.11$), which concurs with one study in bronchiectasis[7] but conflicts with the findings of a previous study in COPD.[8] However, it is important to note that the previous COPD study included participants who were on long-term oxygen therapy and reported a significantly higher number of hours spent sitting than non-oxygen therapy users.[8] Hence, there may only be an existing association between sedentary behaviour and functional performance in those people with COPD who are long-term oxygen therapy users. Additionally, the present study did not identify a relationship between average daily sedentary behaviour and HRQoL, nor identify differences in functional performance measures or HRQoL scores when the cohort was divided into ''low sedentary'' (<8.5 hours) and ''high sedentary'' (≥8.5 hours) groups. This information suggests that measures of functional performance and HRQoL may not be good indicators of sedentary behaviour in people with COPD or bronchiectasis.

Table 2 Sedentary behaviours of the total cohort, COPD and Bronchiectasis.

Item	All ($n = 136$)	COPD ($n = 103$)	Bronchiectasis ($n = 33$)	Mean difference (95% CI)
Watching TV				
Av Weekday, hrs	3.2 ± 1.6	3.2 ± 1.5	3.1 ± 1.8	0.1 (−0.5, 0.8)
Av Weekend, hrs	3.2 ± 1.7	3.3 ± 1.6	3.0 ± 1.8	0.5 (−0.1, 1.2)
Av Day, hrs	3.2 ± 1.6	3.2 ± 1.5	3.0 ± 1.7	0.3 (−0.4, 0.9)
Playing computer				
Av Weekday, hrs	0.4 ± 0.9	0.4 ± 1.0	0.3 ± 0.6	0.1 (−0.2, 0.5)
Av Weekend, hrs	0.4 ± 0.9	0.4 ± 1.0	0.3 ± 0.6	0.1 (−0.3, 0.5)
Av Day, hrs	0.4 ± 0.9	0.4 ± 1.0	0.3 ± 0.6	0.1 (−0.2, 0.5)
Listening to music				
Av Weekday, hrs	0.7 ± 1.0	0.6 ± 0.9	1.1 ± 1.4	−0.6 (−1.0, −0.2)*
Av Weekend, hrs	0.7 ± 1.1	0.6 ± 0.9	1.1 ± 1.6	−0.5 (−1.0, −0.1)*
Av Day, hrs	0.7 ± 1.0	0.6 ± 0.9	1.1 ± 1.3	−0.5 (−0.9, −0.1)*
Talking on the phone				
Av Weekday, hrs	0.5 ± 0.9	0.5 ± 0.8	0.8 ± 1.0	−0.3 (−0.7, 0.1)
Av Weekend, hrs	0.4 ± 0.6	0.4 ± 0.4	0.6 ± 1.0	−0.3 (−0.6, 0.1)
Av Day, hrs	0.5 ± 0.8	0.4 ± 0.7	0.7 ± 1.0	−0.3 (−0.6, 0.1)
Doing paperwork				
Av Weekday, hrs	0.7 ± 1.1	0.7 ± 1.2	0.6 ± 0.6	0.2 (−0.3, 0.6)
Av Weekend, hrs	0.5 ± 0.9	0.5 ± 1.0	0.3 ± 0.5	0.2 (−0.1, 0.6)
Av Day, hrs	0.6 ± 1.0	0.7 ± 1.1	0.5 ± 0.5	0.2 (−0.2, 0.6)
Reading				
Av Weekday, hrs	11 ± 1.1	1.2 ± 1.1	0.8 ± 0.9	0.4 (0.0, 0.8)*
Av Weekend, hrs	1.2 ± 1.2	1.2 ± 1.1	0.9 ± 1.2	0.3 (−0.2, 0.7)
Av Day, hrs	1.1 ± 1.0	1.2 ± 1.1	0.8 ± 0.9	0.4 (−0.0, 0.8)
Playing instrument				
Av Weekday, hrs	0.03 ± 0.1	0.01 ± 0.1	0.1 ± 0.2	−0.1 (−0.1, −0.0)*
Av Weekend, hrs	0.03 ± 0.1	0.0 ± 0.1	0.1 ± 0.2	−0.1 (−0.1, −0.0)*
Av Day, hrs	0.03 ± 0.1	0.01 ± 0.1	0.1 ± 0.2	−0.1 (−0.1, −0.0)*
Doing art/crafts				
Av Weekday, hrs	0.3 ± 0.9	0.1 ± 0.6	0.6 ± 1.4	−0.4 (−0.8, −0.1)*
Av Weekend, hrs	0.2 ± 0.8	0.1 ± 0.6	0.5 ± 1.3	−0.4 (−0.7, −0.1)*
Av Day, hrs	0.2 ± 0.9	0.1 ± 0.6	0.6 ± 1.3	−0.4 (−0.8, −0.1)*
Transport				
Av Weekday, hrs	0.9 ± 1.0	0.8 ± 0.8	1.1 ± 1.2	−0.3 (−0.7, 0.1)
Av Weekend, hrs	0.9 ± 0.9	0.8 ± 0.8	1.0 ± 1.2	−0.1 (−0.5, 0.2)
Av Day, hrs	0.9 ± 0.9	0.8 ± 0.8	1.1 ± 1.2	−0.2 (−0.6, 0.1)
Sedentary time				
Week, total hrs	54 ± 21.8	53 ± 19.1	56 ± 29.0	−2.9 (−11.6, 5.7)
Av Weekday, hrs	7.8 ± 3.4	7.6 ± 2.9	8.3 ± 4.6	0.6 (−2.0, 0.7)
Av Weekend, hrs	7.4 ± 3.0	7.4 ± 2.8	7.3 ± 3.5	−0.1 (−1.1, 1.3)
Av Day, hrs	7.7 ± 3.1	7.6 ± 2.7	8.0 ± 4.1	−0.4 (−1.7, 0.8)

Data are mean ± standard deviation and mean difference (95% confidence interval (CI)) between the COPD group and the Bronchiectasis group

* Significant difference between COPD and bronchiectasis.

Av, average; hrs, hours.

Av day, hrs per item for each questionnaire item: (weekday × 5 + weekend × 2)/7.

Week, total hrs: (weekday × 5) + (weekend × 2).

Av Weekday, hrs, sum of hours per item indicated on weekday sheet.

Av Weekend, hrs, sum of hours per item indicated on weekend sheet.

Av Day, hrs, total of all items as (weekday × 5) + (weekend × 2)/7.

Table 3 Linear regression of average daily sedentary time and pulmonary function to other patient-related outcomes in total cohort.

	Number	Sedentary time (hrs/day)		FEV_1 (% pred)	
SGRQ total	136	$r = 0.01$	$p = 0.87$	$r = 0.17$	$p = 0.05$
SGRQ symptoms	136	$r = 0.02$	$p = 0.78$	$r = 0.15$	$p = 0.08$
SGRQ activity	136	$r = 0.05$	$p = 0.58$	$r = 0.15$	$p = 0.09$
SGRQ impact	136	$r = 0.05$	$p = 0.59$	$r = 0.15$	$p = 0.08$
HADS, anxiety	96	$r = 0.10$	$p = 0.35$	$r = 0.15$	$p = 0.14$
HADS, depression	96	$r = 0.09$	$p = 0.37$	$r = 0.06$	$p = 0.53$
6MWD, m	134	$r = 0.14$	$p = 0.11$	$r = 0.22$	$p = 0.01$*
6MWD,%pred	134	$r = 0.06$	$p = 0.47$	$r = 0.22$	$p = 0.01$*
4MGS, m/s	85	$r = 0.09$	$p = 0.42$	$r = 0.15$	$p = 0.16$
5STS, s	91	$r = 0.07$	$p = 0.54$	$r = 0.03$	$p = 0.79$

* $p = < 0.05$. FEV_1, forced expiratory volume in one minute; HAD, hospital anxiety and depression scale; m, metres; m/s, metres per second; % pred, percentage of predicted; s, seconds; Sedentary timehrs/day, sedentary time in hours for an average day; SGRQ, St George's Respiratory Questionnaire; 4MGS, four metre gait speed test; 5STS, secs, five sit to stand test; 6MWD, six minute walk distance.

Table 4 Differences between the ''<8.5 hrs/day sedentary group'' and the ''≥8.5 hrs/day sedentary group''.

Variable	<8.5 hrs/day ($n = 96$)	≥8.5 hrs/day ($n = 40$)	Mean difference (95% CI)
FEV_1, % pred	61 ± 25	56 ± 21	4 (−5, 13)
SGRQ total	45 ± 16	42 ± 17	3 (−3, 10)
SGRQ symptoms	57 ± 23	53 ± 25	3 (−5, 12)
SGRQ activity	63 ± 20	58 ± 20	5 (−2, 13)
SGRQ impact	31 ± 18	29 ± 17	2 (−4, 9)
6MWD, m	349 ± 112	375 ± 117	−26 (−69, 16)
6MWD, %pred	52 ± 16	54 ± 16	−2 (−8, 4)

Data is mean (standard deviation (SD)) with the mean difference (95% confidence interval (CI) between the <8.5 hrs/day group and the >8.5 hrs/day group.
''≥8.5 hrs/day sedentary group'' is average daily sedentary time of greater than or equal to 8.5 hours per day.
''<8.5 hrs/day sedentary group'' is average daily sedentary time of less than 8.5 hours per day.
hrs, hours; FEV_1, forced expiratory volume in one minute; m, metres; % pred, percentage of predicted; SGRQ, St George's Respiratory Questionnaire; 6MWD, six minute walk distance.

Some limitations are present in the current study. First, a self-report questionnaire was used to measure sedentary behaviour that has not been widely used in respiratory disease. Previous research has recommended that measuring sedentary behaviour through self-report in adults has good reliability but poor to modest validity,[22] and that a combination of subjective and objective methods of measurement are needed to capture important information about how sedentary time is accumulated throughout the day. Self-report tools that use scaled response categories (e.g. 0, 30 min, 1 hour, 2 hours etc.) may also misinterpret total sedentary time, since specific durations of sedentary behaviour for those in the highest category cannot be calculated. A further limitation was that the sample size of the bronchiectasis group was smaller than the group with COPD which may have underpowered the comparison between disease groups.

Conclusion

In conclusion, people with chronic respiratory disease spend a large proportion of their waking hours being sedentary, with no difference in average daily sedentary time between people with COPD and people with bronchiectasis. Additionally, there were no significant associations present between daily sedentary time and functional performance or HRQoL within these chronic respiratory disease groups.

Conflicts of interest

The authors declare no conflicts of interest.

Acknowledgements

We would like to acknowledge Professor Jennifer Peat who provided statistical advice for this research.

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