

Patterns of sedentary behaviour and physical activity in people following curative intent treatment for non-small cell lung cancer

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Research Letter

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In both health and disease, there is increased interest in the role that time spent in sedentary behaviour (SB) and physical activity (PA) may play in health outcomes. The health benefits of participating in moderate-to-vigorous intensity PA (MVPA) have been well reported.¹ Although undertaking MVPA is important, performing tasks at this intensity represents a small proportion of waking hours.² Sedentary behaviour is postures or behaviours undertaken during waking hours in sitting or a reclined posture which require low energy expenditure (≤ 1.5 metabolic equivalent of tasks [METs]).³ Independent of the time spent in MVPA, increased time spent in SB is a risk factor for cardiometabolic disease.⁴ In addition to the total time spent in SB, prolonged uninterrupted bouts of SB are linked with deleterious health outcomes.⁴ These data have led to public health campaigns which seek to reduce total time in SB and interrupt SB every 30 minutes with light intensity PA (LIPA).⁵

In people with lung cancer, data on PA and SB are limited. Studies have reported low levels of PA in people with non-small cell lung cancer (NSCLC),^{6,7} however, these studies have not explored SB or the way in which time is accumulated in SB or PA performed at any intensity. Obtaining data on patterns of SB and PA in this population and comparing these data with those collected in healthy controls will allow health professionals to provide novel targets for rehabilitation interventions. Hence, the aim of this study was to compare patterns of SB and PA in people following curative intent treatment for NSCLC with healthy controls.

People were included if they were 6-10 weeks following lobectomy for NSCLC or, for those who required adjuvant chemotherapy, 4-8 weeks following chemotherapy completion. Age and gender-matched healthy controls, without spirometric evidence of airflow obstruction, were also recruited. The study was approved by Human Research Ethics Committees at three institutions (approval numbers 2011/105; RA-11/033; and HR178/2011). Participants were asked to wear two activity monitors, for 7 consecutive days, during waking hours. Sedentary behaviour and PA were assessed using the SenseWear armband (SAB; BodyMedia Inc., USA).^{8,9} Daily step count was measured using the StepWatch activity monitor (SAM; Cyma Corporation, USA).¹⁰ Exposure variation analysis (EVA)¹¹ was undertaken, using data from the SAB, to calculate the proportion of waking hours spent in SB (≤ 1.5 METs), LIPA (> 1.5 and ≤ 3 METs) and MVPA (> 3 METs).¹ Time spent in SB was analysed in epochs of 0 to < 30 minutes and

≥ 30 minutes and time spent in LIPA and MVPA were analysed in epochs of 0 to <10 minutes and ≥ 10 minutes.

Characteristics of the two groups are presented in Table 1. Comparison of the percentage of waking hours spent in SB, LIPA and MVPA between groups are presented in Figure 1. Table 2 shows the patterns of accumulation of SB, LIPA and MVPA. Daily step count was lower in the NSCLC group compared with healthy controls ($8,863 \pm 3,737$ steps/day versus $11,856 \pm 3,024$ steps/day; $p=0.009$).

The results demonstrate that, compared to healthy controls, people following curative intent treatment for NSCLC took fewer steps each day. Although there was no difference total time spent in SB, the NSCLC group accumulated a greater proportion of time in SB in prolonged, uninterrupted periods. They also spent less time in LIPA and accumulated less time in this domain in uninterrupted bouts ≥ 10 minutes. In summary, people following curative intent treatment for NSCLC spend more time in prolonged bouts of SB at the expense of LIPA. Interventions for this population should aim at breaking up time spent in prolonged periods SB with LIPA and increasing the time spent in bouts ≥ 10 minutes of LIPA.

Keywords: lung cancer; non-small cell; physical activity; sedentary behaviour; treatment; lobectomy.

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Conflict of interest

The authors declare no conflict of interest.

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Figure legend

Figure 1: Comparison of the time, expressed as a percentage of waking hours, spent in sedentary behaviour, light intensity physical activity and moderate-to-vigorous intensity physical activity between groups. Data are expressed as mean \pm standard deviation.

Abbreviations: NSCLC – Non-small cell lung cancer; PA – Physical activity

* $p = 0.04$

Time (% of waking hours)

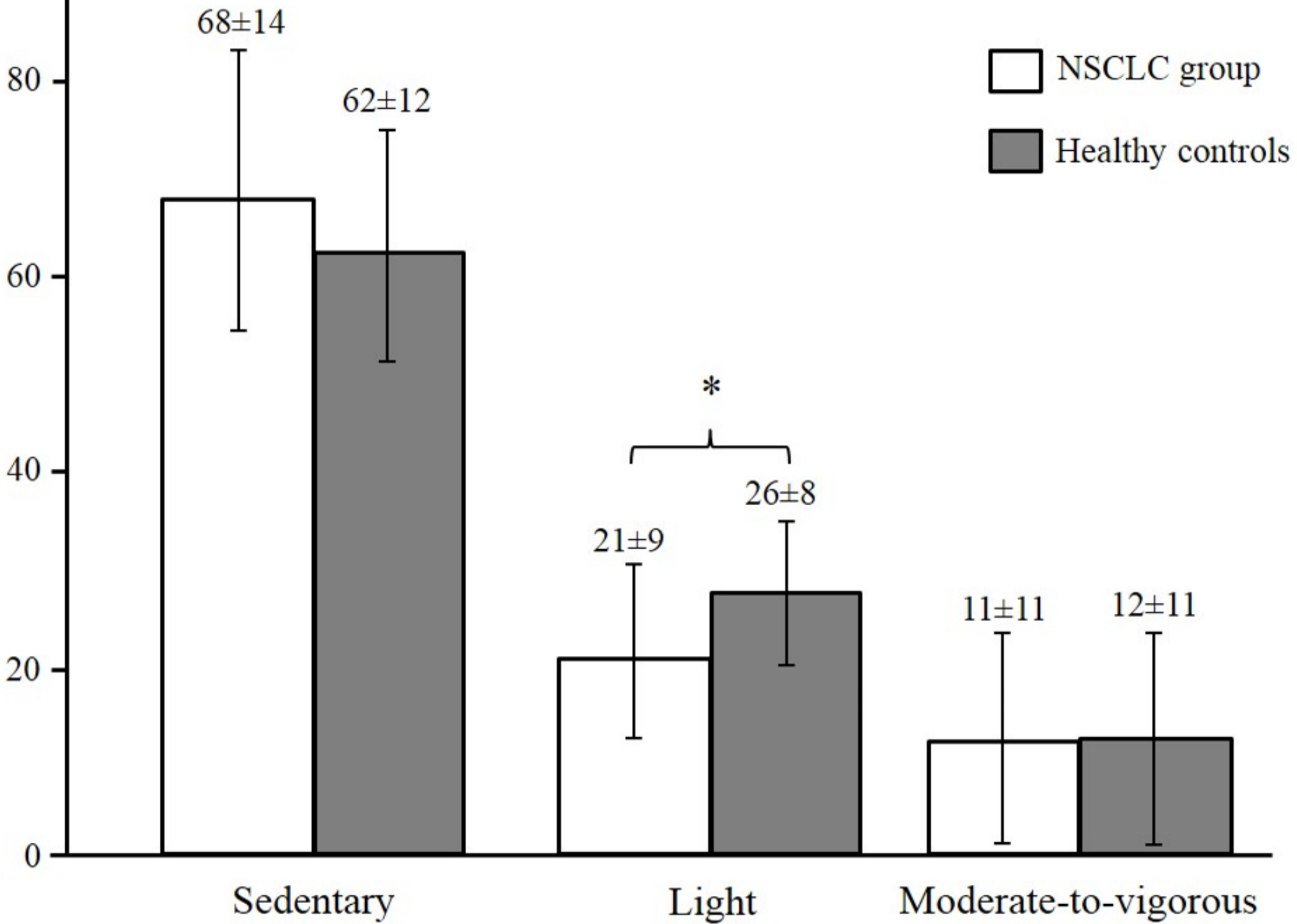


Table 1 – Participant characteristics

Variables	NSCLC group (n=20)		Healthy controls (n=20)		p value
	<i>mean ± SD</i>		<i>mean ± SD</i>		
Age (yr)	68 ± 10		69 ± 5		0.67
Height (cm)	165 ± 13		167 ± 6		0.36
Weight (kg)	72 ± 21		71 ± 14		0.82
BMI (kg·m ⁻²)	26 ± 6		25 ± 4		0.79
Smoking (pack·years)	35 ± 17		0.3 ± 0.9		<0.001
FEV ₁ (L)	1.69 ± 0.50		2.68 ± 0.54		<0.001
FEV ₁ (%pred)	67 ± 17		103 ± 15		<0.001
FVC (L)	2.74 ± 0.74		3.44 ± 0.75		<0.001
FVC (%pred)	81 ± 10		99 ± 15		<0.001
	n	%	n	%	
Gender, male/female	7/13	35/65	7/13	35/65	0.92
Smoking status					
Current smoker	1	5	0	0	0.34
Ex-smoker	16	80	2	10	<0.001
Never smoked	3	15	18	90	<0.001
COPD	11	55	0	0	<0.001
Other comorbidities					
Hypertension	11	55	2	10	<0.001
Stable ischaemic heart disease	3	15	1	5	0.25
Diabetes Mellitus	3	15	1	5	0.25
Dyslipidaemia	5	25	6	30	0.38
GORD	3	15	1	5	0.39
Hypothyroidism	2	10	3	15	0.62
Type of NSCLC					
Adenocarcinoma	14	70			
Squamous cell carcinoma	5	25			
Large cell carcinoma	1	5			
NSCLC stage					
I	15	75			
II	3	15			
IIIA	2	10			
Types of surgery					
Open	8	40			
VATS	12	60			
Adjuvant chemotherapy	2	10			

Abbreviations: BMI – Body-mass index; COPD – Chronic obstructive pulmonary disease; FEV₁ – Forced expiratory volume in one second; FVC – Forced vital capacity; GORD - Gastro-oesophageal reflux disease; MVV – Maximum voluntary ventilation; NSCLC – Non-small cell lung cancer; SD – Standard deviation; VATS – Video-assisted thoracoscopic surgery.

Table 2 - Patterns of accumulation of sedentary behaviour, light and moderate-to-vigorous intensity physical activity

Variables	NSCLC group n = 20	Healthy controls n = 20	<i>p</i> value
Percentage of total time in SB accumulated in bouts \geq 30 min	49 [42 to 65]	42 [30 to 58]	0.048
Percentage of total time in light intensity PA accumulated in bouts \geq 10 min	13 [5 to 21]	19 [13 to 29]	0.025
Percentage of total time in moderate-to-vigorous PA accumulated in bouts \geq 10 min	30 [17 to 40]	26 [13 to 50]	0.45

Data are expressed as median [interquartile range].

Abbreviations: NSCLC – Non-small cell lung cancer; PA – Physical activity; SB – Sedentary behaviour.