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№ 5517

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Sara Maheronnaghsh, Mario Vaz and Sara Shahedi

May 13, 2021

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Sara Maheronnaghsh[1], Mario Vaz[2], Sara shahedi[3]
[1, 3] PhD candidate of Occupational safety and health, Laboratory for Energy, Transports and Aeronautics (PROA/INEGI/LAETA), Faculty of Engineering, University of Porto,
[2]Associated Associate Professor, Mechanical Engineering Department
Laboratory for Energy, Transports and Aeronautics (PROA/INEGI/LAETA), University of Porto.

Abstract
Objective: This cross-sectional study aimed to examine the occupational sedentary time, physical activity, well-being, and job satisfaction reported by university office workers. **Background:** Prolonged sitting time has been reported among university workers, which can have adverse health effects. **Method:** An online invitation email with a self-reported survey was distributed to office workers, and 40 were recruited and completed the well-being questionnaire (SF-12 questionnaire) and job satisfaction (Minnesota questionnaires). Also, the physical activity was measure with the accelerometer (Actigraph GT3X). **Results:** 10 males and 30 females with a median age of 38 years wore Actigeraph for 16.7 hours and 4.16 days. They spent the majority of their time being sedentary (90%) and the least time in light (5.15%), moderate (4.13%), and vigorous activity (0.75%). The mean value of SF-12 scales was between 54 to 91.6, and overall job satisfaction was 70.35 out of 100.

Conclusion: The result shows significant relation between well-being and physical activity and occupational sedentary. However, no relation was found for job satisfaction.

Keywords: Well-being, Job satisfaction, Intervention, Sedentary workers

Introduction:

Sedentary behavior (SB) is increasingly present in people's professional lives and negatively affects their health. With the advancement of technologies, there has been an increase of sitting position (Wilmot et al., 2012) and influencing the culture of the workplaces. According to (W.H.O, 2019), SB has defined as any waking behavior characterized by an energy expenditure of $\leqslant$1.5 METs and a sitting or reclining posture.

Office workers spend up to 70% to 90% of the workday in a prolonged sitting posture (Smith et al., 2015) and are also exposed to ergonomic risk factors (Thorp et al., 2012). SB increases about 5% the risk of obesity and a 7% increase in the risk of diabetes(Hu FB, 2003). Additionally, there is growing evidence that prolonged sitting is associated with multiple health risks, including musculoskeletal disorders, cardiovascular diseases, some forms of cancer (Gao et al., 2016), which consequently causes direct (e.g., health-care costs) and indirect costs (e.g., sick leave, disabilities) (OMS, 2015; Pfeiffer et al., 2011), and decreases well-

being (Qi et al., 2018). Some studies show that an active lifestyle can improve well-being and decrease chronic diseases' risk $p \leq 0.05$(Puig-Ribera et al., 2015; Warburton et al., 2006).

WHO, 2018 reports that people who are not physically active are at risk of premature mortality compared to those who have moderate physical activity(PA) per week(WHO, n.d.).

Previous studies analyzed the differences in sitting and activity time between workdays and non-workdays, and the results showed that the workplaces have a key role in improving PA (McCrady & Levine, 2009; Thorp et al., 2012). Furthermore, exercise for fitness does not decrease the adverse effect of inactivity time during the workday; and people need to make slight modifications in no exercise activities during the workday (Finni et al., 2014).

The previous review has done on existing studies on this matter (Maheronnaghsh, 2018a)lead to the conclusion that implementation of these interventions in workplaces could reduce workers' sedentary time, with positive impacts on health and work-related outcomes, like increasing cognitive performance and job performance, as well as decreasing sickness absence (Chau et al., 2016). However, the effect of SB and PA on Job satisfaction(JS) that can influence productivity must be identified(Riketta, 2008). Since well-being identifies as a significant marker of health that plays an important role in workers and employers relations and job satisfaction (Joan Burton, 2010);

This study aimed to characterize the occupational SB and PA among office workers of the University of Porto. Additionally, we investigated the associations between PA, sedentary hours, and several dimensions of well-being and job satisfaction.

Material and Method:

Recruit participants

Forty office workers of UP were recruited via an internal email to all faculties and institutions. This email included a short explanation of the aim of the research. Subjects who expressed interest were asked to reply to the email with their demographic data, weight, and height (for initializing the accelerometer). Participants need to have office-based work that spends at least 6 hours out of an 8-hour per day sitting. Those who had the problem with using the accelerometer were excluded. During the data-gathering, they were asked to do their usual work. Before the

measurements, they were asked to sign the informed consent form. Each participant received one accelerometer with instructions for use, a reminder sign of wear, and a diary table to write wearing and taking off accelerometer's time. Also, they were asked to fill questionnaires about job satisfaction and well-being.

Measure physical activity:

For detecting SB and the level of PA were used accelerometers (ActiGraph GT3X [ActiGraph LLC, Pensacola, FL, USA]) strapped on the participants' thigh (Cleland et al., 2013; Montoye et al., 2016). The Actigraph GT3X (3.8×3.7×1.8 cm; 27 g) is a triaxial accelerometer-based PA monitor with a dynamic range of 2 g and is valid and reliable to monitor activities among various populations(Swartz et al., 2018). Accelerometer data will collect in 30HZ(Thorp et al., 2012). The measurements were performed during the five consecutive working days(Van Der Ploeg et al., 2010).

Accelerometer data were downloaded using ActiLife 3.2.2 software, and the validity of data was determined (e.g., wearing time, valid days). If the participant did not wear the Actigraph for 75% of the workday's hour, they were asked to wear it again. The activity was categorized as sedentary (<100 cpm; predominantly sitting), light-intensity activity (100-2019 cpm; typically gentle walking), moderate activity(2020–5998 cpm), and vigorous activity (≥ 5999 cpm)(Troiano et al., 2008).

A 60-second epoch length was used for data collection. The non-wear time was defined as ≥60 consecutive minutes of counts equalling zero, and thus the data were not included in the computation of sedentary time (Thorp et al., 2012).

Questionnaires

Job satisfaction was assessed with a Portuguese and English version of the short-form Minnesota Questionnaire (MSQ) (Ferreira et al., 2009; Weiss et al., 1967). Item responses are summed and averaged to create a total score; the lower score is the lower the level of job satisfaction. Besides the overall job satisfaction score, the items were combined into four-form subscales measuring nature of work, extrinsic, intrinsic,

and physical job satisfaction factors based on Toker, 2012, because the authors found these factors were the most suitable for the aim of this study.

The well-being was evaluated with the Portuguese and English versions of Health Questionnaire SF-12 (Pais Ribeiro, 2005; Ware et al., 1996). It measures functional health and well-being from the participant's point of view and will use as a quantitative measure of the health outcome according to the participant's judgment. It has twelve items in eight different scales (21): "General health (1 item), Physical functioning (2 items), Role physical (2 items), Role emotional (2 items), Body pain (1 item), Mental health (2 items), Vitality (1 item) and Social functioning (1 item)". Each item has a Likert scale that participants rate themselves from 0(lowest level of health) to 100(highest level of health), then scale scores compute using the responses to items (Gandek et al., 1998).

Statistical Analysis:

Data management and analysis were performed using the IBM SPSS Statistics package, version 26.0. Data were expressed as means and standard deviations (SD) for continuous variables and as frequencies and percentages for categorical variables. The Kolmogorov-Smirnov test was used to test the normality of variables. Spearman test was used for analyzing nonparametric data, respectively.

Result

Forty-four participants had the interest to participate in this study; however, only 40 returned the questionnaires. Of these, ten were male and 30 female with a median age of 38 years. Additional socio-demographic characteristics of workers are presented in Table 1.

Table 1: Socio-Demographic and body composition data of participants(n=40)

Variables	N	%	Mean	SD
Age	40		38	8.93
gender				
Female	30	75.00		
Male	10	25.00		

Marital status				
Single	15	37.50		
Married	19	47.50		
Union of Fact	6	15.00		
Weight	40		67.41	12.28
Height	40		168.12	7.72
BMI	40		23.73	3.36
Underweight(<18.5)	1	2.50		
Normal	27	67.50		
Overweight	9	22.50		
Obese	3	7.50		
Education				
Bachelor	15	37.50		
Master	21	52.50		
Doctoral	4	10.00		
Profession				
Researcher	18	45.00		
Administrative	22	55.00		

BMI: body mass index

For the analyses of physical activity and sedentary during work time, on average, 16.7 valid hours and 4.16 valid days per person were measured. Actigraph-based measurements are described in Table 2.

The sedentary time during workdays was categorized into low (0-4 h), moderate (4–6 h), and high (>6 h), comprising, respectively, 2.5%, 7.5%, and 90 % of workers.

They spent the majority of their time being sedentary (6.86 hours per day) and the least time in moderate (22.72 minutes per day) and vigorous activity (3.08 minutes per day).

Seventy percent of workers have a prolonged sedentary time for more than 30 minutes, and the average length of sedentary time during work hours was 27 min (± 12). They recorded an average of 3235 ± 1592 steps and an average of 59 min per work-hour Table 2.

Table 2: Accelerometer-based sedentary time and physical activity during workday (n = 40)

	Count	**%**	**Min**	**Max**	**Mean**	**SD**
Sedentary time (hours/day)			3.89	8.44	6.86	.929
0-4 hours	1	2.50				
4-6 hours	3	7.50				

> 6 hours	36	90				
MAX length in sedentary bouts (min)			12	57	27	12
Prolonged Sedentary time >30 min		70				
Time in Sedentary		90				
Time in Light PA (minutes/day)		5.15	8.37	60.35	25.56	11.86
Time in Moderate PA (minutes/day)		4.13	6.80	47.22	22.72	8.77
Time in Vigorous PA (minutes/day)		0.75	0.10	10.34	3.08	2.60
Steps per day	3235					1592
Steps min/workday	57					27

The mean values for SF-12 scales for participants are shown in Table 3. Questions are integrated into eight factors and twelve sub-factors (Table 3). The mean value of SF-12 scales was between 54 to 91.6 out of 100. Physical functioning and body pain were the highest scales 91.6 and 80, respectively, and vitality, general health, and role of emotion (54, 67.6, 64.1) were the lowest scales.

Table 3 shows factors and their items, with mean scores and standard deviations. As it is seen, social status (4.29), social service (4.28), and ability utilization (4.24) had the highest level of satisfaction mean scores. Compensation (2.97), Advancement (2.66), and company policies and practices (3.28) had the lowest level of satisfaction mean scores. Physical job satisfaction has the lowest mean value between the other four factors. The overall job satisfaction for this sample group is 3.69 out of 5.

Table 3: Mean value of factors of MSQ, and SF-12 (n=40)

	Factors	**Items (mean)**	**Overall Mean**
SF-12	General health	-	64,1
	Physical functioning	Moderate activity limitation (91)	91,6
		Climbing stairs limitation (92.3)	
	Role physical	Limited activity due to physical problem (82.5)	78,8
		Performing difficulty due to physical problem (77.5)	
	Role emotional	Decreased working due to emotional problem (76.9)	67,6
		Accomplish less due to emotional problem (58.9)	
	Body pain	-	80
	Vitality	-	54
	Mental health	Feel nervous (70)	75,2

		Feel blue (80.5)	
	Social functioning	-	74.9
MSQ	Factor 1 (nature of work)	Independence, 4.1 (82)	3.8 (71.2)
		Variety, 3.7 (74.3)	
		Creativity, 3.8 (40)	
		Responsibility,3.7 (75.5)	
		Ability utilization,3.7 (74.5)	
		Activity, 4 (81)	
	Factor 2 (Extrinsic)	Supervision (technical), 3.7 (74)	3.6(74.8)
		supervision (human relations), 3.7 (75)	
		Recognition, 3.7 (74.7)	
		Company policies and practices, 3.3 (75.6)	
	Factor3 (intrinsic)	Social service, 3.7 (75)	3.7 (73.2)
		Authority, 3.5 (70.5)	
		Security, 3.6(72.5)	
		Social status 3.5, (70.7)	
		Achievement, 3.6 (72.1)	
		Moral values, 3.9(78.5)	
	Factor4 (physical job satisfaction)	Compensation, 2.9 (58.5)	3.1(62.2)
		Advancement , 2.6(52.5)	
		Working conditions, 3.8(75.8)	
	Overall		3.6 (70.35)

Table 4 shows that there were a correlation between light PA with age (R=0.320, p=0.044) and education (R= -0.312, p=0.050) of workers, also, results shows that profession has a relation with amount of moderate(R=0.318, p=0.046) and moderate to vigorous PA (R=0.318, p=0.046) per day. Occupational sedentary hours per day has negative correlate with experience(R= -0.437, p=0.005), and age (R= -0.347, p=0.028); meanwhile vigorous PA (R= 0.358, p= 0.023) and steps per day (R= 0.324, p=0.042) have positive correlation with experience (P≤0.05).

There were negative correlation between length of experience and role emotional (*decreased working due to emotional problem* (R= -0.350, p=0.027)*, and accomplish less due to emotional problem* (R= -0.318, p=0.045)) as well as mental health (R= -0.356, p=0.034). Also, age has a relation with role physical (R= -0.376, p=0.017) (*limitation in climbing stairs*(R= -0.358, p=0.023)), and *profession with accomplish less due to emotional problem* (R= 0.341, p=0.032) has relationship (Table 4).

Table 4 : Spearman correlation between occupational sedentary hours, PA, job satisfaction, well-being with age, education, profession, experience

		Age	Education	Profession	Experience
Light PA minute per day	R	.320	-.312	NA	NA
	Sig. (2-tailed)	.044	.050		
Moderate PA minute per day	R	NA	NA	.318	NA
	Sig. (2-tailed)			.046	
Vigorous PA minute per day	R	NA	NA	NA	.358
	Sig. (2-tailed)				.023
MVPA minute per day	R	NA	NA	.318	NA
	Sig. (2-tailed)			.046	
Steps	R	NA	NA	NA	.324
	Sig. (2-tailed)				.042
Occupational sedentary hours per workday	R	-.347	NA	NA	-.437
	Sig. (2-tailed)	.028			.005
DW	R	NA	NA	NA	-.350*
	Sig. (2-tailed)				.027
AL	R	NA	NA	.341*	-.318*
	Sig. (2-tailed)			.032	.045
C	R	-.358*	NA	NA	NA
	Sig. (2-tailed)	.023			
RP	R	-.376	NA	NA	NA
	Sig. (2-tailed)	.017			
MH	R	NA	NA	NA	-.356
	Sig. (2-tailed)				.024
JS Overall	R	NA	NA	.337*	NA
	Sig. (2-tailed)			.044	
Factor 1	R	NA	NA	.375*	NA
	Sig. (2-tailed)			.019	
Factor 2	R	NA	NA	-.325*	NA
	Sig. (2-tailed)			.050	
Factor 3	R			.365*	
	Sig. (2-tailed)			.026	

DW= Decreased working due to emotional problem; AL= Accomplish less due to emotional problem; C= Climbing stairs limitation; RP=Role physical; MH=Mental health; JS= Job satisfaction

Factor1 = nature of work

Factor 2= extrinsic job satisfaction

Factor3= intrinsic job satisfaction

NA= No correlation found

$p \leq 0.05$

Table 5 shows the relation between wellbeing factors and sedentary hours with body pain (R= 0.329, p= 0.038), and vitality (R= 0.342, p= 0.031); also, invers correlation with moderate activity limitation (R= - 0.354, p= 0.027)(p≤0.05).

Table 5: Spearman correlation of SF-12 scales and occupational sedentary hours and Physical activity

		Sedentary hours per day	**Light physical activity**	**Moderate physical activity**	**Steps per day**
Moderate Activity Limitation	R	-.354	-.341	NA	NA
	Sig. (2-tailed)	.027	.032		
Climbing stairs Limitation	R	NA	-.321	NA	NA
	Sig. (2-tailed)		.043		
Body pain	R	-.329	NA	NA	.335
	Sig. (2-tailed)	.038			.035
Vitality	R	-.342	NA	NA	.315
	Sig. (2-tailed)	.031			.048
MCS	R	NA	NA	.352	.367
	Sig. (2-tailed)			.026	.020
Feel Blue	R	NA	NA	NA	.336
	Sig. (2-tailed)				.034

MCS: Mental component summary
NA: No correlation found
p≤0.05

Physical component summary (PCS) and mental component summary (MCS) scores are two summary measures for SF-12 questions. The MCS focuses on depression and anxiety, social activity, carelessness, and the impact of feelings on the amount accomplished. There were an association between MCS and Moderate physical activity (R= 0.352, p= 0.026), and step per day (R= 0.367, p= 0.034). The positive correlation was found between feel blue (R= 0.336, p= 0.034), and vitality (R= 0.367, p= 0.020), and body pain (R= 0.335, p= 0.035) with number of steps per day (Table5).

No significant association was observed between job satisfaction factors and sedentary hours, light/moderate/vigorous physical activity. The job satisfaction overall and factor 1(nature of work) (R= 0.375, p= 0.019) , factor2 (extrinsic) (R=

0.325, p= 0.050) and factor 3 (R= 0.365, p= 0.026) has a relation with profession (Table 4). No correlation was found between factor 4 and other variables.

Discussion:

The results show that having more moderate PA is related to better mental health and more step per day related to better mental health and vitality. These results are consistent with the previous studies on these issues (Kilpatrick et al., 2013; Marques et al., 2016; Michishita et al., 2017; Watanabe & Kawakami, 2017).

The evidence demonstrated that engaging in SB was linked to an increased risk of mental health outcomes, and increasing physical activity has been shown can be beneficial in reducing mental health outcomes in and adults(Ströhle, 2008; Teychenne et al., 2015)

There was a negative correlation between subjects' sedentary hours per day and vitality, body pain, and limitation in moderate PA. Previous research has identified that sitting for more than 7 hours per day was associated with increased mental health problems, specifically depressive symptoms and less moderate activity(Puig-Ribera et al., 2015).

Also, the result demonstrated that light PA has a negative correlation with limitation in doing moderate PA. Types of professions and tasks can affect accomplishing tasks less due to emotional problems.

No relationship was found between job satisfaction and PA and sedentary hours per day. Although, previous studies show regular physical activity could increase job satisfaction and quality of life for office workers (Arslan et al., 2019). The result shows increasing PA and decreasing occupational sedentary hours with interventions may result in better mental health and job satisfaction.

Limitation

As a cross-sectional study, it is impossible to establish cause-effect relationships between sitting time, PA, mental well-being, and job satisfaction. Nevertheless, the placement of Actigraph on the thigh and real-work situation to collect accurate data is the study's strength. Therefore, the result can be utilized to design the most appropriate interventions to improve health outcomes.

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