International Journal of Industrial Ergonomics 95 (2023) 103448

Contents lists available at ScienceDirect

International Journal of Industrial Ergonomics

journal homepage: www.elsevier.com/locate/ergon

Personal predictors of the longest episode of occupational sitting and their interaction with workplace support for health among workers in Accra: A cross-sectional analysis with sensitivity analyses

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ARTICLE INFO

Keywords:
Occupational sitting
Workplace support for health
Personal factors
Hierarchical linear regression
Ghana

ABSTRACT

Many studies have identified personal factors associated with occupational sitting time, but none of them focused on the longest episode of occupational sitting (hereby referred to as continuous occupational sitting time) nor considered whether workplace support for health moderates the associations between these factors and continuous occupational sitting time. This study aimed to identify personal factors predicting continuous occupational sitting time and ascertained whether workplace support for health moderates the associations between these factors and continuous occupational sitting time. A cross-sectional design and an adapted hierarchical linear regression analysis was employed. The participants were 991 employees of public and private organizations in Accra, Ghana. Results were presented with hierarchical linear regression analysis. The ultimate predictors of continuous occupational sitting time at a minimum of $p < 0.05$ include age, job type, and job income. Workplace support for health significantly moderated the primary associations, which means that workplace support for health altered the strength of the associations between all predictors (except tenure) and continuous occupational sitting time. This study concludes that there are inequalities in continuous occupational sitting time between employee groups that can be modified by workplace support for health.

1. Introduction

Research to date has shown that excessive occupational sitting is a major health risk that can increase the risk of chronic conditions such as hypertension and stroke (Bennie et al., 2013; De Cocker et al., 2014, 2014; Gilson et al., 2011). Occupational sitting increases the risk of physical inactivity (Chau et al., 2010; Gilson et al., 2011; Loyen et al., 2018; Müller et al., 2020), which is a leading cause of the above long-term conditions and mortality (Albert et al., 2020; Legh-Jones and Moore, 2012). Occupational sitting time is the amount of time spent by employees sitting to perform job-related tasks (Van Uffelen et al., 2010; Yang et al., 2017). We operationally define occupational sitting time as the total amount of sitting time spent on a typical day in completing job tasks, including activities necessitated by the individual's employment. This is an extended definition that recognises key components of occupational sitting time not previously considered by researchers. For example, time spent sitting as a driver or passenger while travelling to work has not been measured as a domain of occupational sitting. With our definition, therefore, occupational sitting time includes time spent around the employee's work desk (with or without a computer) and during meetings, lunchtime, and travel to and from work.

Several studies (Bennie et al., 2013; De Cocker et al., 2014; Yang et al., 2017) have assessed the associations between individual factors and occupational sitting time. For example, Bennie and colleagues examined individual correlates of occupational sitting time in a sample from 32 countries and found age, gender, and education as some of the key predictors of occupational sitting. De Cocker et al. explored individual variables as potential predictors of occupational sitting and found income, age, and gender as major correlates of occupational sitting. In the United States, Yang et al. found race, household income, and job type (i.e., full-time vs part-time) as some of the key predictors of occupational sitting. We have observed that these studies measured sitting

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https://doi.org/10.1016/j.ergon.2023.103448
Received 7 September 2022; Received in revised form 26 January 2023; Accepted 1 April 2023

time as the total amount of time spent on a typical day completing job tasks while sitting. This measurement technique required the participants to report a single value of both long and short sitting times on a typical day, which concealed continuous sitting time. Recent commentaries (Duncan et al., 2015; Hadgraft et al., 2015; Lakerveld et al., 2017) suggest that sitting is not necessarily harmful if it is short. More specifically, sitting is more likely to be harmful if it is continuous (i.e., it is uninterrupted with a physical task) for at least 30 min (Duncan et al., 2015; Pronk et al., 2012). If so, studies focusing on continuous occupational sitting time are needed to add to the evidence available to date. We operationally define continuous occupational sitting time as the time from the employee's longest episode of sitting in five aspects of work (i.e., travelling to work, travelling from work, sitting around a desk or screen at work, sitting during meetings, and sitting during launch) on a typical day that is uninterrupted by a walk or any other physical activity. Details of the measurement based on this definition are provided later in this paper. To build on the evidence to date, we assess personal predictors of continuous occupational sitting time. This assessment is novel for focusing on continuous occupational sitting time for the first time and measuring domains of occupational sitting not previously considered in research.

As a health risk factor that can cause low productivity (Gilson et al., 2011; Van Uffelen et al., 2010), occupational sitting must be discouraged among employees; discouraging occupational sitting enables employees to keep active and maintain health as well as productivity. In the extant literature, organizations reduce the risk of occupational sitting by adopting and rolling out workplace health promotion programmes (Chau et al., 2010). Recently, Kava et al. (2021) developed a scale measuring workplace support for health, a construct of basic organizational efforts to support employee health. The key components of this construct are the availability of health promotion programmes for employees and health champions who encourage healthy behaviours. These attributes of the scale are the basic aspects of workplace health promotion driven by a policy on occupational health and safety (Kava et al., 2021). Since this construct is new, not previously studied about employees' personal factors, and yet measures basic health promotion programmes of organizations, the second objective of this study was to ascertain how it interacts with employee personal attributes to influence continuous occupational sitting time.

We attempted to answer two research questions as follows: *(1) which personal factors are associated with continuous occupational sitting time,* and *(2) does workplace* support *for health interact with the personal factors to influence continuous occupational sitting time?* To address these questions, we adapted a hierarchical linear regression technique (Bempong and Asiamah, 2022; Rezai et al., 2009) to classify the personal predictors into two groups: *the ultimate factors* and *non-significant factors*. We employed this technique as a more resilient method to group the personal factors and to make it easier for stakeholders to rank the predictive influences of the factors on occupational sitting. This analysis would also make the moderating role of workplace support for health more comprehensive. Our analysis is expected to guide stakeholders to identify and understand potential inequalities in occupational sitting time between employee groups and how these inequalities are affected by workplace support for health.

2. Methods

2.1. Design

This study adopted a cross-sectional design and an adapted hierarchical linear regression (HLR) analysis performed in some previous studies (Bempong and Asiamah, 2022; Rezai et al., 2009). The first stage of this HLR analysis was employed to screen for the ultimate personal factors. We employed the HLR analysis as part of the cross-sectional design for two reasons. First, it enabled us to identify predictors of the dependent variable in an orderly manner. Secondly, it made it easier for us to identify how workplace support for health modifies the effects of the predictors on continuous occupational sitting time.

2.2. Population, sample, and selection

The study population was residents of Accra who were working with public and private organizations. The population comprised employees of 28 organizations (private organizations = 10; public organizations = 18) implementing basic workplace support for health programmes. The participants were selected with the following inclusion criteria: (a) readiness and willingness to participate in the study; (b) having a minimum of a basic school leaving certificate, which was an indicator of the ability to complete questionnaires in English; (c) being able to walk independently for at least 10 min (Bempong and Asiamah, 2022), and (d) being an employee of one of the selected organizations. Through a phone interview performed over two weeks, research assistants selected 1203 employees who met the above inclusion criteria. We utilised the G*Power 3.1.9.4 software and standard statistics ($\alpha = 0.05$; power = 0.8; effect = 0.2) to calculate the minimum sample necessary. The minimum sample reached for multiple regression analysis with a maximum of 11 predictors was 151. To maximise response rate and statistical power, we decided to collect data on all employees who were eligible to participate.

2.3. Measures

Continuous occupational sitting time was measured by asking participants to report the time (in minutes) spent on the longest episode of sitting on a typical day in five areas of work: (1) travelling as a driver or passenger to work; (2) travelling as a driver or passenger back from work; (3) working around a desk with or without a screen; (4) having a meeting at work, and (5) eating or chatting with friends during lunchtime. We added time reported on these five domains to generate data on "continuous occupational sitting time", which we subsequently refer to as occupational sitting time in this paper. Appendix A shows operational definitions used to measure occupational sitting time in the five aspects of work. Workplace support for health was measured with the five-item scale that accompanies five descriptive anchors (i.e., *strongly disagree – 1, disagree – 2, somewhat agree – 3, agree – 4, strongly agree – 5*). The scale, whose five items as shown in Appendix B, produced a Cronbach $\alpha = 0.82$ in the study from which it was adopted (Kava et al., 2021). In the current study, it produced Cronbach's $\alpha = 0.78$, which evidenced its internal consistency. Each item of the scale produced factor loadings ≥ 0.5 in exploratory factor analysis, which evidenced the relevance of all items (Garson, 2012).

We drew on relevant previous studies (Asiamah et al., 2022; Asiamah et al., 2021; Loyen et al., 2018; Yang et al., 2017) to measure 11 personal factors relevant to the study context as follows. Gender was measured as a dichotomous categorical variable (i.e., men – 1; women – 2). Similarly, job type (full-time – 1; part-time – 2), sector of employment (public company – 1; private company – 2), industry (manufacturing company – 1; service company), and chronic disease status (none – 1; one or more conditions – 2), were measured as dichotomous categorical variables. These categorical variables were dummy coded, and one group was set as a reference for the regression analysis. Physical function was measured as a numeric variable by asking participants to indicate on a scale of 1–4 (i.e., not at all – 1; low extent – 2; moderate extent – 3, high extent – 4) the extent to which they could independently perform physical tasks such as lifting up heavy objects weighing at least 20kgs (Bempong and Asiamah, 2022). The resulting data on physical function was numeric and could, therefore, be incorporated into the statistical analysis. Income was measured as a continuous variable by asking participants to report their net monthly pay in Ghana cedis. Job tenure was measured as a continuous variable by asking the participants to report how long (in years) they had worked in their respective organizations. Age (in years) was measured as a continuous variable. Similarly, education was measured as a continuous variable by asking the participants to report their total years of schooling.

2.4. The questionnaire

A self-reported questionnaire was used to collect data. This instrument had three main sections; the first section presented items on the personal factors; the second part measured workplace support for health, and the third part presented measures of occupational sitting time. The questionnaire had an introductory statement that included the research objective, ethics statement, and instructions for completing the survey. To minimise or avoid common methods bias, some steps recommended in the literature were taken (Bempong and Asiamah, 2022; Jakobsen and Jensen, 2015). The first step was at the study design stage where the questionnaire was structured to avoid or minimise response bias. In this regard, the three main sections were presented as unique blocks, each with a different preamble and set of instructions. The second step was *Herman's one-factor* method, which involved the use of exploratory factor analysis to assess the factor structure of the scale used to measure workplace support for health. This analysis (which utilised the principal components methods with varimax rotation) produced a factor solution with two factors (total variance = 54%): factor 1 (3 items; variance = 38%) and factor 2 (2 items; variance = 16%). Each item was associated with a factor loading ≥0.5. Since this analysis produced more than a single factor, common methods bias was minimal or absent (Jakobsen and Jensen, 2015).

2.5. Data collection

This study received ethics clearance from an institutional ethics review board in Accra (ethics review number: 02-2021-ACE). The participants provided written informed consent after reading the study's ethics statement. The questionnaire was hand-delivered at the premises of the organizations by three research assistants who initially selected eligible participants using a screening questionnaire. The questionnaires were delivered to the participants in sealed and stamped envelopes. Some participants completed and returned the questionnaire instantly, whereas others returned them after four to five weeks. Thus, the data collection process lasted about five weeks (March 4 – April 10, 2021). Out of 1203 questionnaires administered, 1044 were returned. Fifty-three questionnaires were discarded: 23 were not completed at all whereas 30 were completed halfway. So, 991 questionnaires were analysed.

2.6. Statistical analysis technique

We analysed data with SPSS 28 (IBM Inc, New York) in two phases. The first phase involved exploratory data analysis where outliers and missing items were identified and primary assumptions governing the use of HLR analysis assessed. As part of the first phase, we used descriptive statistics to summarise all the variables; the mean and standard deviation were used to summarise continuous variables whereas frequencies and percentages were used to summarise categorical variables. This step revealed the proportion of missing items in the data for each variable. We analysed the data with the missing items found (see Table 1) since the longest continuous chain of missing data for any variable was less than 10% (Bempong and Asiamah, 2022).

Subsequently, we assessed the linearity of the associations between all personal factors and occupational sitting time to know if HLR could be used to model these relationships. In this vein, we fitted a multiple regression model with the personal factors as predictors and occupational sitting time as the dependent variable. We then plotted the standardised residuals against their respective predicted values to do a scatter plot. Our assessment of the scatter plot based on recommendations in the literature shows that the associations can be modelled with an HLR (Garson, 2012). We also observed the shape and pattern of the scatterplot based on Garson's (Garson, 2012) recommendations and confirmed homoscedasticity, a necessary assumption for HLR. Homoscedasticity is the situation where the error term of the association between the dependent variable and independent variable is the same for all values of the independent variables in a model (Garson, 2012). We further identified potential multivariate outliers through the foregoing model by saving the Mahalanobis distance (i.e., MAH-D) values and computing their corresponding p-values. We confirmed the absence of multivariate outliers with all MAH-D values producing p-values ≥0.001. Other relevant assumptions were assessed in the second phase of the analysis.

In the second phase, we adapted the first stage of a sensitivity analysis utilising HLR (Bempong and Asiamah, 2022; Rezai et al., 2009). In this regard, we fitted a multiple regression model (i.e., block 1) aimed at removing all potential predictors with $p \geq 0.25$ (Bempong and Asiamah, 2022; Rezai et al., 2009). It is assumed that other predictors kept in the regression model at $p < 0.25$ can significantly influence the dependent variable in another multiple regression model not including the predictors removed. Hence, we fitted another multiple regression model (i.e., block 2) in which only the remaining potential predictors were included. All potential predictors that failed to predict the dependent variable at $p < 0.05$ were removed from this block. A confirmatory model (i.e., block 3) was further fitted to find out if all the potential predictors retained in block 2 were significantly associated with occupational sitting time. We found that all the variables retained in block 2 were significantly associated with occupational sitting time at $p < 0.05$. These predictors became the ultimate personal factors whereas the other variables removed from blocks 1 and 2 became the non-significant predictors.

Table 1
Summary statistics on participant characteristics.

Variable	Group	Frequency/ Mean	Percent/ SD
Categorical variables			
Marital status	Not married	298	30%
	Married	653	66%
	Missing	40	4%
	Total	991	100%
Chronic disease status	None	803	81%
	≥1	168	17%
	Missing	20	2%
	Total	991	100%
Job type	Full-time	791	80%
	Part-time	180	18%
	Missing	20	2%
	Total	991	100%
Physical function	No	30	3%
	Yes	902	91%
	Missing	59	6%
	Total	991	100%
Industry	Manufacturing	100	10%
	Service	861	87%
	Missing	30	3%
	Total	991	100%
Sector	Public	861	87%
	Private	120	12%
	Missing	10	1%
	Total	991	100%
Gender	Men	493	50%
	Women	489	49%
	Missing	9	1%
	Total	991	100%
Continuous variables			
Income (₵)	–	1245.59	746.74
Job tenure (yrs)	–	5.28	4.32
Age (yrs)	–	33.95	8.72
Education (yrs)	–	5.32	18.19
Occupational sitting time	–	172.73	18.01
Workplace Support for Health	–	15.43	2.81

Note: SD – standard deviation; Mean and SD are for continuous variables whereas frequency and percent are for categorical variables.

Following previous studies (Asiamah et al., 2021; Bempong and Asiamah, 2022), we assessed the interactions of all personal variables with workplace support for health by first using the compute function to generate relevant interaction terms. For example, WSH*Education represented the interaction between workplace support for health and education. Two other multiple regression models were subsequently fitted; one of these (i.e., block 1) examined the association between occupational sitting time and the interactions between the ultimate personal factors and workplace support for health whereas the other model (i.e., block 2) examined the association between occupational sitting time and the interactions between the non-significant personal factors and workplace support for health. The statistical significance of the results was detected at $p < 0.05$. The remaining assumptions (i.e., independence of errors and multicollinearity assumptions) for using HLR were assessed and met with the above blocks.

3. Findings

Table 1 shows summary statistics on the personal characteristics of participants. The table shows that 30% (n = 298) of the participants were not married whereas 66% (n = 653) were married. The average age of participants was 34 years (Mean = 33.95; SD = 8.72) whereas the average occupational sitting time was 173 min (Mean = 172.73; SD = 18.01). The table shows other relevant summary statistics. Table 2 shows Pearson's correlation between occupational sitting time, workplace support for health, and the ultimate personal variables. The table shows a negative correlation between occupational sitting time and workplace support for health ($r = -0.179$; $p < 0.001$; two-tailed), which means that higher workplace support for health was associated with lower scores of occupational sitting time. Other relevant correlations are shown in Table 2.

Table 3 shows HLR results showing the relationships between occupational sitting time and the ultimate personal variables. Gender, education, and sector were removed at $p \geq 0.25$ in the first block. In the second block, physical function, industry, and job tenure were removed at $p > 0.05$. In the third block, all the ultimate personal variables have a significant association with occupational sitting time, with age having the strongest relationship with occupational sitting time ($\beta = -0.24$; $t = -4.1$; $p < 0.001$). Thus, participants who reported higher ages reported smaller occupational sitting time. Job type also has a negative association with occupational sitting time ($\beta = -0.16$; $t = -4.13$; $p < 0.001$), which means that full-time employees reported higher occupational sitting time, compared with part-time employees.

Table 4 shows regression coefficients associated with the interaction between workplace support for health and the ultimate personal variables as well as the non-significant predictors. In block 1, workplace support for health and its interactions with all the ultimate personal variables, except marital status, are significantly associated with occupational sitting. Generally, workplace support for health weakened the associations between the ultimate personal factors and occupational sitting. For instance, the negative relationship between age and occupational sitting time was weakened by workplace support for health ($\beta = -0.14$; $t = -2.58$; $p < 0.05$). In the second block, workplace support for health significantly moderated the associations between the non-significant personal factors and occupational sitting time. More specifically, the interaction between gender and workplace support for health (i.e., WSH*Gender) is positively associated with occupational sitting time ($\beta = 0.1$; $t = 2.99$; $p < 0.001$), which suggests that women reported higher occupational sitting time than men at higher workplace support for health. The association between occupational sitting time and marital status became non-significant at higher workplace support for health ($\beta = 0.04$; $t = 0.99$; $p > 0.05$), which means that married employees were less likely to report occupational sitting at higher workplace support for health. All the non-significant personal factors, except job tenure, significantly predicted occupational sitting time at higher workplace support for health.

4. Discussion

This study aimed to identify the ultimate personal factors predicting occupational sitting time and ascertained whether workplace support for health moderates the associations between personal factors and occupational sitting time.

Out of eleven personal variables, five were significantly associated with occupational sitting time at a minimum of $p < 0.05$. More specifically, part-time employees reported lower occupational sitting time, compared with full-time employees, which is consistent with some previous studies (De Cocker et al., 2014; Yang et al., 2017). In the study of De Cocker and colleagues, for instance, full-time employees reported higher occupational sitting time compared with part-time employees. This result may be owing to full-time employees spending more time on the job on a typical day than part-time employees. Thus, occupational sitting time would be proportional to the total amount of time the employee spends at work. Further to the above, income was positively associated with occupational sitting time, which means that occupational sitting time was higher for employees who reported higher income. Similarly, the study by De Cocker et al. found that employees with higher job income reported higher occupational sitting. Another study conducted in Australia (Hadgraft et al., 2015) found a positive association between income and occupational sitting. This relationship may be due to work engagement among employees increasing with higher job income; as employees receive a promotion to higher job ranks where they receive higher pay, their job responsibility and engagement increase, causing an increase in occupational sitting time.

This study also found that employees without a clinically diagnosed chronic condition reported larger occupational sitting time than employees with at least one of these conditions. This result is supported by recent pieces of evidence (Asiamah et al., 2022; Asiamah et al., 2021) suggesting that people with long-term conditions may be more active than their counterparts without these conditions. For instance, Asiamah and colleagues found that individuals with a chronic condition reported higher physical activity time, compared with those without this condition. This seemingly counterintuitive result may be owing to employees with a chronic condition increasing their physical activity time and reducing their sitting time upon knowing about their chronic disease status. This thinking harmonises with the argument of Asiamah et al. that people who are aware of their chronic conditions are more likely to modify their behaviours by sitting less and eating well. Similarly, people

Table 2
Bivariate correlations between occupational sitting time, workplace support for health, and ultimate predictors.

Variable	1	2	3	4	5	6	7
1. Occupational sitting time	1	−.179**	−.129**	0.05	−.160**	0.051	−.076*
2. Workplace Support for Health		1	−0.024	−.065*	0.005	−.112**	0.021
3. Job type (ref – full-time)			1	−.404**	−.153**	−.331**	−.472**
4. Income (₵)				1	.347**	.341**	.556**
5. CDS (ref – none)					1	.249**	.698**
6. Marital status (ref – not married)						1	.477**
7. Age (yrs)							1

**$p < 0.001$; *$p < 0.05$; CDS – chronic disease status.

Table 3
The ultimate correlates of occupational sitting from the hierarchical linear regression analysis.

Model	Predictor	Standardized Coefficients			95% CI	Model fit			
		β	t	p		R^2	Adjusted R^2	Durbin Watson	F
1	(Constant)		3.22	0.001	±230.24	0.114	0.102	1.6	9.45**
	Gender (reference – men)[a]	0.01	0.18	0.86	±39.97	–	–	–	–
	Education (yrs)[a]	0.02	0.20	0.81	±37.11	–	–	–	–
	Physical function	0.05	1.25	0.21	±126.63	–	–	–	–
	Industry (ref -manufacturing)	0.10	1.21	0.23	±127.18	–	–	–	–
	Sector (reference – public)[a]	0.07	0.8	0.42	±119.90	–	–	–	–
	Job type (reference – Full-time)	−0.15	−3.67	<.001	±53.47	–	–	–	–
	Income (₵)	0.12	2.19	0.03	±0.04	–	–	–	–
	CDS (reference – none)	−0.16	−3.07	0.002	±69.95	–	–	–	–
	Marital status (reference – not married	0.17	4.08	<.001	±45.54	–	–	–	–
	Job tenure (yrs)	0.08	1.17	0.24	±7.89	–	–	–	–
	Age (yrs)	−0.26	−3.44	<.001	±4.31	–	–	–	–
2	(Constant)		4.55	<.001	±178.54	0.108	0.099	1.6	11.43**
	Physical function[b]	0.06	1.42	0.156	±126.15	–	–	–	–
	Industry (reference – manufacturing)[b]	0.04	1.11	0.268	±53.84	–	–	–	–
	Job type (reference – Full-time)	−0.13	−3.18	0.002	±52.53	–	–	–	–
	Income (₵)	0.13	2.61	0.009	±0.03	–	–	–	–
	CDS (reference – none)	−0.15	−2.998	0.003	±69.47	–	–	–	–
	Marital status (reference – not married)	0.18	4.45	<.001	±43.48	–	–	–	–
	Job tenure (yrs)[b]	0.10	1.55	0.122	±7.47	–	–	–	–
	Age (yrs)	−0.28	−3.97	<.001	±4.03	–	–	–	–
3	(Constant)		10.53	<.001	±96.40	0.085	0.08	1.6	15.95**
	Job type (reference – full-time)	−0.16	−4.13	<.001	±47.67	–	–	–	–
	Income (₵)	0.15	3.64	<.001	±0.03	–	–	–	–
	CDS (reference – none)	−0.12	−2.58	0.01	±62.56	–	–	–	–
	Marital status (reference – not married)	0.12	3.23	0.001	±38.67	–	–	–	–
	Age (yrs)	−0.24	−4.10	<.001	±3.24	–	–	–	–

**$p < 0.001$.
[a] Predictors removed from block 1.
[b] Predictors removed from block 2; CI – confidence interval (of B); CDS – chronic disease status; Tolerance value for each predictor ≥0.2; Block 1 – the primary model from which weak predictors were removed at $p \geq 0.25$; block 2 – a regression model including only predictors retained from block 1; block 3 – a confirmatory regression model assessing whether all predictors in block 2 predicted continuous occupational sitting time.

Table 4
Workplace support for health as a potential moderator of the personal correlates of occupational sitting time.

Models	Predictor	Standardized Coefficients			95% CI	Model fit			
		β	t	p-value		R^2	Adjusted R^2	Durbin Watson	F
1	(Constant)		9.99	<.001	±89.82	0.056	0.051	1.62	11.6**
	WSH*type	−0.16	−4.25	<.001	±2.78	–	–	–	–
	WSH*income	0.11	3.00	0.003	±0.13	–	–	–	–
	WSH*CDS	−0.10	−2.3	0.022	±3.56	–	–	–	–
	WSH*Mstatus	0.04	0.99	0.324	±2.17	–	–	–	–
	WSH*Age	−0.14	−2.58	0.01	±0.18	–	–	–	–
2	(Constant)		3.73	<.001	±85.91	0.029	0.024	1.75	5.87**
	WSH*Gender	0.10	2.99	0.003	±1.86	–	–	–	–
	WSH*Education	0.11	2.12	0.002	±9.21	–	–	–	–
	WSH*PF	0.08	2.62	0.009	±3.25	–	–	–	–
	WSH*Industry	0.14	2.87	0.004	±4.32	–	–	–	–
	WSH*Sector	0.14	2.88	0.004	±4.42	–	–	–	–
	WSH*tenure	−0.01	−0.43	0.668	±0.21	–	–	–	–

**$p < 0.001$; WSH – workplace support for health; CDS – chronic disease status; PF – physical function; CI – confidence interval (of B); Block 1 – a multiple regression model assessing the interaction between the ultimate predictors and workplace support for health; block 2 – a multiple regression model evaluating the interaction between the non-significant predictors and workplace support for health.

who do not have a health condition or are unaware of their chronic conditions may not be motivated to exercise regularly and avoid excessive sitting. Further to the above, married employees reported higher occupational sitting, compared with those who were not married. To explain, married employees possibly had more dependants and had to spend more time at work to make enough money to meet the needs of their dependents. This reasoning draws on our result suggesting that higher income was associated with higher occupational sitting.

This study also found a negative association between age and occupational sitting time, which means that higher occupational sitting was reported by younger employees. This result is counter-intuitive since sitting generally increases with age, but it is consistent with the study of De Cocker et al. (De Cocker et al., 2014) which found that employees aged 18–39 years reported higher but non-significant occupational sitting time compared with employees aged 40–80 years. Similarly, a study (Hadgraft et al., 2015) found that older employees reported lower occupational sitting time, compared with younger employees. As mentioned earlier in this section, older employees, compared with younger employees, would sit less at work if they are aware of their vulnerability to long-term health conditions. Younger employees, who would feel safer from long-term conditions, may not have any motivation to limit their occupational sitting. A key implication is that occupational sitting among employees does not necessarily increase with age. Quite compelling is the moderation of the associations between all the personal factors (except job tenure) by workplace support for health. Whereas workplace support for health weakened the associations between the ultimate personal factors and occupational sitting time, it strengthened the associations between the non-significant factors (except job tenure) and occupational sitting. This result suggests that inequalities in occupational sitting time between employee groups were higher or lower at higher workplace support for health.

Specifically, lower education is associated with lower occupational sitting time at higher workplace support for health, which means that employees who were less educated better avoided occupational sitting at higher workplace support for health. Similarly, higher occupational sitting was associated with higher physical function at higher workplace support for health, which suggests that occupational sitting time was lower among employees with lower physical functional ability at higher workplace support for health. If so, workplace support for health is a way to influence people with minimal education and physical functional ability to modify their behaviours and limit workplace sitting. To add, men reported lower occupational sitting time at higher workplace support for health; without workplace support for health, men would report more occupational sitting time compared with women. Drawing on the above findings, workplace support for health was associated with lower or higher inequalities in occupational sitting in some employee groups. This result suggests that some employee groups more vulnerable to occupational sitting avoided excessive sitting at work owing to lessons or health literacy acquired from workplace support for health, which supports studies (Chau et al., 2010; Kava et al., 2021; Lindström and Eriksson, 2011) that recognise workplace health promotion as a way to discourage unhealthy behaviours among employees.

Our results regarding the moderating role of workplace support for health in this study has some implications for health promotion. First, workplace support for health can be more beneficial to some employee groups, particularly those most vulnerable or disadvantaged (e.g., less educated employees) (Aziz et al., 2015; De Cocker et al., 2014). Second, the occupational sitting of different employee groups is affected to varying degrees by workplace support for health. This is rightly so because employee groups respond or commit to workplace health promotion programmes in different ways that can be dependent on their vulnerability and current health situation. More vulnerable groups such as older people or employees with long-term conditions may be more committed to workplace health promotion programmes, but employees who feel healthier or do not face any health risk may be less committed to these programmes. This being so, the adoption of workplace health promotion programmes should be cognisant of employees' vulnerability to occupational sitting and may prioritise those in greater need of workplace support for health. Targeting more vulnerable groups can maximise the desired impact of workplace health promotion efforts.

This study, nevertheless, has some limitations that future researchers and decision-makers must consider. Like related previous studies (De Cocker et al., 2014; Hadgraft et al., 2015; Loyen et al., 2018), this study could not measure all personal factors because we aimed to focus on measurable factors that were only relevant to our Ghanaian context. Even so, future researchers are encouraged to measure a more exhaustive set of personal factors, if possible, to widen the scope of our evidence. Our subjective measurement of continuous occupational sitting time may be associated with recall bias, so future studies utilising objective measures (e.g., the use of a pedometer) would be necessary. Since we used some selection criteria to select participants, our sample was not probabilistic, which means that our findings may have limited generalisability. For this reason, future studies utilising nationally or regionally representative samples would be necessary. We also think our sample size is relatively small and can be increased in future studies to maximise the representativeness of findings. Though this study was conducted after a lockdown and national social distancing protocols were relaxed, social distancing efforts at the individual and organizational levels might have affected our results. Continuous sitting time among employees often varies between days, but this study measured continuous sitting time for a typical day, which means the above variations were not considered. Our measurement of physical function was based on a method applied to an older population. Future studies can use a psychometric tool developed for the general population to measure physical function. The regression analysis produced relatively low error variations, which represent low model fit. This result implies that there may be other predictors not incorporated into the current analysis. Future studies are encouraged to build on our models by incorporating more predictors.

Despite the above limitations, this study is important for some reasons. First, this study is the first to adapt an existing sensitivity analysis to screen for the ultimate personal predictors of occupational sitting time. Previous studies (De Cocker et al., 2014; Hadgraft et al., 2015; Loyen et al., 2018) have fitted their regression models by including both the ultimate and non-significant personal factors concurrently, an approach that does not clearly visualise the best predictors of occupational sitting time. This study is also the first to assess the moderating role of workplace support for health in the associations between personal factors and occupational sitting. This unique attribute of our study might enable organizations to consider employees' personal factors before designing workplace support for health programmes. It also unfolds potential inequalities in occupational sitting time across employee groups and how workplace support for health affects these inequalities. In addition, our statistical analysis approach made it possible for us to make more evident the importance of the moderating role of workplace support for health in the associations between the personal factors and occupational sitting. As such, our study serves as a model of a potentially more resilient approach to analysing potential correlates of occupational sitting time. Further to the above, our effort against common methods bias could maximise the internal validity of our results.

5. Conclusion

Continuous occupational sitting was associated with all the ultimate personal factors such as age, type of job, and chronic disease status, which means that occupational sitting time can be more dependent on some personal factors such as working full-time. Workplace support for health significantly moderated the associations between continuous occupational sitting time and the ultimate personal and non-significant factors, except job tenure. We conclude that workplace support for health can modify the association between continuous occupational sitting time and personal factors. More so, workplace support for health can be associated with lower or higher inequalities in occupational sitting time between employee groups. If so, employers should consider these inequalities in their design of workplace health support programmes. Ideally, policies regarding workplace health promotion should be designed to target employee groups most vulnerable to occupational sitting.

Author contribution

ED conceived the research idea, provided funds for the study, and wrote part of the manuscript. NA conducted statistical analysis and compiled the draft manuscript. Both authors proofread and approved the draft manuscript.

Funding

This study received no funds from external organizations.

Institutional review board statement

This study was approved by Africa Centre of Epidemiology ethics review committee in Accra. The ethics review number is 02-2021-ACE.

All the participants provided written informed consent.

Informed consent statement

All participants provided written informed consent.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

Acknowledgements

We would want to acknowledge support from the Africa Centre of Epidemiology and Mr Richard Eduafo who supported questionnaire administration.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.ergon.2023.103448.

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