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Do Passive Jobs Contribute to Low Levels of Leisure-Time Physical Activity? The Whitehall II Cohort Study

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Abstract

Background—There is mixed evidence on the association between psychosocial work exposures (i.e., passive jobs) and physical activity, but previous studies did not take into account the effect of cumulative exposures nor did they examine different trajectories in exposure. We investigated whether exposure to passive jobs, measured three times over an average of five years, is associated with leisure-time physical activity (LTPA).

Methods—Data were from working men (n=4291) and women (n=1794) aged 35 to 55 who participated in the first three phases of the Whitehall II prospective cohort. Exposure to passive jobs was measured at each phase and LTPA at phases 1 and 3. Participants were categorized according to whether or not they worked in a passive job at each phase, leading to a scale ranging from 0 (non-passive job at all three phases) to 3 (passive job at all three phases). Poisson regression with robust variance estimates were used to assess the prevalence ratios of low LTPA.

Results—An association was found in men between exposure to passive jobs over 5 years and low LTPA at follow-up, independently of other relevant risk factors. The prevalence ratio for low LTPA in men was 1.16 (95% confidence interval 1.01 to 1.33) times greater for employees with three reports of passive job than for those who had never worked in passive jobs. No association was observed in women.

Conclusion—This study provides evidence that working in passive jobs may encourage a passive lifestyle in men.

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Competing interest: None of the authors has anything to declare.

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Keywords

longitudinal; occupational; physical exercise; sedentarism

INTRODUCTION

In economically developed societies, physical inactivity is a major risk factor for chronic disease and accounts for 3% of the total disease burden, 20% of heart disease and 10% of stroke.¹ Also, physical inactivity contributes to other leading causes of the burden of disease, such as obesity.² The cost of inactivity to the national care system in England amounts to £8.2 billion per year in addition to the costs of 18 million days of sickness absence due to obesity.³ It is estimated that £300 million could be saved annually if the proportion of insufficiently active people was reduced by just 5%.³

Work characteristics are modifiable and may therefore provide a potential target for influencing lifestyle in working populations.⁴⁻⁶ In the context of psychosocial work conditions, it has been hypothesized that jobs combining low psychosocial demands and low control over one's work situation (i.e., passive jobs), which lack challenge and are depleted of meaningful content, may be conducive to a passive life-style such as low levels of leisure-time physical activity (LTPA).⁷ Empirical evidence of this relationship is mostly cross-sectional, except for one small (n=200) prospective study,⁸ and inconclusive with some studies reporting effects⁹⁻¹² and some none.^{8,13,14} Behavioural changes in response to working demands and constraints can happen quickly, and thus cross-sectional research may provide a fair picture of the short-term effects. However, previous studies with a single measurement fail to capture the effects of longer-lasting exposure to passive jobs and its potentially cumulative effect on health-related behaviours, such as physical activity.¹⁵

In this study from the Whitehall II cohort of British civil servants, we investigate the extent to which exposure to passive job, measured at three phases over a mean follow-up of five years, is associated with low LTPA when taking into account the effects of potential confounders, such as other life-style factors, socio-economic circumstances, and health. We hypothesize that the more a person works in passive jobs the less likely she/he will be to engage in LTPA at follow-up.

METHODS

Participants

The target population of the Whitehall II Study was all office staff based in London, England, aged 35 to 55 years, in 20 civil service departments.¹⁶ With a 73% participation rate, the baseline cohort included 6895 men and 3413 women. The present study included 6085 participants (59.0% of the original cohort), 4291 men (62.2% of all men) and 1794 women (52.6% of all women), who participated at phases 1 (1985-1988), 2 (1989-1990) and 3 (1992-1993). Excluded participants were those who died between phases 1 and 3 (n=106), were non-working by phase 3 (n=2202), did not participate in all three phases (n=1101), or had incomplete data (n=814). The excluded participants were more likely to work in a passive job (31.9% vs. 28.8%, p=0.001) and to be in the low LTPA group (50.2% vs. 45.4%, p<0.001) at phase 1.

Design

The Whitehall II Study is a prospective observational cohort study. Odd-numbered phases include a clinical examination and a self-administered questionnaire, while even-numbered

phases are questionnaire only.¹⁶ Work characteristics were measured at phases 1, 2 and 3. LTPA was assessed at phases 1 and 3. Covariates were measured at phase 1 except health behaviours that were measured over phases 1, 2, and 3. The University College London Medical School Committee on the Ethics of Human Research approved the protocol and informed consent was gained from all participants.

Assessment of passive jobs

We measured passive jobs using the job strain questionnaire.¹⁷ A participant was classified as working in a passive job when the participants' responses to questions about both the psychological job demands (4 items, Cronbach $\alpha > 0.67$ at the three phases) and job control (15 items; Cronbach $\alpha \geq 0.80$ at the three phases) were below the sex-specific median score for each scale. We measured the accumulation of exposure to passive jobs over phases 1, 2, and 3 by adding together the number of times the participant reported working in a passive job. Chronic passive job was defined as working in a passive job all phases.

Assessment of leisure-time physical activity (LTPA)

LTPA was assessed with the same standard questionnaire instrument at phases 1 and 3. Participants were asked two items on the average number of hours per week spent in "moderately energetic" (e.g., dancing, cycling, leisurely swimming) and "vigorous" (e.g., running, hard swimming, playing squash) physical activity. Consistent with current guidelines, participants were classified according to whether their level of LTPA met the recommendations (i.e., at least 30 minutes a day of at least moderate intensity on five or more days of the week)³. Thus, participants reporting at least 1.5 hours or more per week of at least moderately energetic LTPA per week were classified as performing high levels of LTPA. Participants whose physical activity level was below the recommended levels were classified as performing low LTPA.

Assessment of covariates

We measured the following variables at phase 1 with standard questionnaire measures: sex, age, ethnicity, marital status and employment grade. Employment grade is a measure of education, income and employment relations, grouped into high (administrators, the top seven unified grades), middle (executives, professionals and technical staff) and low (clerical and office support staff).¹⁶ We measured two health-related variables, self-rated health state over the last 12 months and body mass index (BMI in kg/m²) calculated based on clinically assessed weight (in kg) and height (in m) according to standard guidelines.

Marital status (married vs. single)¹⁸ and health-related behaviours were asked at phases 1, 2 and 3. Health behaviours included excess alcohol intake (>14 units/week for women and >21 units/week for men);¹⁹ poor diet (white bread, whole milk, and no fruits or vegetables),²⁰ and current smoking. We summed exposure to each of these variables over phases 1 to 3. Since the follow-up from phases 1 to 3 was not equal for everybody (average was 5.2 (SD 0.7; range 3.7-8.1 years), we controlled in the analyses for the period under follow-up.

Data analyses

As the prevalence of low LTPA was expected to be high, rather than using logistic model which tend to overestimate the associations, analyses were carried out using Poisson regression with robust variance estimates²¹ to assess the prevalence ratios (PR) and 95% confidence intervals for low versus high LTPA at follow-up. The contribution of the covariates to the associations between passive jobs and LTPA was explored by including each of the following sets of factors in turn: baseline LTPA, socio-demographic

characteristics (age, ethnicity, marital status and employment grade), health-related variables (self-rated health and obesity), health-related behaviours (alcohol, diet and smoking), and follow-up period. Finally, the analysis was repeated with simultaneous adjustment for all the above covariates. We used the likelihood ratio test to examine whether the model including the interaction of sex with the explanatory variables fit the data significantly better (i.e., the model had a lower log likelihood) than the model without the interaction. All P values are two tailed, and P values below 0.05 were considered to indicate statistical significance. STATA/SE v.9.2® was used for all the analyses.

RESULTS

Tables 1 and 2 show the associations between each of the variables under study and low LTPA by sex. The likelihood of low LTPA at follow-up was greater among male participants of non-white ethnicity (trend $p=0.001$), with lower than good health status (trend $p<0.001$) and with poor diet (trend $p=0.001$). Respective trends among women were less marked than those among men and there were no sex differences (all interaction $p\geq 0.14$). However, other associations were dependent on sex. Participants with low employment grades were more likely to have low LTPA among men but not women (interaction $p=0.015$). Both men and women with low baseline levels of LTPA had a greater likelihood of low LTPA at follow-up, although the association was more marked among men (interaction $p<0.0001$). Being single in all three phases had a greater likelihood of LTPA than being married among men but not women (interaction $p=0.012$). There was an association between exposure to passive jobs and low LTPA among men (trend $P<0.001$) but not women (trend $p=0.28$), although sex differences were not observed (interaction $p=0.28$). Exposure to chronic passive jobs had an effect on LTPA only among men (PR=1.34; 95% CI 1.18-1.51).

Because there was no evidence a relationship between passive jobs and low LTPA, we only present the multivariate regression models for men (table 3). Sex interactions in the final model were non-significant. Regardless, covariate adjustment did not greatly alter the non-significant relationship between passive job and low LTPA (data not shown).

Covariate adjustment (Table 3) attenuated the prevalence ratio, although exposure to passive jobs for three phases remained associated with a greater likelihood of low LTPA at follow-up in men. Compared with other covariates, baseline LTPA accounted for the largest reduction (PR=1.18; 95% CI 1.04-1.28). The association persisted after simultaneously adjusting for all the covariates (PR=1.16; 95% CI 1.01-1.33).

DISCUSSION

Our findings demonstrate for the first time that cumulative exposure to passive jobs encourages a passive lifestyle among men. We found that men who worked in passive jobs for an average on five years had a 15% greater likelihood of low LTPA than men in non-passive jobs. This association was only partially accounted for by factors such as baseline levels of LTPA, health, socioeconomic circumstances, and other health-related behaviours.

Our findings are in agreement with earlier cross-sectional research demonstrating an association between passive work and health behaviors.⁹⁻¹² However, our findings, which appear to be applicable only to men, were based on a large well-characterized occupational cohort with repeated measurements of psychosocial work environment (i.e., passive jobs) during a five-year follow-up that allowed us to study previously ignored examination of the cumulative effect of passive work on LTPA. The lack of association between passive jobs and LTPA for women is consistent with research into work-related gender inequalities in

health showing that working conditions seemed to affect men somewhat more negatively, while the impact of family demands on health is greater in women.²² The choice of the LTPA measure, which not considered work-related (whether paid work or unpaid domestic chores) physical activity neither a measure of total physical activity, may have contributed to the lack of association observed since LTPA measures may categorize women as inactive when they might actually be quite active.

Several methodological issues must be considered when interpreting our findings. First, given the composition of the cohort, mostly white male office-based civil servants, there is a need for more diverse samples to extend the validity of our findings. Nonetheless, given the increased percentage of white-collar workers in affluent societies,²³ this cohort may be largely representative of current workplaces. Second, we selected only working participants since once out of job the balance between time dedicated to work and non-work related activities changes, which may have health consequences. Whether and how the impact of passive jobs on sedentary behaviours persists after retirement is an important question for future research. Third, a passive job might be an indicator of physical activity at work but this is unlikely to be major confounder for office-based white-collar (non-manual) populations such as ours where physically demanding manual work is expected to be small and not to distinctly modify the amount of physical activity. Indeed, adjustment for employment grade only produced a small attenuation of the relationships. Fourth, we adjusted our analyses for baseline measures of body mass index and health status. Since these two measures can be consequences of low physical activity, adjusting for them at later phases would have adjusted the outcome for some of its effects. Fifth, our sample only included 59% of the original cohort. Incompleteness may have caused our results of the association between passive job and LTPA to be misestimated since cohort members lost to follow-up were more frequently working in passive jobs and were less physically active than the included participants.

In sum, our data from British civil servants suggest that an independent relationship exists between exposure to passive jobs and low levels of LTPA in men. Thus, our results suggest that work may have an independent, albeit relatively small, effect on life-style. Although we realize the challenges of modifying the real work environment, work factors are potentially amenable to interventions. However, work factors have previously received less attention as a potential driving force in the regulation of health-related behaviours.^{24,25} As physical inactivity is a leading cause of disease burden in all economically developed societies, upstream interventions that reduce dull, demotivating and unchallenging jobs may be worthy of consideration.

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What is already known on this topic

- Physical inactivity is a major risk factor for chronic disease
- Passive jobs, which lack challenge and are depleted of meaningful content, are hypothesized to be associated with low levels of leisure-time physical activity
- Knowledge of the effects of work on leisure-time physical activity is so far based on cross-sectional research lacking of data on cumulative exposure to passive jobs

What this study adds

- An association exists in men between exposure to passive jobs and low levels of leisure-time physical activity independent of other risk factors
- Passive work encourages a passive lifestyle in men so that the longer time workers spend in passive jobs the less they are likely to be physically active outside work

TABLE 1

Risk factors at baseline (Phase 1) of low leisure-time physical activity (LTPA) at follow-up (Phase 3) for men (n=4291) and women (n=1794).

Variables at Phase1	Men		Women		Sex interactions
	% with LTPA at Phase 3 (Total participants)	Prevalence ratio (95% CI)	% with LTPA at Phase 3 (Total participants)	Prevalence ratio (95% CI)	
N	44.7 (4291)		66.2 (1794)		
Age (mean (SD) ^a)	43.6 (5.8)	1.01 (1.00-1.01)	44.8 (5.8)	1.01 (1.00-1.08)	0.74
<i>P for linear trend^b</i>		0.08		0.07	
Ethnicity					0.14
Non-white	57.4 (296)	1.00	72.2 (212)	1.00	
White	43.8 (3995)	0.76 (0.65-0.89)	65.4 (1582)	0.91 (0.76-1.07)	
<i>P for linear trend^b</i>		0.001		0.26	
Employment grade					0.015
High	42.9 (1696)	1.00	70.1 (244)	1.00	
Middle	44.1 (2287)	1.03 (0.93-1.13)	63.7 (793)	0.91 (0.76-1.08)	
Low	58.8 (308)	1.37 (1.16-1.61)	67.6 (757)	0.97 (0.81-1.15)	
<i>P for linear trend^b</i>		0.006		0.96	
Self-rated health					0.20
Good	42.5 (3430)	1.00	64.3 (1234)	1.00	
Average	52.8 (740)	1.24 (1.11-1.39)	68.9 (450)	1.07 (0.94-1.22)	
Poor	57.0 (121)	1.34 (1.05-1.71)	77.3 (110)	1.20 (0.96-1.50)	
<i>P for linear trend^b</i>		<0.001		0.09	
Body Mass Index (kg/m²)					0.88
Underweight (<18.5)	48.8 (215)	1.13 (0.93-1.38)	66.5 (161)	1.04 (0.85-1.28)	
Healthy weight (≥18.5 & <25)	43.2 (2468)	1.00	63.6 (1000)	1.00	
Overweight (≥ 25 but <30)	46.5 (1418)	1.08 (0.98-1.19)	69.1 (473)	1.09 (0.95-1.24)	
Obese (≥ 30)	46.3 (190)	1.07 (0.86-1.33)	738 (160)	1.16 (0.95-1.41)	
<i>P for linear trend^b</i>		0.12		0.09	

Variables at Phase1	Men		Women		Sex interactions
	% with LTPA at Phase 3 (Total participants)	Prevalence ratio (95% CI)	% with LTPA at Phase 3 (Total participants)	Prevalence ratio (95% CI)	
LTPA					<0.0001
At least recommended level	28.7 (2601)	1.00	47.7 (727)	1.00	
Below recommended level	69.3 (1690)	2.41 (2.20-2.64)	78.8 (1067)	1.65 (1.46-1.87)	
<i>P for linear trend^b</i>		<0.001		<0.001	

^a SD=standard deviation

^b p-value for linear trend across the levels of the explanatory variable

^c Probability that the model including the interaction of sex with the explanatory variable fits the data significantly better than the model without the interaction.

TABLE 2

Risk factors cumulated over three phases (1, 2 and 3) of low leisure-time physical activity (LTPA) at follow-up (Phase 3) for men (n=4291) and women (n=1794).

Variables	Men		Women		Sex interaction*
	% with LTPA at Phase 3 (Total participants)	Prevalence ratio (95% CI)	% with LTPA at Phase 3 (Total participants)	Prevalence ratio (95% CI)	
Marital status: single					0.012
None	42.5 (3376)	1.00	66.9 (1011)	1.00	
1 phase	46.1 (180)	1.09 (0.87-1.36)	58.3 (103)	0.87 (0.67-1.13)	
2 phases	40.5 (121)	0.95 (0.72-1.27)	56.9 (107)	0.84 (0.64-1.09)	
3 phases	35.3 (614)	1.35 (1.21-1.52)	68.4 (573)	1.02 (0.90-1.16)	
<i>P for linear trend^b</i>		<0.001			0.87
Excess alcohol intake					0.59
None	46.1 (3050)	1.00	66.7 (1490)	1.00	
1 phase	40.2 (488)	0.87 (0.75-1.01)	67.5 (154)	1.01 (0.83-1.24)	
2 phases	41.4 (338)	0.90 (0.76-1.07)	63.9 (83)	0.96 (0.73-1.26)	
3 phases	42.7 (415)	0.93 (0.79-1.08)	55.2 (67)	0.83 (0.60-1.15)	
<i>P for linear trend^b</i>		0.11			0.34
Poor diet					0.19
None	41.3 (1670)	1.00	66.7 (838)	1.00	
1 phase	44.6 (906)	1.08 (0.96-1.22)	64.7 (343)	0.97 (0.83-1.13)	
2 phases	44.9 (717)	1.09 (0.95-1.24)	66.9 (272)	1.00 (0.85-1.19)	
3 phases	50.4 (998)	1.22 (1.09-1.37)	66.0 (341)	0.99 (0.85-1.15)	
<i>P for linear trend^b</i>		0.001			0.93
Current smoking					0.81
None	45.7 (3061)	1.00	66.2 (1408)	1.00	
1 phase	43.9 (264)	0.96 (0.80-1.16)	66.0 (53)	1.00 (0.71-1.40)	
2 phases	39.5 (256)	0.86 (0.71-1.06)	62.3 (72)	0.99 (0.74-1.32)	
3 phases	42.7 (710)	0.93 (0.83-1.06)	66.7 (261)	1.00 (0.86-1.18)	

Variables	Men		Women		Sex interaction*
	% with LTPA at Phase 3 (Total participants)	Prevalence ratio (95% CI)	% with LTPA at Phase 3 (Total participants)	Prevalence ratio (95% CI)	
<i>P for linear trend^b</i>		0.16		0.96	0.28
Passive job					
None	41.7 (2064)	1.00	65.7 (931)	1.00	
1 phase	41.4 (904)	0.99 (0.88-1.12)	60.9 (350)	0.93 (0.79-1.08)	
2 phases	47.6 (675)	1.14 (1.00-1.30)	70.1 (281)	1.07 (0.91-1.25)	
3 phases	55.9 (648)	1.34 (1.18-1.51)	71.6 (232)	1.09 (0.92-1.29)	
P for linear trend ^b		<0.001		0.28	
Follow-up period from Phase 1 to Phase 3 (mean (SD)^a)					
	5.3 (0.7)	1.08 (1.01-1.15)	5.3 (0.7)	1.05 (0.97-1.13)	0.58
<i>P for linear trend^b</i>		0.018		0.22	

^aSD=standard deviation

^bP-value for linear trend across the levels of the explanatory variable

^cProbability that the model including the interaction of sex with the explanatory variable fits the data significantly better than the model without the interaction.

Association between cumulative exposure to passive jobs over three phases (1, 2 and 3) and low leisure-time physical activity (LTPA) at Phase 3 in men (n=4291).

TABLE 3

Passive job, over 3 phases	Prevalence ratio (95% CI) for LTPA at Phase 3, adjusted for				
	Baseline LTPA	Socio-demographics	Health status	Health-related behaviours	Follow-up period
None	1.00	1.00	1.00	1.00	1.00
1 phase	0.97 (0.86-1.10)	0.98 (0.88-1.11)	0.99 (0.87-1.11)	0.99 (0.87-1.11)	0.99 (0.88-1.12)
2 phases	1.07 (0.94-1.22)	1.09 (0.95-1.25)	1.12 (0.99-1.28)	1.12 (0.98-1.27)	1.14 (1.01-1.30)
3 phases	1.18 (1.05-1.34)	1.24 (1.08-1.42)	1.31 (1.16-1.48)	1.31 (1.15-1.48)	1.35 (1.20-1.53)
<i>P for linear trend</i>	0.009	0.003	<0.001	<0.001	<0.001
					0.055

Note: Sociodemographics include age, ethnicity, marital status and employment grade; Health-related behaviours include alcohol drinking, diet and smoking; Health status includes self-rated health and body mass index. All variables as presented in tables 1 and 2.