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a cross-sectional study

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Physical activity and perceived stress at work in university workers: a cross-sectional study

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ABSTRACT

BACKGROUND: Previous research has suggested high levels of physical activity (PA), either in occupational or leisure-time, to be associated with low levels of perceived stress at work (PSW). However, because studies have been set in particular conditions, there is no possibility to generalise results on other populations of workers. This study investigated the association between PA and PSW in university workers.

METHODS: University employees (N=757) aged from 26 to 65 years (47% female) at a large public Spanish university. Data were collected between January 2017 and December 2017. Physical Activity Vital Sign (PAVS) questionnaire and a single-item scale were used to assess PA levels and PSW. Associations were examined through an adjusted logistic regression.

RESULTS: Results showed the strongest association between high PSW and low PA levels after adjusting for age, gender and profession (Odds Ratio [OR]=2.60, 95%CI 1.44-3.68). Around half of the employees (51.9%) performed at least 150 minutes of PA per week, which is higher than in most other Spanish and European worker populations.

CONCLUSIONS: Adequately high levels of PA may be beneficial for stress management in university workers as previously seen in other types of workers. Promoting PA strategies at the workplace could improve the working environment and the health of the workers.

Key words: Physical activity - Mental health - Job strain – Workplace - Occupational hazards - Perceived stress.

TEXT

Introduction

Physical activity (PA) aids in the prevention of non-communicable disease and risk factors. The World Health Organization (WHO) ranks lack of PA as risk factor number four concerning global mortality [1]. Dose-response associations exist, i.e., people who are more active live longer and are less prone to developing several types of cancer, type II diabetes, cardiovascular diseases, or suffering from poor mental health [2–5]. Moreover, PA promotes healthy ageing, and importantly, older people who exercise tend to be less frail [6]. Saint-Maurice et al. [7] found that PA levels tracked from adolescence to later adulthood and those with high PA levels had a 29-36% lower risk for all-cause mortality. PA during adulthood after being inactive also decreases the risk of mortality by 32-35%.

Figures from the latest European Commission report on PA estimates that 60% of the European adults never or rarely exercise [8]. Even more concerning, a downhill trend of 7.7% less cardiorespiratory fitness in the last five decades has been detected within high- and upper-middle-income countries [9]. The International Sport and Culture Association Health (ISCA) and the Centre for Economics and Business Research (CEBR) report an annual cost of 80 billion euros derived from medical care, medical treatments, functional limitations, disability, loss of dependence and a loss of working hours and productivity for European countries [10]. Lindegård et al. [11] reported stress-related mental disorders and musculoskeletal disorders as the two most important factors behind long-term sick leave in Sweden. Therefore, implementing measures to diminish the impact of the absenteeism regarding these two issues would be desirable.

Because jobs tend to be less physically active in western countries [10] and more workers are diagnosed with mental disorders such as too much work-related stress, anxiety, depression or psychosocial disorders [12], institutions are trying to tackle those issues by implementing different measures in the workplace. Sit-stand desks, workplace policy changes, provision of counselling or multi-component interventions show inconsistent results when improving PA and avoiding sitting [13], whereas implemented measures at an organisational level resulted in no significant improvement when lowering perceived stress at work (PSW) [14]. However, PA-focused interventions seem to be one of the most promising actions to reduce work-related stress and psychosocial hazards, as current research report PA to improve figures on mental health [3,15,16] and absenteeism [14,17–19]. Easy to implement, encouraging employees to be active (walking through the office) and to climb stairs (instead of using the elevator) are two of the principal strategies regarding PA promotion in the workplace among white-collar workers [20]. Nevertheless, PA promotion has been reported to have a low priority for small and large companies likely because they are unaware of the relationship between PA with absenteeism and productivity [21]. Thus, as occupational PA is usually less than the weekly recommended 150 minutes of moderate PA or 75 minutes of vigorous PA, to assess overall PA (leisure, occupational and commuting time) would be desirable to know whether workers are reaching recommended levels of PA [22]. Johnson et al. [23] reported that expensive tools were a barrier for companies as the balance between investment and cost are usually unknown. Therefore, the use of more accessible assessment and standardised instruments such as Physical Activity Vital Sign (PAVS) [24] or its electronic version (EVS) [25] could help to gain reliability and generability on the matter.

Moderate evidence has suggested high stress at work to be associated with lack of PA either in occupational or leisure-time [14,26–30]. Moreover, job stress has been associated with the

development of cardiovascular diseases such as atrial fibrillation, stroke, and coronary heart disease [27,31–34]. The demand-control model, i.e., an imbalance between low control over working conditions, and the effort-reward divergence model are the two most used models to assess work-related stress [34]. Individual factors and working conditions could contribute to the personal perception of job stress, but also both organisational culture and structure [12]. Little is known about PA levels among university workers because research is usually focused on university students [35]. Also, only a few low-quality studies have investigated PA determinants in the workplace within southern Europe countries such as Spain, the need for more research on the issue has been recently suggested by governmental institutions [22]. The present study aimed to investigate possible associations between PSW and PA levels among Spanish university employees.

Materials and methods

The current research was based on a cross-sectional design. The study got the approval of the Aragonese Ethics Research Committee (CEICA; Identification Code PI18/027). The sample consisted of university workers from a Northeastern Spanish university, including both academic and university staff. All data were de-identified and analysed anonymously. University workers who got the voluntary university health check and fulfilled the medical questionnaire from January 1, 2017, to December 31, 2017, were included in the sample. Seven hundred fifty-seven employees, including lecturers and service staff from all campuses, agreed to wholly or partly complete the survey. All questionnaires were anonymous, allocated in medical centres, and supervised by medical personnel during medical check-ups.

The tool used to estimate PA levels among workers was the Physical Activity Vital Sign (PAVS) short version [24]. This questionnaire consisted of two questions related to the number of days and minutes employees usually take part in PA in a regular week. Employees could choose among 0,1,2,3,4,5,6 or 7 days of weekly PA and 10,20,30,40,50,60,90 and 150 or more for minutes they typically do PA on average each of those selected days. Weekly minutes of PA were calculated by multiplying days with minutes. PAVS has previously been validated using accelerometry, showing a moderate agreement among the United States clinic administrative staff (Cohen´s κ=0.46, P<0.001) [36]. For a better understanding of the results, obtained PA levels were categorised into three groups regarding WHO recommendations about moderate and vigorous PA. As PAVS estimates PA in bouts of 10 minutes, and WHO recommendations on PA are set in a range of 75 to 150 weekly minutes when combining both moderate to vigorous PA, 80 and 150 minutes were considered as cut-off points.

Levels of PSW were estimated through the following question: "How much labour stress are you experiencing?" Possible answers comprised a 10-point scale varying from 1 "a little" to 10 "very much" perceived work-related stress. According to previous research, single-item scales have shown content, criterion, and construct validity for group-level analysis when monitoring stress at work [37]. Several advantages such as reduced costs, increased face validity for the participant, and problems concerning the designing of sum scales support the use of single-item scales [38]. The question used for this study offered high reliability and validity (Cronbach's α = .83) when tested in 24 university employees voluntarily chosen from the sample, and showed moderate correlation (Pearson´s r= 0.64, p<0.001) when compared to the validated Spanish version of the effort-reward imbalance model questionnaire (intrinsic section), which demonstrated high reliability and validity among

Spanish hospital personnel (Cronbach's α = .81) [39]. According to the expertise of the Occupational Risk Division on medical checks from previous years, PSW was categorized into three equal groups using 4 and 7 score as two cut-off points. Both PAVS and PSW questions were included in the institutional medical written questionnaire designed by the University Occupational Risk Division. On the questionnaire, respondents chose from three groups related to age, two types of occupations (i.e. academic staff and service staff), and gender. Due to confidentiality reasons, the study did not register age by date of birth and occupation by a more complete wide range of options. For the same reason, other possible covariates such as lifestyle or demographic characteristics could not be implemented.

Statistical analyses were conducted through the Statistical Package for Social Science (SPSS) version 22.0. To check for differences between different groups regarding PA, age, gender, profession, and PSW, a one-way analysis of variance was computed. To investigate the association between the dependent variable, PSW, and the independent variable, PA, a multiple logistic regression adjusted by factors (gender and profession) and covariate (age) was implemented. Significance was set at $p<0.05$.

Questionnaires with missing data (n=289) were excluded. Therefore, four hundred sixty-eight university employees fully answered to the questions related to variables and covariates. The final cohort did not vary substantially from those who were discarded in terms of mean age (45.6; SD=11.2 in the final sample vs 47.1; SD=10.2 in the excluded employees), the proportion of men (55.9% vs 55.1%) and academic staff (54.4% vs 52.3%).

Results

The initial sample was composed of 757 university employees. According to data provided by the institution, participants in this study represent 12.8% of all employees contractually linked to the university during 2017. Table 1 shows the features of the sample data with missing values. The study population was, on average, 46.6 years old (SD=10.8), and 53.4% were academic staff. The average level of PA was 177.2 (SD=145.6) minutes per week.

Table 2 shows the differences between the three categories of PA. No significant differences in PA were detected in age, gender, or occupation. However, a significant difference was found among PSW groups (p=0.002).

A further analysis to estimate the association between PA and PSW adjusted for gender, age and profession showed that those employees reaching 70 minutes of weekly PA or less were more likely to have high PSW than low PSW (OR 2.60, 95% CI 1.44-3.68). A weaker but still relevant association was also found between high PSW and medium PA (OR 2.12, 95% CI. 1.22-2.93) and medium PSW and low PA (OR 2.08, 95% CI. 1.46-2.57) (Table 3).

Discussion

The present study examined levels of physical activity and perceived stress at work of Spanish university workers, and this is the first known study to investigate these areas in Spain. The present study found 70 or less weekly PA minutes to be associated with 7 to 10 PSW points in a ten graded scale when taking low PSW group as reference. University staff showed an average PA of 177 minutes per week and around half of the participants (51.90%) met the goal of 150 weekly PA minutes. According to the present study, no significant differences in gender, age, or profession on PA levels were detected among employees.

Although PA has been usually reported using different measurement tools, a previous study used electronic PAVS version (Exercise Vital Sign) on a broader adult sample finding 30.4% participants meeting the 150 minutes criteria [25]. PA has also been estimated with the British adult population through the GPAQ (Global Physical Activity Questionnaire). Estimated PA for the British population aiming for WHO recommendations were 35.40% [40]. Also, a multicenter study using accelerometry-based measurements of PA found an average of 51 weekly minutes (SD 29.5) in a sample composed of 329 Spanish adults [41]. A more recent study using AerobePAR questionnaire estimated that 33.20% of Spanish adults met the recommended PA [42]. These figures are considerably lower than those observed in the present study.

Regarding university staff, a study by Cooper & Barton [35] revealed that around half of the adult university employees reported sufficient PA concerning the recommended activity guidelines. Although that study measured PA through IPAQ (International Physical Activity Questionnaire), those figures are comparable to those found in the present population of university workers. The use of various measurement tools and a wide range of sociodemographic differences among cohorts might explain PA differences among studies. Several studies remark the importance of sociodemographic features such as education, and occupation when explaining differences among PA population levels [42,43]. It could clarify why figures are very close when comparing between the two university staff cohorts and quite different when comparing to a less homogeneous population.

Previous research shows that employees with low PA and high PSW are more prone to develop cardiovascular diseases such as ischaemic heart disease or atrial fibrillation [31,33]. Other studies focus more on workability, finding a significant difference in favour of those

with higher exercise levels [44]. In any case, high PSW is generally related to a less PA at and outside of the workplace [16,26,28,29,45,46]. A meta-analysis found that physical inactivity was 26% and 21% more likely among those with high-strain jobs and defined passive jobs, respectively [47]. Jonsdottir et al. [48] observed either light PA or moderate to vigorous PA as the only significant factor correlated with Sweden health care and social insurance workers perceived stress after adjusting by age, gender, body mass index, and educational level. Moreover, Kouvounen et al. [49] demonstrated public sectors employee with high strain, passive jobs or low control jobs to be less active than their counterparts with differences ranging between 2.6 to 5.2 MET (Metabolic Equivalent Task index) hours/week, even when adjusting for occupational and health factors.

The fact that questionnaires were fulfilled in a medical setting, which may contribute to gain certainty as subjects are less likely to overstate their level of PA during a health check [25]. Another strength of our study is related to the high number of assessed workers, which is quite challenging to reach with objective tools. On the other side, since a questionnaire was used to estimate levels of PA and PSW, the results of this research should be considered carefully because of the inherent risk of reporting bias. The PSW question has not been validated in previous research, whereas tools such as questionnaires and surveys usually lead to overestimating PA [50,51]. Consequently, the true levels of PA may be lower than those observed in this study. Because there are different methods for assessing stress, e.g., the job strain and ERI (effort-reward imbalance) model [34], comparisons between studies are not easy to accomplish. Overall, the typical observational risk of bias involving issues such as reverse causation, residual confounding, and selection may also affect the present results. Because PAVS do not discriminate between moderate and vigorous exercise, some of the participants in the PA range between 80 and 140 minutes of weekly PA could potentially have reached

recommended levels of PA. Besides, the number of missing PA values is quite high, probably as a result of several employees not having enough time to complete the whole questionnaire during the medical check. Despite that, small differences were detected between missing and valid values concerning age, gender, and profession.

Conclusions

This research observed a strong association when matching high PSW and low PA within a university workers population. There were also relationships between high PSW and medium PA, and the same occurred between medium PSW and low PA. A possible dose-response association has been detected regarding high and medium PSW and the three levels of PA. University employees PA levels might be higher than those assessed in other adult populations as universities usually develop PA programs aimed at workers.

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NOTES

Conflicts of interest.—The authors certify that there is no conflict of interest with any financial organisation regarding the material discussed in the manuscript.

Authors' contributions.—Rubén López-Bueno: Study concepts/study design, data acquisition, data interpretation, literature research. Lars L. Andersen: Study concepts/study design, manuscript revision for important intellectual content. Lee Smith: Data acquisition, data analysis, data interpretation. Guillermo F. López-Sánchez: Data acquisition, data analysis, draft the work. Javier Mompel: Data acquisition, data interpretation, study design. Luis Casedas: Data acquisition, data interpretation, study design. José A. Casajús: Study concepts/study design, manuscript revision for important intellectual content, guarantor of integrity of entire study.

Table I. Descriptive statistics for the Spanish university workers sample (N=757).

Variable	n (%)
Age, M (SD)	46.6 (10.8)
Missing	0 (0)
Gender	
Male	396 (52.3)
Female	361 (47.7)
Missing	0 (0)
Job role	
Service Staff	319 (42.1)
Academic Staff	404 (53.4)
Missing	34 (4.5)
PA, M (SD)	177.2 (145.6)
Missing	289 (38.2)
PSW, M (SD)	5.29 (2.1)
Missing	12 (1.6)

Note: PA=Physical Activity; SD=Standard Deviation; PSW=Perceived Stress at Work; M=Mean

Table II. Cohort personal features and association with categorised levels of PA in Spanish university workers.

Variable	Low PA (≤70min/week)	Medium PA (80-150min/week)	High PA (≥160min/week)	P Value
Gender (n, %)				
Male	58 (24.2)	69 (28.7)	113 (47.1)	0.895
Female	54 (23.7)	70 (30.7)	104 (45.6)	
Age, in years (n, %)				
≤41	45 (26.2)	42 (24.4)	85 (49.4)	
42-53	33 (22.9)	46 (31.9)	65 (45.1)	0.985
>53	34 (22.4)	51 (33.6)	67 (44.1)	
Profession (n, %)				
Service Staff	47 (24.7)	53 (27.9)	90 (47.4)	0.915
Academic Staff	60 (23.1)	79 (30.4)	121 (46.5)	
PSW, in scale points (n, %)				
Low ≤4	26 (18.6)	38 (27.1)	76 (54.3)	
Medium 5-6	34 (20.4)	52 (31.1)	81 (48.5)	0.002*
High ≥7	51 (33.3)	45 (29.4)	57 (37.3)	

*p<0.005.

Note: PA=Physical Activity; PSW=Perceived Stress at Work

Table III**.** Associations between different categorised levels of PA and PSW in Spanish university workers adjusted for gender, age, and profession. (n=468).

	Low PA (≤70min/week)		Medium PA (80-150min/week)		High PA (≥160min/week)	
	OR	95% CI	OR	95% CI	OR	95% CI
Low PSW	1		1		1	
Medium PSW	2.08	[1.46, 2.57]	1.45	[0.93, 2.26]	1.39	[0.73, 2.03]
High PSW	2.60	[1.44, 3.68]	2.12	[1.22, 2.93]	1.04	[0.71, 1.35]

Note: PA=Physical Activity; PSW=Perceived Stress at Work; OR=Odds Ratio; CI=Confidence Interval