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On the Effects of a Workplace Fitness Program upon Pain Perception: a Case Study Encompassing Office Workers in a Portuguese Context

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Abstract *Introduction* Office workers share several behavioural patterns: they work seated without moving for long times, they use only a few specific muscles of their arms, wrists and hands, and they keep an overall poor body posture. These working patterns generate musculoskeletal disorders, and produce discomfort or pain. Implementation of a work fitness program is thus a low-cost strategy to reduce/prevent body pain derived from work. The aim of this study was to test the benefits of a workplace fitness program, specifically applied to an administrative department of a Portuguese enterprise. Recall that this type of primary prevention level of musculoskeletal disorders has been seldom applied in Portugal, so this research effort materialized an important contribution to overcome such a gap. *Methods* The participants in this study were office workers (n = 29 in the study group, and n = 21 in the control group)—who consistently had reported pain mostly on their back side (neck, posterior back, and dorsal and lumbar zones), wrists and posterior legs. The workplace fitness program consisted of three sessions per week during an 8-month period, with 15 min per session; emphasis was on stretching exercises for the body regions most affected by workers' pain perception. Each participant was requested to point out the injured region, as well as the intensity of pain felt, by using a visual analogue scale. Statistical analyses of the perceived pain data from control and study groups resort to non-parametric hypothesis tests. *Results* There was a strong evidence that the workplace fitness program applied was effective in reducing workers' pain perception for their posterior back, dorsal and lumbar zones, and for their right wrist ($P < 0.05$). *Conclusions* These results generated are rather promising, so they may efficiently serve as an example for other enterprises in that country—while raising awareness on the important issue of quality of life at the workplace.

Keywords Occupational health · Ergonomics · Workplace intervention · Backache · Injury prevention · Quality of life

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Introduction

Until very recently, enterprise managers were chiefly focused on productivity, so they typically attributed little importance to the health of their workers. Despite realization that the direct relationship between work conditions and health/disease has been grasped interest ever since the Industrial Revolution, a major attention has been received only in recent decades—when the rate of absenteeism of employees due to occupational diseases started increasing considerably, thus imparting measurable constraints onto the overall profit of the enterprise [1, 2].

As a consequence of the campaigns launched by the European Agency for Safety and Health at Work [3, 4], employers, technicians and workers in Portugal have become more and more aware of occupational diseases—namely those more directly related to ergonomic issues at

work. However, careful analysis of job designs is still a long way from being a routine practice—especially because most enterprises in that country are small and micro-enterprises (c. 95%). Unfortunately, these issues are not yet considered as a major factor for competitiveness of enterprises, via increase in the quality life of theirs workers.

Approximately 25% of all workers in EU27 do repeatedly complain of backache, and 23% also report muscular pains; MuskuloSkeletal Disorders (MSD) thus appear as one of the most frequently reported problems in work-related health. MSD are accordingly a cause of major concern—not only because of health effects upon individual workers that interfere negatively with their quality of life, but also because of the outstanding economic impact on business budgets and overall social costs [5]. Remember that MSD consist of impairments of such bodily structures as muscles, joints, tendons, ligaments, nerves, bones and localized blood circulation system, which are caused (or aggravated) primarily by work, or the immediate ergonomic environment in which work is carried out [4]. Most MSD are indeed cumulative disorders, resulting from repeated exposure to high or low intensity loads over a long period of time. These disorders affect mainly the back, neck, shoulders, and upper limbs of an individual [6–8]—yet they can also affect the lower limbs. Such MSD as carpal tunnel syndrome in the wrist is rather specific, because of a number of well-defined symptoms; others are nonspecific, leading only to general pain or discomfort, without evidence for a clear specific disorder [9].

An integrated management approach is obviously necessary to efficiently tackle MSD. This approach should consider not only prevention of new disorders, but also retention, rehabilitation and reintegration of workers who already suffer from MSD. One way to do so is via implementation of a Workplace Fitness Program (WFP)—which can be seen as a set of physical practices drawn from the work, carried out during working hours, aimed at counterbalancing the body structures commonly used at work, enabling those that are not so much required, and providing relaxation and toning [10, 11]. In WFP, physical exercise is intended to promote routine practice of any form of physical activity as a means to enhance health and work performance: a reduction in one's sedentary lifestyle and an improvement of stress control, likely leads to a better quality of life—and thus increases professional, personal and social performances. Furthermore, proper exercise at the workplace can prevent many problems related to work, by taking advantage of the fact that it can be performed virtually anywhere and at any time, and that it requires no special equipment.

Office workers—regardless of the nature of business they are engaged in, share some work activity descriptors: they work seated without moving for a long time, thus using excessively only a small number of specific muscles of their arm and hands, while typically keeping a poor body posture. These factors lead to MSD associated with this type of work, thus producing discomfort and even pain [12, 13]. It is sometimes not possible to keep a correct posture—because the furniture is poorly designed and cannot be easily changed/adapted, or because the employee is already addicted to a wrong posture and will thus hardly modify it on his own initiative. However, even when work takes place under appropriate conditions, it is not recommended to maintain specific positions for long periods without a break in between—as contraction of the same muscle for long hours produces discomfort or even pain. Socially-aware enterprises have engaged in instructing their own workers on how they can prevent such (avoidable) self-injuries, but they still account for only a minority of enterprises in Portugal.

Considering that WFP is still a relatively novel issue in Portugal, the aim of this study was to evaluate the results of a volunteer participation of office workers in a WFP, developed within a Portuguese enterprise, in terms of the perceived intensity of body pain. Although by itself not fully innovative, this type of applied study is of the utmost importance to Portuguese companies—which refuse to directly extend the results and recommendations of studies performed abroad, claiming they are too apart from the specific socio-economic environment prevailing in that country.

Methods

Selection and Description of Participants

This study was conducted in an administrative department of a representative Portuguese enterprise, and encompassed 60 workers in charge of organizing industrial exhibitions and cultural shows. All workers usually perform their functions in a sitting position, and work with typical office tools (i.e. computer, calculator, paper and telephone). At start-up of the study, notices were posted on the wall of the offices and corridors, and short addresses were specifically delivered aimed at increasing the awareness of workers about the potential benefits of WFP. Since participation of workers in this program was not enforced by the enterprise management, a convenience sample was used for the entire WFP—based on volunteer workers. The study sample was accounted for by the workers that properly filled the surveys, and attended most classes of WFP ($n = 29$). The control group was composed of the workers that properly filled the surveys, but did not follow-up the WFP ($n = 21$). The other workers ($n = 10$) were excluded because they

decided from the very beginning not to participate in the study.

Consent for participation was obtained from each individual in writing. Precautions were obviously taken to preserve their privacy and related information. The health and well-being of each volunteer were guaranteed above all other matters, throughout the full duration of this program.

Evaluation of Musculoskeletal Pain Perception

A survey was applied to characterize the group of individuals, as well as the organizational work; another survey was designed to assess their perception of pain musculoskeletal complaints [14]. After 8 months, the same survey was applied once again, to assess evolution of pain complaints. This survey showed the various body segments (front and back) graphically—to facilitate filling in by each individual, and interpretation by the evaluator; hence, each individual had to just point out the injured region, as well as the intensity of pain felt, using a 100 mm visual analogue scale [15].

Workplace Fitness Program

The WFP consisted of three weekly sessions, and encompassed Compensatory Labour Gymnastics type—i.e. the activities were developed during the workday, and lasted 15 min each. The various activities were adapted to the workers' clothes and working environment. The exercises were directed to the MSD identified in individuals—as previously assessed from the surveys. Emphasis was on stretching exercises for the body segments most affected by pain complaints—although playful and recreational activities were also performed; massage with physiotherapy ball and exercises with Pilates balls were included as well. Relaxation exercises/stretches and similar activities were performed on an individual basis, as well as in pairs and in groups. Classes were performed along with background music, to help workers relax and further make the program enjoyable.

Statistical Analyses

Statistical analysis of the data was performed by Predictive Analytics SoftWare (PASW) v.18 by SPSS Inc. (IBM, Chicago, IL and marketed by PSE, Lisbon, Portugal). Non-parametric tests were used, because the data were not normally distributed (Kolmogorov–Smirnov, $P < 0.05$). Wilcoxon test was employed to test on the effect of WFP upon reduction of pain perception within each group (i.e. pre and post-intervention groups). Mann–Whitney test was used to test the effect of WFP upon reduction of pain complaints between groups (i.e. study group versus control group).

Results

Characteristics of Participants

The average age of participants was 42.7 ± 1.8 years old in the control group, and 38.8 ± 1.3 years old in the study group. Table 1 tabulates several other characteristics of the participants. They could be considered very similar groups—so presumably these factors did not influence the effectiveness of the WFP, and the statistical significance of the conclusions drawn.

Effect of Workplace Fitness Program on Pain Perception

Workers of both groups had already experienced pain on a consistent basis during regular performance of their profession; the regions of the body most often associated therewith are shown in Fig. 1. One observed that complaints were mostly on the back side (neck, posterior back, and dorsal and lumbar zones), wrist and posterior leg. The frontal zone of arm and shoulder, posterior zone of hands, fingers, knees and ankles received much less frequent

Table 1 Percentage of participants in control group (i.e. undergoing regular work) and study group (i.e. following application of workplace fitness program), according to organizational and individual characteristics

Characteristics	Percentage of participants	
	Control (n = 21)	Study group (n = 29)
Number of years as office worker		
1–5	19	38
6–10	43	35
11–15	24	10
16–20	10	14
>20	4	3
Number of work hours per day		
8	86	90
9	10	7
10	4	3
Number of 5-min breaks		
0	19	21
1	13	11
2	58	61
>3	10	7
Physical activity practiced		
None	50	38
Walk/run/bicycle	25	27
Swimming	10	7
Soccer	10	3
Body-building	5	25

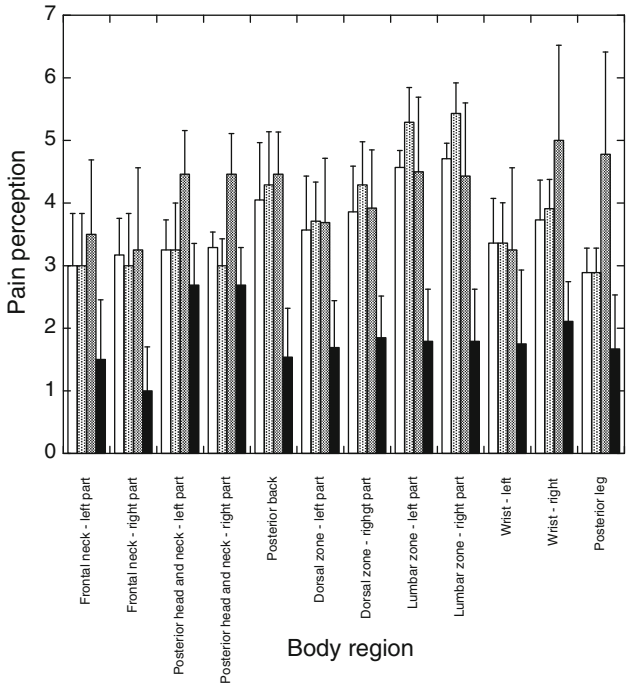

Fig. 1 Average and standard error bars of workers' pain perception, pre- and post-intervention of the workplace fitness program, for the control (*open square* pre and *dotted square* post) and the study groups (*shaded square* pre and *filled square* post), according to body region

Table 2 *P*-Values for Wilcoxon tests within groups, and for Mann–Whitney test between groups (i.e. control group undergoing regular work, and study group following application of workplace fitness program), according to body region

Body region	Wilcoxon		Mann–Whitney
	Control	Study	
Frontal neck—left part	0.705	0.066	0.208
Frontal neck—right part	1.000	0.066	0.077
Posterior head and neck—left part	1.000	**0.001**	0.770
Posterior head and neck—right part	0.157	**0.001**	0.779
Posterior back	0.225	**0.001**	**0.003**
Dorsal zone—left part	0.655	**0.001**	**0.025**
Dorsal zone—right part	0.083	**0.001**	**0.006**
Lumbar zone—left part	0.102	**0.001**	**0.001**
Lumbar zone—right part	0.102	**0.001**	**0.001**
Wrist—left	1.000	0.059	0.106
Wrist—right	0.414	**0.011**	**0.048**
Posterior leg	1.000	**0.007**	0.070

The intragroup test was applied to the data obtained for either the control or the study group, by 0 and 8 months; the intergroup test was applied to the data pertaining to the study group relative to the control group, and obtained by 8-month period. Significance differences are denoted in bold

complaints (just one or two workers), so no further statistic analysis was pursued in these cases.

Inspection of Table 2, one notes that within the control group the pain perception did not change significantly during the 8-month period (according to Wilcoxon test), as expected. However, in the study group, the pain perception was significantly reduced (according to Wilcoxon test) in the following body regions: posterior head and neck, posterior back, dorsal zone, lumbar zone, right wrist, and posterior leg. Moreover, the effectiveness of the WFP (as accessed via Man-Whitney test, based on comparison of the study group with the control group by 8 months) was significant for the posterior back, dorsal zone and lumbar zone, and right wrist.

Discussion

Adhesion to the Workplace Fitness Program

From the 60 workers, 48% participated in the entire WFP—which is about half of them; this can be considered a success in terms of motivation for this study. This degree of participation is also in agreement with other studies—according to which participation levels in health promotion interventions at the workplace were typically below 50% [16]. Some workers assumed from the very beginning that they would not benefit from this WFP, whereas others were afraid of some form of subliminar hierarchical punishment if they participated in this program (as they would take working time out for it; workers were indeed aware that the management board was planning several changes in the current human resources). In the study group, some lack of motivation (and thus of attendance) was noticed—although explanation of the program was done previously to its implementation; a more active promotion of participation by the enterprise management is thus strongly recommended nuclear for the success of this type of program. This realization is in agreement with results reported by other authors [16, 17], who also reported a relatively low attendance of the WFP—and claimed as justification that: (1) some workers prefer not to use their breaks during work—as also found in our enterprise, in which ca. 20% of workers do not regularly take any break at all; (2) there is an intrinsic resistance to change; (3) some degree of job insecurity is present; and (4) workers feel too exposed when they flex the trunk, back and wrists, and receive massages in front of their co-workers. This last point may explain why adhesion to WFP was much higher within women (57%) than men (36%).

Inspection of the data in Table 1 indicates that the overall characteristics of the participants in the control and the study groups were essentially identical. Therefore, one accepted that such groups could thus play the roles of control and study groups for the purpose of statistically validate this study.

One found a large prevalence of MDS in office workers; all back zones were affected, as well as the posterior zone of legs. A few authors [6–8] indicated that back pain (cervical, posterior, dorsal and lumbar zones) is very common in office workers that spend most of their working time in a sitting position.

No significant reduction in perceived pain was observed for the control group during the 8-month period, whereas the WFP led to significant reduction of MSD pain in the study group (Table 2). Hence, one concluded, on statistically significant grounds, that there was a significant effect of WFP upon MSD pain perception (Table 2). Similar conclusions were reached for workers in other sector, such as pharmaceutical industry [18], call centre [19], furniture industry [20] and metallurgical company [21]; the global benefits of WFP are indeed well documented [7, 22, 23]. Additionally, the WFP improved the working atmosphere prevailing in the enterprise department.

Therefore, more information and formation should be given to the managers of Portuguese enterprises about the potential of WFP to induce positive changes in MSD pain reduction and in work productivity, namely using our study as an example.

Conclusions

The data generated in this study confirmed the results obtained in similar studies—that a workplace fitness program is an effective way to decrease pain perception of musculoskeletal disorders among symptomatic office workers. Despite being a first step, future research on a larger scale, and encompassing different activities, is urged to demonstrate that Portuguese workers may benefit from WFP as routine practice in much the same way as Japanese, Americans and some European workers do—and with an eventually quantifiable cost-benefit ratio.

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References

1. Kelsey JL, Pastides H, Bisbee GE, White AA. Musculoskeletal disorders: their frequency of occurrence and their impact on the population of the United States. New York: Prodist; 1978. p. 31–6.
2. Hashemi L, Webster BS, Clancy EA, Volinn E. Length of disability and costs of workers 'compensation low back pain claims. J Occup Environ Med. 1997;39:937–45.
3. European Agency for Safety and Health at Work. Turn your back on musculoskeletal disorders. European Week for Safety and Health at Work, 57 pp. [brochure on the internet]. Available from http://www.bvsde.paho.org/bvsast/i/fulltext/msds/msds.pdf.
4. European Agency for Safety and Health at Work. Introduction to work-related musculoskeletal disorders. Fact Sheet. 2007;71.
5. Podniece Z, Taylor TN. Work-related musculoskeletal disorders: prevention report. Luxembourg: Office for Publication of the European Communities, European Agency for Safety and Health at work; 2008.
6. Mongini F, Ciccone G, Rota E, Ferrero L, Ugolini A, Evangelista A, Ceccarelli M, Galassi C. Effectiveness of an educational and physical programme in reducing headache, neck and shoulder pain: a workplace controlled trial. Cephalalgia. 2008; 28:541–52.
7. Bell JA, Burnett A. Exercise for the primary, secondary and tertiary prevention of low back pain in the workplace: a systematic review. J Occup Rehabil. 2009;19:8–24.
8. Sjögren T, Nissinen KJ, Järvenpää SK, Ojanen MT, Vanharanta H, Mälkiä EA. Effects of a workplace physical exercise intervention on the intensity of low back symptoms in office workers: a cluster randomized controlled cross-over design. J Back Musc Rehabil. 2006;19:13–24.
9. Adersen JH, Haahr JP, Frost P. Risk factors for more severe regional musculoskeletal symptoms: a two-year prospective study of a general working population. Arthritis Rheum. 2007;56: 1355–64.
10. Hayden JA, van Tulder MW, Malmivaara AV, Koes BW. Meta-analysis: exercise therapy for nonspecific low back pain. Ann Intern Med. 2005;142:765–77.
11. Schonstein E, Kenny D, Kreating J, Koes B, Herbert RD. Physical conditioning programs for workers with back and neck pain: a cochrane systematic review. Spine. 2003;28:E391–5.
12. Dunn K, Croft P. Epidemiology and natural history of low back pain. Europe Medicophysica. 2004;40:9–13.
13. Main C, Williams A. Musculoskeletal pain. Brit Med J. 2002; 325:534–7.
14. Echternach J. Evaluations of pain in clinical environment. In: Ethternach JL, editor. Pain. Virginia: Churchill Livingston; 1987. p. 215–33.
15. Huskisson E. Visual analogue scales. In: Melzack R, editor. Pain measurement and assessment. New York: Raven Press; 1983. p. 33–7.
16. Robroek SJW, van Lenthe FJ, van Empelen P, Burdorf A. Determinants of participation in worksite health promotion programmes: a systematic review. Int J Behav Nut Phys Activ. 2009;6:26–38.
17. Soares RG, Assunção AA, Lima FPL. A baixa adesão ao programa de ginástica laboral: buscando elementos de trabalho para entender o problema/searching for elements at work that could explain the low attendance to labor gymnastic program. Rev Brazil Saúde Ocupac/Brazil J Occup Health. 2006;31:149–60.
18. Silveira MG, Silva RP, Reis VM, Novaes JS. Effect of the workplace exercises in the morphologic, functional, lifestyle and absenteeism variables in workers on the pharmaceutical industry of Montes Claros–MG. Fit Perform J. 2006;6:295–301.
19. Resende MC, Tedeschi CM, Bethônico FP, Martins TT. Efeitos de ginástica laboral em funcionários de teleatendimento/effects of work gymnastic on teleassistance employees. Acta Fisiat. 2007; 14:25–31.
20. Garganta R, Pereira H, Guerreiro F, Souza M, Prufer C, Menezes S. Prevalence of MSDs and effect of a prevention program based on exercise and ergonomics in workers of the furniture industry. In: SPOSHO—Portuguese Society of Occupational Safety and Hygiene, editor. International symposium on occupational safety and hygiene: Proceedings of the SHO 2010—International

Symposium on Occupational Safety and Hygiene. Guimarães, Portugal: University of Minho; 2010. p. 266–7. Feb 11–12.
21. Neto AP, Barbosa CG, Abdala DW, Junior AJ, Mendes MMS. Flexibility profile of workers participants in a labor gymnastic program of a metallurgical company from Guaxupé–MG. Fit Perform J. 2009;8:279–85.
22. Mngoma N, Corbière M, Stevenson J. Pain profiles and psychosocial distress symptoms in workers with low back pain. Physiother Can. 2008;60:239–45.
23. Wattles MG, Harris C. The relationship between fitness levels and employee's perceived productivity, job satisfaction, and absenteeism. J Exerc Physiol. 2003;6:24–32.