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original article

Comparison of worker's health promotion interventions: cluster randomized controlled trial

Comparação de intervenções de promoção à saúde do trabalhador: ensaio clínico controlado randomizado por cluster

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Abstract – This study compared different strategies to improve occupational health and evaluated their impact on some quality of life domains (health, physical activity, occupational environment, and perception of quality of life). This cluster randomized controlled clinical trial enrolled 172 men and women aged 26.10 ± 6.03 who worked in the administrative department of 4 companies. The interventions lasted three months. Employees in company A (EA) received workplace exercises (WE) and educational interventions (EI) (posters with healthcare and quality of life recommendations and computer messages); in Company B (EB), only WE; in company C (EC), only EI; and in company D (ED), employees formed a control group. A quality of life and health (QVS-80) questionnaire was used for all assessments. The Wilcoxon test was used to compare quality of life before and after interventions, and the Kruskal-Wallis test ($p \leq 0.05$), for each quality of life domain. The scores for occupational environment increased in companies A and B ($p < 0.01$), which suggests that WE may improve the occupational environment.

Key words: Health promotion; Occupational health; Physical activity; Quality of life.

Resumo – *O objetivo do presente estudo foi comparar diferentes intervenções de promoção à saúde do trabalhador e seu impacto nos domínios da qualidade de vida (Saúde, Atividade Física, Ambiente Ocupacional e Percepção da Qualidade de Vida). Foi conduzido um ensaio clínico controlado randomizado por cluster em 4 empresas com 172 trabalhadores de ambos os sexos, com idade média de 26,10 ± 6,03, todos do setor administrativo. As intervenções tiveram duração de três meses. A Empresa A (EA) recebeu o exercício físico no local de trabalho [ginástica laboral (GL)] mais as intervenções educativas (IE: cartazes com recomendações de saúde e qualidade de vida e software computacional); a Empresa B (EB) recebeu a GL; os trabalhadores da Empresa C (EC) receberam a IE; a Empresa D (ED) foi o controle. As avaliações da qualidade de vida no trabalho ocorreram por meio do Questionário de Avaliação da Qualidade de Vida e Saúde (QVS-80). Foram encontradas melhorias significantes ($p<0,01$) no domínio do ambiente ocupacional para as empresa que receberam GL (EA e EB). Conclui-se que as empresas que receberam a GL promoveram benefício no domínio do ambiente de trabalho.*

Palavras-chave: *Atividade física; Promoção da saúde; Qualidade de vida; Saúde do trabalhador.*

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INTRODUCTION

The Industrial Revolution brought important amenities to everyday life, which led to improvements in its quality and in health in general. The following developments stand out: means of transportation, long-distance communications and workplace fatigue reductions. However, there have also been negative changes in lifestyles because of longer working hours, a decrease of energy expenditure during work activities and an increase of sitting time[1-4]. These negative factors contributed to an increase in the occurrence of noncommunicable chronic diseases, which now account for 63% (36/57 million) of deaths due to all causes worlwide[5].

Currently, the weekly workload, according to the Brazilian Constitution, cannot exceed 44 hours. The workplace, however, is where people spend a large part of a normal day (approximately 8 hours)[6]. Therefore, workplace health promotion programs have gained importance because of their potential to develop strategies that may improve employees' quality of life (QoL)[7-16].

Contemporary studies[17,18] draw attention to office work, during which employees spend a long time sitting. Time sitting seems to increase metabolic risk regardless of length of physical activity during leisure time[3,13].

Several studies have analyzed the effectiveness of interventions in workplace health promotion programs[2,7,8]. Workplace physical activities, educational interventions, collective e-mail messages, individual or collective counseling are some examples of such programs. Studies usually measure the outcomes of physical activity, dietary intake, stress control, smoking and drinking[11,14].

Systematic reviews and meta-analyses[1,3,12,18] were inconclusive about the impact of these interventions on QoL and health[1,12]. However, several factors associated with employees, such as the comfort of not leaving the workplace, having similar working behaviors and demands, having formal and informal communications with each other and sharing the same challenges posed by the interventions, reinforce the idea of the workplace as a potential site for the development of healthy behaviors[3,14,16,19].

However, which is the most effective workplace intervention? Is it an educational intervention alone? The practice of exercise during working hours? A combination of these two interventions? In an attempt to answer these questions, this study compared different health promotion interventions and their impact on domains of the quality of life of office workers.

METHODS

Type of study

In this cluster randomized controlled clinical trial, the interventions were randomized by company, and not by individuals, using the Research Randomizer 3.0 software. Allocations were concealed, as neither the investigators nor the companies were able to predict the result of the randomization of interventions.

Inclusion and exclusion criteria

Inclusion criteria were: employees who had never participated in any worksite quality of life interventions; companies that had administrative departments. Moreover, employees should be office workers and use a computer most of their working shift, and working hours should be equal to all participants.

The choice of office workers for the study was based on previous studies[2,10], which found that these employees had similar behaviors. Therefore, it was assumed that each cluster had homogeneous characteristics.

Subjects

This study included men and women aged 26.10 ± 6.03 years who worked in the administrative department of four small private companies (20-99 employees) in the city of Londrina, Brazil.

To form the clusters of employees, first the Human Resources Department of each company announced its participation in a study. A group meeting was scheduled to explain the objectives of the study, to introduce the institution in charge of the study and to explain privacy procedures to each participant. After that, employees that agreed to participate received further information about the study and signed an informed consent term.

All procedures were approved by the Ethics in Research Committee of Universidade Metodista de Piracicaba under number 14/10.

Instrument

The QVS-80 quality of life and health questionnaire was chosen to investigate workplace quality of life and health because it is based on other questionnaires, such as the WHOQOL and the SF-36, and has been validated for Brazilian employees[19]. This instrument has 80 questions, 67 of which should be answered using a Likert-like scale and 13 that referred to the employee's health history. Four domains are identified in QVS-80: health (H), physical activity (PA), occupational environment (OE) and perception of quality of life (QoL).

The H domain comprises 17 questions that refer to lifestyle and habits, such as sleeping quality, smoking and drinking. The PA domain has 15 questions about physical activities during leisure time. The OE domain has 11 questions about physical activities during work and the occupational environment. The QoL domain has 24 questions about personal and collective characteristics and autonomy.

Each QVS-80 question should be answered using a 5-point Likert-like scale in which numbers are presented in an increasing order. After answering the questionnaire, values are added and normalized to a 0-100 scale for each domain. The authors of the instrument classified scores as: excellent (≥ 75 point); good (≥ 50 and <75 point); fair (≥ 25 and < 50 point); and poor (≤ 25 point)[19].

Procedures

First, searches were conducted for companies in the industrial area of Londrina using the Internet. After that, the companies that showed interest in

participating were contacted by phone. The company was then visited for an explanation about the study phases.

During the first meeting, we explained allocation concealment and the definition of what type of intervention each company would receive. For that purpose, we used the Research Randomizer 3.0 software, available for free at http://www.randomizer.org, to randomly define the interventions that each company would receive. The companies were asked to provide a letter of acceptance.

The study flowchart for each intervention cluster, within each study phase, is shown in Figure 1.

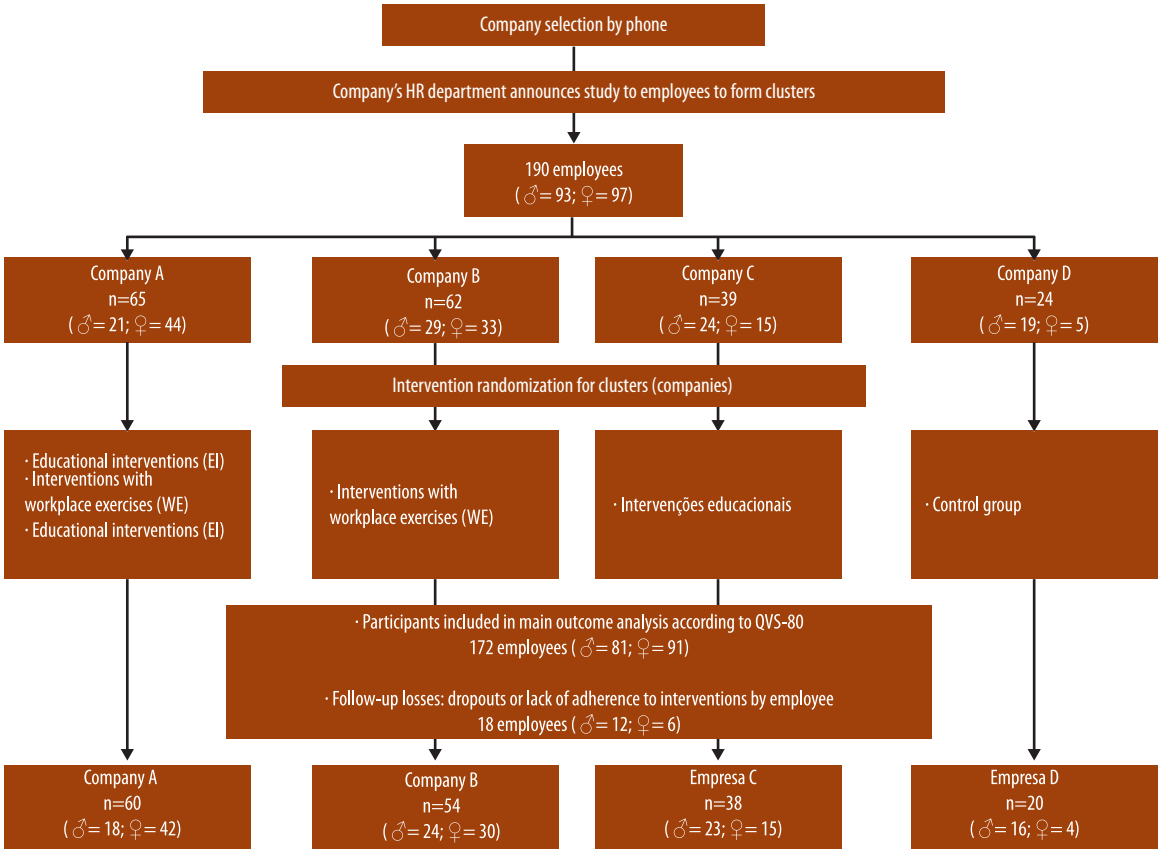

Figure 1. Study flowchart

Intervention

Each company received a different type of intervention: employees in company A (EA) received workplace exercises (WE) and educational interventions (EI) (posters with healthcare and quality of life recommendations and computer messages); in Company B (EB), only WE; in company C (EC), only EI; and in company D (ED), employees formed a control group.

Educational interventions were messages associated with quality of life and health, equally distributed using software and poster. The computer software *Saúde com Consciência*[26] ("Conscious Health") was developed in partnership with a computer science specialist. Daily messages about qual-

ity of life and health were shown on the computer screens as the computers were turned on, and their sequence was predefined by the investigator. Posters were printed in 11.7x16.5-in sheets, and eight were posted each month in different areas of the companies (close to water fountains, rest areas, cafeteria, close to restrooms and locker rooms). The messages both in posters and on computer screens were based on scientific evidence associated with quality of life and health.

WE were prepared to promote the practice of physical activities and demonstrate the benefits to participants. In each company that received WE, three 15-min sessions were held three times per week every other day using batons and latex tubes, exercises in pairs, massage, sitting exercises and relaxation on mats.

The WE sessions were prepared specifically for the office work performed by the study participants. The choice of physical exercises took into consideration the company spaces, the employee's clothes and the time the exercises were applied. The exercises lasted thirty seconds, and most were performed in static positions; some dynamic exercises were included in some sessions.

Data analysis

Data were described as medians, standard deviations, frequency tables and box plots.

A chi-square test (x^2) was used to compare sociodemographic variables and to check whether sample loss was homogeneous.

The Kruskal-Wallis test was used to compare company characteristics at baseline, which were nonnormal variables.

Factorial ANOVA was used to analyze variables considering the unit of allocation for error analysis after the transformation of the dependent variable by means of standardized scores of squared data. Transformations were used to provide characteristics of the continuous number distribution and to meet the normalcy assumptions of the distribution and the homogeneity of variance according to the central theorem limit (for this study: μ @ 0^{-14} and σ @ $1x0^{-12}$). When significant F values were found, the Tukey's HSD post hoc test for unequal n was used to determine differences.

The level of statistical significance was set at $p \leq 0.05$ for all analyses.

RESULTS

A total of 190 employees were included in the study. At retest, follow-up loss was 18 employees (9.5%): five in EA, eight in EB, one in EC and four in ED. Losses were due to lack of adherence to WE sessions and dropouts. Therefore, the study ended with 172 employees, and follow-up losses were homogeneous along the study for the clusters under analysis ($\chi^2 = 0.97$; $p = 0.81$).

Table 1 shows the general characteristics of employees in the companies included in the study.

Table 1. Baseline biological and sociodemographic characteristics according to company included in the study

	Company				
	A	B	C	D	Total
	X ± S	X ± S	X ± S	X ± S	X ± S
Biological Characteristics					
Age (years)	25.6 ± 6.6	26.1 ± 6.7	30.1 ± 9.9	26.4 ± 8.4	27.1 ± 7.6
Weight (kg)	65.3 ± 13.1	67.4 ± 13.0	71.5 ± 16.0	68.9 ± 13.4	68.3 ± 13.9
Height (cm)	168.0 ± 10.2	168.6 ± 10.0	171.1 ± 10.6	173.0 ± 7.3	170.2 ± 9.5
BMI (kg/m²)	23.1 ± 3.6	23.2 ± 4.7	23.5 ± 5.6	23.0 ± 4.0	23.2 ± 4.5
Sociodemographic Characteristics	n (%)	n (%)	n (%)	n (%)	n (%)
Sex					
Male	21 (35.0)	15 (27.8)	21 (55.3)	14 (70.0)	71 (41.3)
Female	39 (65.0)	39 (72.2)	17 (44.7)	6 (30.0)	101 (58.7)
Marital status					
Single	49 (81.7)	39 (72.2)	21 (55.3)	13 (65.0)	122 (70.9)
Married	11 (18.3)	15 (27.8)	17 (44.7)	7 (35.0)	50 (29.1)
Education (college)					
Complete	31 (51.7)	35 (64.8)	28 (73.7)	6 (30.0)	100 (58.1)
Incomplete	29 (48.3)	19 (35.2)	10 (26.3)	14 (70.0)	72 (41.9)
Household income					
≤ R$ 1,500.00	25 (41.7)	13 (24.1)	11 (28.9)	6 (30.0)	55 (32.0)
> R$ 1,500.00	35 (58.3)	41 (75.9)	27 (71.1)	14 (70.0)	117 (68.0)

As only age had a nonnormal distribution, the nonparametric Kruskal-Wallis test was used. However, there were no statistically significant differences at baseline.

The proportions of sociodemographic variables were compared for all companies, and there were no statistically significant differences between them.

Figure 2 shows the comparison of intervention effectiveness for the quality of life domains between companies.

In the H domain, the median values and the classification of the quality of life domain were: EA before intervention (BI) = 76 (excellent), EA after intervention (AI) = 76 (excellent); EB BI = 75 (excellent), EB AI = 75 (excellent); EC BI = 77 (excellent), EC AI = 79 (excellent); ED BI = 79 (excellent) and ED AI = 76 (excellent). There were no statistically significant differences in the H domain between companies ($F_{1,168}$ = 0.30; p = 0.58), time points ($F_{1,168}$ = 050; p = 0.48) or interactions ($F_{1,168}$ = 0.40; p = 0.53) (Figure 2).

In the PA domain, the median values and the classification of the quality of life domain were: EA BI = 26 (fair), EA AI = 30 (fair); EB BI =35 (fair), EB AI 27 (fair); EC BI = 38 (fair), EC AI = 36 (fair); ED BI = 45 (fair) and ED AI= 36 (fair). There were statistically significant differences between companies ($F_{1,168}$ = 11.15; p = 0.0009) A and D (0.04). However, there were no statistically significant differences between time points ($F_{1,168}$ = 1.18; p = 0.28) (Figure 2).

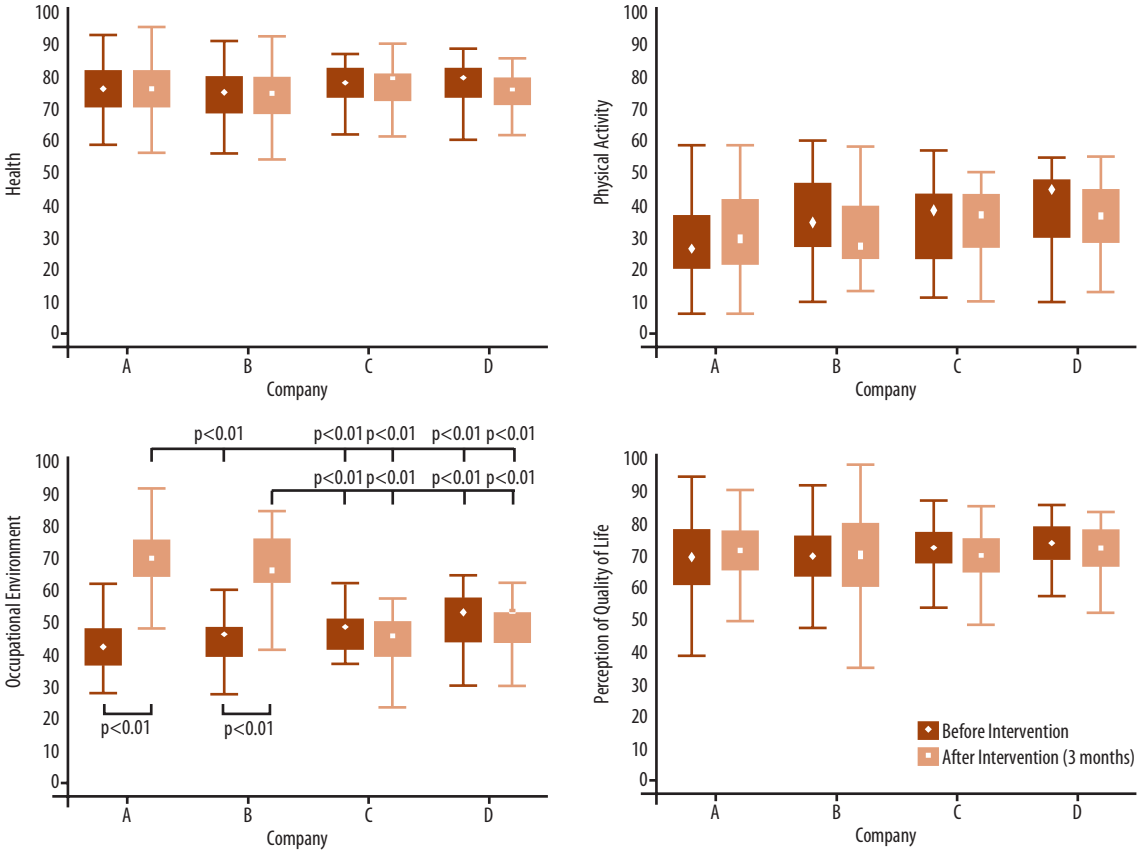

Figure 2. Comparison of different health promotion interventions for employees for the outcomes associated with quality of life

In the OE domain, the median values and the classification of the quality of life domain were: EA BI = 43 (fair), EA AI = 70 (good); EB BI = 45 (fair), EB AI = 65 (good); EC BI = 47 (fair), EC AI = 45 (fair); ED BI = 52 (good) and ED AI = 52 (good). Again, in the OE analysis, there were significant differences between companies ($F_{1,168}$ = 36.47; p = 4.10^{-9}) and after interventions ($F_{1,168}$ = 97.19; p = 2.64^{-20}). Moreover, there was an interaction between companies and interventions ($F_{1,168}$ = 132.20; p = 5.04^{-26}). EA and EB had significant differences after interventions (p < 1.00^{-17}). There were statistically significant differences (p < 0.01) also between EA and EB before interventions and EC and ED before and after interventions.

In the perception of QoL domain, the median values and the classification of the quality of life domain were: EA BI = 70 (good), EA AI = 71.5 (good); EB BI = 70.5 (good), EB AI = 68.5 (good); EC BI = 72 (good), EC AI = 72 (good); ED BI = 72 (good) and ED AI = 72 (good). As for the H domain, there were no statistically significant difference in the perception of QoL domain between companies ($F_{1,168}$ = 1.42; p = 0.23), after interventions ($F_{1,168}$ = 0.20; p = 0.65) or in interactions between companies and interventions ($F_{1,168}$ = 2.08; p= 0.15).

DISCUSSION

This study compared the effect of workplace interventions on QoL domains: health, physical activity, occupational environment and perception of QoL. Three months seems to be a short time for great changes in the domains under study, except the occupational environment, considering the companies that received WE. The interventions analyzed for at least three months have shown to be efficient in increasing the level of physical activity only. Three months of physical activity interventions after their working shift increased from 25% to 51% the proportion of employees that reached the minimum recommended by the ACSM for the practice of physical activities[11].

Using a longer intervention time, another study found that nine months of counseling for physical activity practice by employees led to positive changes in the physical fitness components associated with health, body composition and cardiorespiratory condition. Moreover, the level of physical activity practice increased significantly. Data found in our study differ from the literature in that the interventions did not change the level of physical activity during leisure time, which may be associated with the duration of the interventions, as the study was conducted between August and November, that is, during two different seasons in Brazil (end of winter and beginning of spring). Such data are in agreement with those reported in a study conducted between July and October, which found a decrease in the level of physical activity among the population under study[28]. However, seasonal variations are not consensual in the literature. A study with children found that habits associated with physical activity practice during the four seasons did not change significantly[29].

The analysis of each domain before and after interventions in each company revealed that the companies that received WE had a significant improvement in the results for the OE domain. Moreover, the intervention clusters in the companies were similar at baseline. Therefore, these benefits may be assigned to the group exercises, during which the employees could become more aware of the importance of healthy behaviors. Studies in the literature report that awareness-raising activities conducted in groups may positively change certain lifestyle factors[20]. Although the company that received the EI did not improve, the company that received the best intervention, that is, WE and EI, had the greatest changes. However, those changes were not statistically significant.

Quality of life and health are areas that demand further studies due to their complexity and associated factors. Therefore, the generalization of results is compromised. However, our data may support the analysis of the importance of combined strategies, such as the practice of physical activities, educational interventions and the understanding of the lifestyle components in the workplace.

There were improvements in the quality of life in EA and EB in the OE

domain. EA received both interventions, and all the quality of life domains tended to improve in this company, which suggests that long periods of intervention may be important to achieve significant outcomes[28].

The positive points of this study were the originality of the software used for the educational intervention, the combination of interventions and the study design, which used a control group and different interventions.

The major limitations of this study were associated with cluster randomization because of the biases that may have resulted from company recruitment and the sample differences at baseline. Although statistical differences were not found, the proportional differences between sexes, income and education may represent biases due to the differences at baseline, which become clinically important and affect the evaluation of quality of life. Moreover, the three months during which interventions were conducted may have been too short a time to find positive changes.

CONCLUSION

This study found that three months is a short time to observe significant improvements in the domains of health and perception of quality of life. However, the occupational environment values improved significantly in the companies that received the WE intervention.

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