Peertechz

MEDICAL GROUP

ARCHIVES OF
Community Medicine and Public Health OPEN ACCESS JOURNAL

ISSN: 2455-5479 DOI: https://dx.doi.org/10.17352/acmph

Research Article

Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes

Laura Gómez-Paredes[1]*, María José Aguado-Benedi[2,3] and Luis Reinoso-Barbero[1,4]

[1]Department of Health and Occupational Risk Prevention, Santander Bank, Boadilla del Monte, Madrid, Spain

[2]General Council of the Judiciary, Madrid, Spain

[3]Department of Social Psychology, Work and Differential, Faculty of Psychology, Complutense University of Madrid, Madrid, Spain

[4]Faculty of Health Sciences. International University of La Rioja, La Rioja, Spain

Received: 22 September, 2022
Accepted: 10 October, 2022
Published: 11 October, 2022

***Corresponding author:** Laura Gómez-Paredes, MD, Department of Health and Occupational Risk Prevention, Santander Bank, Boadilla del Monte, Madrid, Spain, E-mail: laura.gomezparedes@gruposantander.com; lauragparedes@gmail.com

ORCID: https://orcid.org/0000-0001-8352-4392

https://www.peertechzpublications.com

Check for updates

Abstract

Objectives: The aim of this study was to evaluate the effects of a global health promotion intervention in the workplace on cardiovascular risk factors and weight-related outcomes in offices workers after two years.

Methods: This nonrandomized retrospective observational study analyzed data of two medical check-up of 728 office workers, over 40 years old: intervention group (376) and control (352) at baseline and after 2 years of a global health promotion program (based on nutrition, physical activity, and mental health) of mixed approach (individual, group and organizational) in the workplace of the intervention group.

Results: Systolic and diastolic blood pressure experienced a statistically significant decrease (p ⊠ 0.05) at 2 years of -0.94 mm Hg and -0.79 mm Hg in the intervention group versus the control group whose changes were + 0.02 mm Hg and -0.38 mm Hg. Glucose also decreased 1.59 mg/dl more in the intervention group. Lipids, smoking, body mass index or waist circumference did not undergo relevant modifications.

Conclusion: This program improved blood pressure and glucose of office workers after two year follow-up, even among employees with low cardiovascular risk. However, according to the findings, this intervention was not as effective as expected in improving weight-related outcomes and cardiovascular risk in an office worker population.

Companies should strengthen, not only an overall health intervention, but also individual and personalized advice in the fight against cardiovascular risk.

Introduction

Health promotion initiatives can help prevent the onset of chronic diseases. Globally, chronic diseases have a high incidence and an impact on workforce patterns. Cardiovascular disease is one of the most important. Cardiovascular risk factors are preventable through the promotion healthy lifestyle [1].

Workplaces are a good setting for these interventions because of the potential reach [1-4]. In Spain, 62.7% of the working-age population [5], are employed and, spend an average of 1577 h annually at work [6]. They also offer easy access to occupational doctors and nurses.

The estimated prevalence of cardiovascular risk factors in the Spanish workforce population on average

Citation: Gómez-Paredes L, Aguado-Benedi MJ, Reinoso-Barbero L (2022) Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes. Arch Community Med Public Health 8(4): 120-127. DOI: https://dx.doi.org/10.17352/2455-5479.000187

is hypercholesterolemia at 49.16%, smoking at 43.20%, hypertension at 19.75% and diabetes at 2.83% [7-9].

The aim of this study was to evaluate the effects of a global health promotion intervention in the workplace on cardiovascular risk factors and weight-related outcomes in office workers after two years.

Methods

A nonrandomized retrospective observational study was conducted on a population of ≥ 40 years old office workers of a Spanish company in Madrid for two years (total N = 728), therefore, the current study includes the whole population that fulfills the following criteria. The final sample was divided into two cohorts based on exposure or not to a health promotion program implemented in June 2016 in the corporate headquarters of the company.

All employees included were in the same age group, had a university degree, similar income level, 1700 hours worked/year on average, identical occupational risks, and the same schedule. They received at least two regular medical check-ups at one of the company´s health centers before and after the intervention took place (2015-2018). Figure 1 shows a participant flow chart.

Cohorts

Intervention group: 376 employees working in the corporate headquarters (9 office buildings, company canteens, 2 sports centers, 2 medical centers for Health Surveillance and Occupational Risk Prevention).

Control group: 352 employees working in one of 372 small business offices in Madrid (non-exposed, neither company canteen, nor sports center/ medical center nearby).

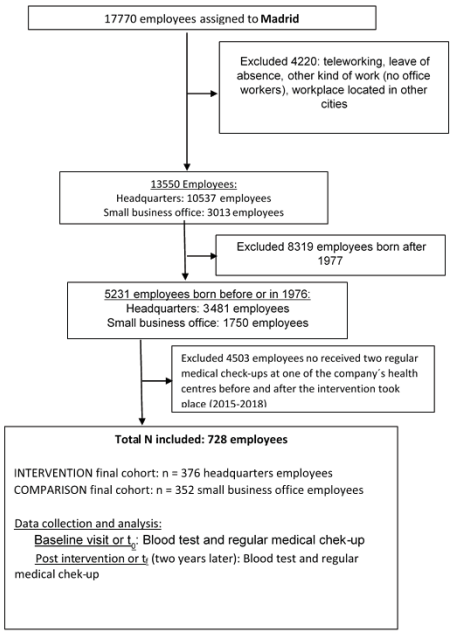

Figure 1: Flowchart for the inclusion and exclusion procedure.

Sample size

The Cochran formula for finite populations with a confidence level = 0.95 and for statistical power = 0.8 was used to calculate the sample size. There were 3481 employees ≥ 40 years old in the workforce at the corporate headquarters, at least 348 employees were needed in the intervention group.

Data collection

The procedures followed were in accordance with the Helsinki Declaration, as revised in 2013, on clinical research. Before the medical check-up, each employee gave informed consent, and confidentiality was respected as explained in Spanish Organic Law on Personal Data Protection 15/1999. Workers gave always their permission to extract data for epidemiological studies globally and anonymously.

After a query with the years of interest (2015-2018) and year of birth, we selected the medical records of the employees who met the inclusion criteria in AT MEDTRA software. Data were collected in an anonymous way in an Excel spreadsheet only by their employee number.

The staff members performing the assessments only knew the employee number.

Participants were not blinded to this intervention.

Baseline visit (t_0)

- **Demographic variables:** age, sex, workplace, smoking [10], (non-smoker: never smoked, smoker: smoked 1 cigarette in the last 6 months and ex-smoker: ≥ 6 months since the last cigarette).
- Medical history and pharmacological treatment.
- **Physical examination:** blood pressure was measured with a calibrated OMRON-HEM-907 device. The employee was seated with his back supported without crossing his legs, no coffee or cigarette for the previous 30 minutes; after 5 minutes of quiet, the device took 3 measurements at 30-second intervals; the mean of the 3 results was taken as the value. If the result showed an elevated value, the employee was given another appointment that week to rule out hypertension. Hypertension [11-13], was considered high blood pressure if previously diagnosed by a physician and treated, or if systolic blood pressure (SBP) ≥ 140 mm Hg, diastolic blood pressure (DBP) ≥ 90 mm Hg on 2 or more occasions.
- **Weight-related outcomes:** weight (in kilograms with a TANITA WB 100 PMA, without shoes and with light clothing), height (in centimeters, a measuring rod was used with feet together, back straight, heels supported), body mass index (BMI = Weight (kg) / Height (m) 2 [14], a worker was considered to be overweight if BMI between 25 and 29.9 or obese if BMI was greater than 30), waist circumference (in centimeters, was measured with a GulicK II tape measure model 67020, the person

Citation: Gómez-Paredes L, Aguado-Benedi MJ, Reinoso-Barbero L (2022) Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes. Arch Community Med Public Health 8(4): 120-127. DOI: https://dx.doi.org/10.17352/2455-5479.000187

should be standing, with feet together, arms at the sides and abdomen relaxed, and then surround the abdomen with the tape measure at the level of the navel and without pressing, take a deep breath in and then out, abdominal obesity [14], was considered if men ≥ 102 cm or if women ≥ 88 cm).

- Electrocardiogram
- **Results of blood test were measured using automated techniques:** glucose levels (diabetes if glucose ≥ 126 mg/dl [15]) and lipids (total cholesterol, and its fractions and triglyceride, dyslipidemia [16], if total cholesterol ≥ 250mg, LDL-cholesterol ≥ 130 mg/dl, HDL-cholesterol < 40 mg/dl or triglycerides ≥ 200 mg/dl).
- **Cardiovascular risk estimation:** SCORE tables for the low-risk population [17].
- A report was delivered with personalized recommendations.
- **Post-intervention visit (t_f):** same as t_0 after two years.

Intervention

The intervention was based on the social-ecological model [18]: the organizational dimension (refers to a healthy environment and atmosphere in the workplace, was delivered to all employees in headquarters), the interpersonal dimension (based on relationships with colleagues, group activities were performed in the workplace) and individual factors (personal counseling that encourages all workers to know their health parameters, set goals and specific actions to achieve them).

Included actions related to nutrition, physical activity, and mental health. Multiple health professionals were involved. This intervention consisted of:

A common part

- **A website:** Staff could find information on the program. It provided tests on nutrition and physical activity to update the start point.
- A monthly agenda with healthy activities and recipes were emailed to all employees.
- An annual healthy month was held in the workplace with activities that required the active participation of the employee to learn healthy lifestyle habits, including an intensive week dedicated to health.

A Specific part: Nutrition/Food: Information on healthy eating was posted with short videos and pills.

Advance information about the weekly menu at the canteen was delivered to all employees, including macro/micronutrient groups and calories.

The canteen menu was adapted to the Mediterranean pattern diet (fruits, vegetables, legumes, nuts, whole grains, and extra virgin olive oil) and reduced salt content.

Information on healthy eating and salt consumption was provided on the canteen paper tablecloths.

Ultra-processed foods were eliminated in favor of nuts or fruit in the vending machines and at the takeaway point. Healthy products were pointed and placed at first sight.

Employees were able to measure blood pressure and calculate individual cardiovascular risk. After that, they receive written recommendations, a book of low-salt recipes, and another one of healthy recipes. The activity lasted 3 months every year.

During the healthy week, free healthy cooking workshops were offered.

The staff received a healthy breakfast for free one day during the healthy month.

A half-price voucher was promoted for 10 individual nutrition consultations in the headquarters medical center.

Physical activity: Short videos and pills were posted to avoid a sedentary lifestyle. Applications for staying active were published on the web.

The company launches a challenge: Go around the world walking for one month. Each employee would try to achieve 10,000 steps/day in that period. Employees could donate the daily steps into a collective register for charitable purposes.

They also used different information channels (workplace screens: cafeterias, computer screen saver, elevator, or intranet) to encourage daily physical activity. Some of the messages were: walking at least 20 minutes/day, parking 1 kilometer farther from the destination or getting off one stop before the bus/metro, using stairs, and using the lunch break to walk. Breaks during work hours to stretch were celebrated too.

During healthy month, a solidarity soccer tournament and race were held in the workplace (the fee went to a charity organization). In addition, new gym memberships at the workplace sports center were at half price for the first six months during that time.

An interactive bracelet was delivered to all employees to measure physical activity.

Employees' membership fees at gyms near their workplace and/or residence were cheaper using the collective company policy.

Monthly classes in new sports were held in the workplace for free to motivate employees to keep moving.

Different sports competitions were organized during the year in the workplace sports center.

Annually, employees were given a free individual pilates class and a back-school workshop that taught them a healthy ergonomic posture during the workday.

Mental health: guidelines to manage stress and flexible scheduling during the workday were offered to everyone as

Citation: Gómez-Paredes L, Aguado-Benedi MJ, Reinoso-Barbero L (2022) Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes. Arch Community Med Public Health 8(4): 120-127. DOI: https://dx.doi.org/10.17352/2455-5479.000187

well as vacation purchases (employees were able to purchase 5 additional days of vacation/year that were deducted from their salary). Free workshops to deal with stress, to enhance positive emotions, outdoor yoga workshops, and meditation or mindfulness courses were proposed annually for all the staff.

Statistical analysis

Analyses were performed at the individual level.

R program version 3.3.3 and RStudio version 1.2.5033 were used.

Quantitative variables were described using the mean and standard deviation (SD). Qualitative variables were described using absolute frequency and relative frequency by percentages. For statistical inference, the normality of the sample was checked (Shapiro-Wilk test, Jarque-Bera test), homoscedasticity (Barlett test, Levene test) and finally, it was analyzed whether the samples were paired or independent to choose the appropriate test: Wilcoxon, Student's t - test paired or independent samples, Welch's t-test independent samples, Mann-Whitney U test paired samples. It was a bilateral analysis.

Pearson's Chi-square test was used for categorical variables.

A value was statistically significant if $p < 0.05$.

Results

728 workers have included: 307 women (42.17%) and 421 men (57.83%) with a mean initial age of 48.5 years and final age of 51.28 years.

The intervention and control group did not statistically differ with respect to most of their baseline characteristics, but the intervention group formed a significantly lower baseline frequency of hypertensive workers ($p = 0.0073$), as well as lower waist circumference levels ($p = 0.0345$), BMI levels (0.0184) and LDL-cholesterol levels ($p = 0.0212$). Tables 1,2 present the characteristics of the study population at baseline and post-intervention analysis.

Table 3 shows the prevalence of the risk factors studied.

The website of the program had 1500 views/month on average (different IP addresses) up to 3400 views during the healthy month. Every year: 4600 healthy breakfasts were delivered, 1100 workers got to know their blood pressure and cardiovascular risk, and 40.6% of employees at headquarters completed the challenge of a round-the-world walk. 315 people ran and played soccer for charity purposes. On average 150 workers attended to try monthly new sports. More than 350 healthy recipes were available for employees. 720 workers adhered to the gym promotion. 2325 employees enjoyed the pilates free class. Nutrition consultations (691 to 1662) and daily canteen menu (3806 to 6255) grew exponentially over two years. Sport center members at the workplace slightly increased after the follow-up (2973 to 3004).

The SBP and DBP showed statistically significant changes ($p < 0.05$) after two years of intervention. A decrease in SBP (−0.94 ± 0.49 mm Hg, (CI = 95%) on average) was observed in the intervention group as opposed to the control group where there was a rise in t_f (+ 0.02 ± 0.55 mm Hg, (CI = 95%) on average). DBP decreased in both groups: in the intervention group, the decrease was 0.79 ± 0.42 mm Hg (CI = 95%), more than double that in the control group (0.38 ± 0.46 mm Hg (CI = 95%)).

Segmented by sex, the drop was observed in men in both groups but not in women. Men in the intervention group showed greater decrease than the control group in SBP (−2.34 ± 0.60 mm Hg (CI = 95%) versus −1.45 ± 0.63 mm Hg (CI = 95%)) and DBP (−1.35 ± 0.54 mm Hg (CI = 95%) versus −1 ± 0.59 mm Hg (CI = 95%)). In women, the trend was upward in both groups, although the increase was greater in the control group (SBP + 1.8 ± 0.80 mm Hg (CI = 95%) and DBP + 0.38 ± 0.69 mm Hg (CI = 95%).) with respect to the intervention

Table 1: Baseline characteristics of the participants for each cohort ($N = 728$).

Baseline visit (t0)							
	Intervention Group			Control Group			
	Total	Women	Men	Total	Women	Men	
N	376	148	228	352	159	193	
	Mean ± SD						
Outcomes	Total	Women	Men	Total	Women	Men	*p* - value
Age (years)	47.13 ± 4.13	47.41 ± 3.39	46.95 ± 4.54	49.86 ± 4.65	48.86 ± 4.28	50.68 ± 4.80	>0.999
SBP mm Hg	115.43 ± 11.84	108.26 ± 9.97	120.07 ± 10.59	117.32 ± 14.09	110.69 ± 12.56	122.79 ± 12.9	0.1277
DBP mm Hg	72.39 ± 8.67	69.8 ± 7.79	74.07 ± 8.82	73.89 ± 9.96	70.96 ± 9.86	76.31 ± 9.39	0.0836
Glucose mg/dl	89.02 ± 9.51	85.88 ± 6.63	91.06 ± 10.5	90.38 ± 11.03	87.19 ± 8.42	93.01 ± 12.19	0.1306
Cholesterol mg/dl	198.89 ± 32.22	196.13 ± 28.79	200.69 ± 34.2	201.62 ± 28.88	201.72 ± 28.86	201.54 ± 28.96	0.0906
HDL-chol mg/dl	54.9 ± 14.35	62.38 ± 14.13	50.05 ± 12.27	53.64 ± 12.67	59.79 ± 12.21	48.58 ± 10.67	0.1853
LDL-chol mg/dl	124.98 ± 29.39	118.19 ± 26.26	129.38 ± 30.51	129.4 ± 25.86	126.43 ± 25.69	131.84 ± 25.8	0.0058
TG mg/dl	94.28 ± 56.23	77.65 ± 33.86	105.07 ± 64.68	92.72 ± 42.32	77.31 ± 30.75	105.41 ± 46.23	0.7791
BMI	25.81 ± 4.13	24.37 ± 4.28	26.75 ± 3.75	26.46 ± 4.01	25.5 ± 4.36	27.25 ± 3.52	0.0184
Waist circumference (cm)	89.19 ± 11.97	81.74 ± 10.32	94.02 ± 10.39	91.29 ± 12.52	84.42 ± 10.87	96.95 ± 10.87	0.0345

Results are shown as means (standard deviations). Statistical differences are depicted in bold. [BMI: Body Mass Index; cm: centimeters; DBP: Diastolic Blood Pressure; HDL-chol: High-Density Lipoprotein Cholesterol; LDL-chol: Low-Density Lipoprotein Cholesterol; mg/dl: milligrams per deciliter; mm Hg: millimeter of mercury; SBP: Systolic Blood Pressure; TG: Triglycerides].

Citation: Gómez-Paredes L, Aguado-Benedi MJ, Reinoso-Barbero L (2022) Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes. Arch Community Med Public Health 8(4): 120-127. DOI: https://dx.doi.org/10.17352/2455-5479.000187

Table 2: Post-intervention characteristics of the participants for each cohort (*N* = 728).

Post-intervention visit (t_f)

	Intervention Group			Control Group			
	Total	Women	Men	Total	Women	Men	
N	376	148	228	352	159	352	
	Mean ± SD						
Outcomes	Total	Women	Men	Total	Women	Men	*p* - value
Age (years)	49.91 ± 4.09	50.14 ± 3.40	49.77 ± 4.49	52.69 ± 4.64	51.70 ± 4.34	53.51 ± 4.73	> 0.999
SBP mm Hg	114.49 ± 12	109.5 ± 12.1	117.73 ± 10.79	117.34 ± 13.67	112.49 ± 13.93	121.34 ± 12.09	0.0079
DBP mm Hg	71.6 ± 8.79	69.87 ± 8.61	72.72 ± 8.75	73.51 ± 9.11	71.34 ± 9.61	75.31 ± 8.28	0.0055
Glucose mg/dl	82.98 ± 9.89	80.89 ± 7.43	84.34 ± 11.01	85.93 ± 12.04	84.44 ± 12.41	87.16 ± 11.62	0.001
Cholesterol mg/dl	203.93 ± 33.02	205.65 ± 30.03	202.82 ± 34.84	205.42 ± 32.23	208.24 ± 30.19	203.09 ± 33.72	0.5171
HDL-chol mg/dl	57.94 ± 15.81	66.51 ± 15.42	52.38 ± 13.41	56.7 ± 13.48	62.92 ± 13.01	51.58 ± 11.61	0.055
LDL-chol mg/dl	127.3 ± 28.93	122.97 ± 26.35	130.11 ± 30.22	130.05 ± 28.49	129.11 ± 26.04	130.83 ± 30.41	0.0265
TG mg/dl	93.69 ± 46.53	80.84 ± 35.01	102.03 ± 51.05	93.33 ± 44.91	81.06 ± 35.15	103.44 ± 49.43	0.982
BMI	26.06 ± 4.22	24.7 ± 4.40	26.94 ± 3.86	26.76 ± 4.11	25.99 ± 4.40	27.4 ± 3.75	0.0193
Waist circumference (cm)	90.8 ± 12.21	83.31 ± 10.57	95.65 ± 10.66	92.88 ± 12.09	86.9 ± 10.77	97.8 ± 10.86	0.0309

Results are shown as means (standard deviations). Statistical differences are depicted in bold. [BMI: Body Mass Index; cm: centimeters; DBP: Diastolic Blood Pressure; HDL-chol: High-Density Lipoprotein Cholesterol; LDL-chol: Low-Density Lipoprotein Cholesterol; mg/dl: milligrams per deciliter; mm Hg: millimeter of mercury; SBP: Systolic Blood Pressure; TG: Triglycerides].

Table 3: Prevalence of cardiovascular risk factors. Statistical differences are depicted in bold.

Cardiovascular Risk Factors		N	Relative frequency %	Chi2 *p* - value for difference
High-normal Blood pressure	I cohort t_0	33	8.78	*p* = 0.8793
	C cohort t_0	33	9.37	
	I cohort t_f	23	6.11	*p* = 0.5926
	C cohort t_f	26	7.39	
Hypertension	I cohort t_0	49	13.03	*p* = 0.0073
	C cohort t_0	73	20.68	
	I cohort t_f	59	15.69	*p* = 0.0204
	C cohort t_f	80	22.72	
Diabetes	I cohort t_0	5	1.33	*p* = 0.35
	C cohort t_0	9	2.56	
	I cohort t_f	6	1.6	*p* = 0.2628
	C cohort t_f	11	3.13	
Dyslipidemia	I cohort t_0	275	73.13	*p* = 0.1339
	C cohort t_0	297	84.38	
	I cohort t_f	298	79.26	*p* = 0.9834
	C cohort t_f	298	84.66	
Smoking	I cohort t_0	76	20.21	*p* = 0.9332
	C cohort t_0	73	20.74	
	I cohort t_f	70	18.62	*p* = 0.7988
	C cohort t_f	62	17.62	
Overweight	I cohort t_0	141	37.5	*p* = 0.4308
	C cohort t_0	143	40.63	
	I cohort t_f	160	42.55	*p* = 0.8268
	C cohort t_f	146	41.48	
Obesity (BMI ≥ 30	I cohort t_0	55	14.63	*p* = 0.1954
	C cohort t_0	65	18.47	
	I cohort t_f	56	14.89	*p* = 0.0612
	C cohort t_f	72	20.45	
Abdominal Obesity	I cohort t_0	88	23.41	*p* = 0.0025
	C cohort t_0	119	33.81	
	I cohort t_f	98	26.06	*p* < 0.001
	C cohort t_f	135	38.35	
Sedentary lifestyle	I cohort t_0	146	38.83	*p* = 0.7332
	C cohort t_0	142	40.34	
	I cohort t_f	131	34.84	*p* = 0.911
	C cohort t_f	125	35.51	

BMI: Body Mass Index; C: Control Group; I: Intervention Group; t_0: baseline; t_f: follow up]

Citation: Gómez-Paredes L, Aguado-Benedi MJ, Reinoso-Barbero L (2022) Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes. Arch Community Med Public Health 8(4): 120-127. DOI: https://dx.doi.org/10.17352/2455-5479.000187

group (SBP +1.24 ± 0.76 mm Hg (CI = 95%) and DBP + 0.07 ± 0.65 mm Hg (CI = 95%).

The glucose of the employees in both groups decreased during the follow-up. In the intervention group, it decreased by 6.04 ± 0.45 mg/dl (CI = 95%) on average in a statistically significant way compared to the control group (-4.45 ± 0.50 mg/dl (CI = 95%) The control group also showed a statistically significant decrease after follow-up. These differences were greater in men (-11.71 ± 0.60 mg/dl CI = 95%) in the intervention group versus -5.84 ± 0.69 mg/dl (CI = 95%) in the control group) than in women (-4.99 ± 0.60 mg/dl (CI = 95%) versus 2.7 ± 0.71 mg/dl (CI = 95%)).

Lipids did not show statistically significant changes after the follow-up (total cholesterol increased so did LDL-cholesterol and HDL-cholesterol). Neither did BMI nor weight nor waist circumference (Table 4), smoking, or SCORE cardiovascular risk categories (Table 5). Segmented by gender, women in the intervention group increased a minimum level of their waist circumference in contrast to the control group in a significant way (p = 0.0018) after the follow-up.

Discussion

The intervention shows a positive influence in decreasing blood pressure values, both SBP and DBP after 2 years. It is a modest decrease since only a decrease in salt consumption to 5-6 g/day for more than four weeks in normotensive individuals reduces the SBP by 2.42 mm Hg and DBP by 1 mm Hg [19] but it reinforces and improves the result obtained in studies on the working population by improving both values (SBP and DBP) in a statistically significant manner.

In contrast to the good result observed in this study (SBP -0.94 ± 0.49 mm Hg), Engbers, et al. [20] found an increase in SBP of 3 mm Hg 3 and 12 months after their intervention in office workers.

Like us, Ryu, et al. [18], found a decrease in DBP with their intervention (-3.45 mm Hg at 6 months). Their result is greater than the one presented in this paper, although the sample was much smaller (30 participants), with no effect on SBP.

The findings presented in men (SBP -2.3 ± 0.60 mm Hg and DBP -1.35 ± 1.6 mm Hg at t_f, both statistically significant) were similar to Groeneveld´s findings, et al. [21] in construction workers (DBP drop statistically significantly after 6 months of intervention by 1.7 mm Hg, maintained at 12 months and a nonsignificant decrease of - 2.2 mm Hg in SBP). Scapellato, et al. [22] obtained a greater decrease at 6 months: SBP of -4.4 mm Hg and DBP of -2.5 mm Hg in healthcare workers.

This research shows a tendency of the program to reduce glucose in a statistically significant way (this parameter decreased 1.59 ± 0.48 mg/dl (CI = 95%) more in the intervention

Table 4: Bilateral statistical inference analysis. Evolution of the variables in both cohorts. Statistical differences are depicted in bold.

	Control	Intervention	t_0	t_f
	t_0 *vs* tf	t_0 *vs* t_f	Intervention *vs* control	Intervention *vs* control
SBP	Increase	Decrease	Decrease	Decrease
p - value	*p* = 0.671	*p* = 0.0338	*p* = 0.1277	*p* = 0.0079
DBP	Decrease	Decrease	Decrease	Decrease
p - value	*p* = 0.5913	*p* = 0.01	*p* = 0.0836	*p* = 0.0055
Glucose	Decrease	Decrease	Decrease	Decrease
p - value	*p* ⍰ 0.001	*p* ⍰ 0.001	*p* = 0.1306	*p* ⍰ 0.001
Cholesterol	Increase	Increase	Decrease	Decrease
p - value	*p* = 0.0104	*p* ⍰ 0.001	*p* = 0.2285	*p* = 0.5395
HDL-chol	Increase	Increase	Increase	Increase
p - value	*p* ⍰ 0.001	*p* ⍰ 0.001	*p* = 0.5048	*p* = 0.6614
LDL-chol	Increase	Increase	Decrease	Decrease
p - value	*p* = 0.3583	*p* = 0.0118	*p* = 0.0212	*p* = 0.1852
TG	Increase	Decrease	Increase	Increase
p - value	*p* = 0.8901	*p* = 0.2676	*p* = 0.1668	*p* = 0.8441
BMI	Increase	Increase	Decrease	Decrease
p - value	*p* < 0.01	*p* < 0.01	*p* = 0.0184	*p* = 0.0193
Waist circumference	Increase	Increase	Decrease	Decrease
p - value	*p* < 0.001	*p* < 0.001	*p* = 0.0345	*p* = 0.0309

BMI: Body Mass Index; cm: centimeters; DBP: Diastolic Blood Pressure; HDL-chol: High-Density Lipoprotein cholesterol; LDL-chol: Low-Density Lipoprotein cholesterol; mg/dl: milligrams per deciliter; mm Hg: millimeter of mercury; SBP: Systolic Blood Pressure; t_0: baseline; t_f: post-intervention; TG: Triglycerides.

Table 5: SCORE cardiovascular risk categories.

SCORE [17]	Low		Moderate		High		Chi2 *p* - value for difference
	N	Relative frequency %	N	Relative frequency %	N	Relative frequency %	
I Group t0	357	94.95	18	4.79	1	0.27	*p* = 0.9974
C Group t0	320	90.91	31	8.81	1	0.28	
I Group t_f	338	89.89	36	9.57	2	0.53	*p* = 0.984
C Group t_f	270	76.70	80	22.73	2	0.57	

C: Control Group; I: Intervention Group; t_0: baseline; t_f: follow up

Citation: Gómez-Paredes L, Aguado-Benedi MJ, Reinoso-Barbero L (2022) Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes. Arch Community Med Public Health 8(4): 120-127. DOI: https://dx.doi.org/10.17352/2455-5479.000187

group), although the control group also experienced a significant decrease between t_0 and t_f. This finding differs in a positive way from the study by Ryu, et al. [18] where glucose in the intervention group increased at 3 and 6 months. Scapellato, et al. [22] obtained a similar effect in glucose in both genders after 6 months (-1.5 mg/dl and not statistically significant) being much lower than our -6.04 ± 1.4 mg/dl of the intervention group. The effect observed affected more men who participated in the program.

Despite these findings seeming discrete for clinical practice, the increase in the age of the population studied during the follow-up and the real possibility of an increase in blood pressure and glucose values, make these findings relevant.

Cholesterol, its fractions, and triglycerides worsened in both groups contrary to other studies that improved HDL-cholesterol such as Engbers, et al. [20] at 3 and 12 months or Groeneveld, et al. [21] at 12 months. Contrary to what was found after this program, Scapellato, et al. [22] described a decrease in LDL-cholesterol at 6 months (-3.4 mg/dl).

Unexpectedly, weight, BMI, and waist circumference did not suffer significant changes despite the adaptation of the canteen menu to the Mediterranean diet and the results published by other investigators [18,22]. The case of the women deserves further research.

The prevalence of the cardiovascular risk factors is slightly different from that estimated in other studies including the Spanish working population [7-9]: frankly better in the sample studied with regard to smoking (it was around 20%), slightly lower for hypertension, especially in the intervention group where the maximum prevalence estimated was 15.69% in t_f or in the case of diabetes which did not exceed 4% in either cohort.

On the other hand, the prevalence of dyslipidemia exceeded 50% in both groups, being greater than in the investigations of Martinez-Abadía, et al. [8] or Alvarez-Fernandez, et al. [9] and similar to the results of Sanchez-Chaparro [7]. The difference in diagnostic criteria over the years could explain part of the difference.

Limitations

Because it is a retrospective study and company medical check-ups are voluntary, this sample may only reflect data from those workers most interested in their health. For this same reason, it was not possible to measure the impact on the results of single actions of the intervention since it was not recorded in how many of the proposed activities the employees were involved in. The previous differences related to hypertension population, BMI, waist circumference, or LDL cholesterol are a limitation of this study, but the good result of BP in the end, in the best baseline group (intervention) makes this company´s effort on promotion worthwhile.

Conclusion

This global health promotion program based on diet, physical activity, and mental health has shown a positive trend in improving blood pressure and glucose of office workers after a short, but longer than 1-year follow-up.

This workplace intervention of a mixed approach (individual, group, and work environment) to promote healthy habits improves some cardiovascular risk factors after more than a year of follow-up, even among workers with low cardiovascular risk such as those in this study.

However, according to the findings, this intervention was not as effective as expected in improving weight-related outcomes and cardiovascular risk in an office worker population.

Companies should strengthen, not only an overall health intervention but also individual and personalized advice in the fight against cardiovascular risk factors in the long term. Special attention should be paid in the future to a personalized approach to workplace health promotion. We should try to focus our efforts on the employee´s individual needs in order to make a difference.

New actions to control participants' compliance and the lifestyle changes achieved should be studied.

References

1. Arena R, Arnett DK, Terry PE, Li S, Isaac F, Mosca L, Braun L, Roach WH Jr, Pate RR, Sanchez E, Carnethon M, Whitsel LP. The role of worksite health screening: a policy statement from the American Heart Association. Circulation. 2014 Aug 19;130(8):719-34. doi: 10.1161/CIR.0000000000000079. Epub 2014 Jul 10. PMID: 25013030.

2. Kwak L, Hagströmer M, Jensen I, Karlsson ML, Alipour A, Elinder LS. Promoting physical activity and healthy dietary behavior: the role of the occupational health services: a scoping review. J Occup Environ Med. 2014 Jan;56(1):35-46. doi: 10.1097/JOM.0000000000000012. PMID: 24351888.

3. Rodríguez Artalejo F, Banegas JR. La contribución de la medicina del trabajo a la medicina cardiovascular [Contribution of occupational medicine to cardiovascular medicine]. Rev Esp Cardiol. 2006 May;59(5):409-13. Spanish. PMID: 16750136.

4. Carnethon M, Whitsel LP, Franklin BA, Kris-Etherton P, Milani R, Pratt CA, Wagner GR; American Heart Association Advocacy Coordinating Committee; Council on Epidemiology and Prevention; Council on the Kidney in Cardiovascular Disease; Council on Nutrition, Physical Activity and Metabolism. Worksite wellness programs for cardiovascular disease prevention: a policy statement from the American Heart Association. Circulation. 2009 Oct 27;120(17):1725-41. doi: 10.1161/CIRCULATIONAHA.109.192653. Epub 2009 Sep 30. PMID: 19794121.

5. OECD Employment rate (indicator). doi: 10.1787/1de68a9b-en (Accessed on 20 July 2022).

6. OECD (2022), Hours worked (indicator). doi: 10.1787/47be1c78-en (Accessed on 20 July 2022)

7. Sánchez-Chaparro MA, Román-García J, Calvo-Bonacho E, Gómez-Larios T, Fernández-Meseguer A, Sáinz-Gutiérrez JC, Cabrera-Sierra M, García-García A, Rueda-Vicente J, Gálvez-Moraleda A, González-Quintela A. Prevalencia de factores de riesgo vascular en la población laboral española [Prevalence of cardiovascular risk factors in the Spanish working population]. Rev Esp Cardiol. 2006 May;59(5):421-30. Spanish. PMID: 16750139.

8. Martínez Abadía B, Arbués ER. Prevalencia de los factores de riesgo cardiovascular en trabajadores de los sectores laborales secundario y terciario. Enferm glob Murcia. 2012;11(28):31-40. Disponible en: http://scielo.isciii.es/scielo.php?script=sci_arttext&pid=S1695-61412012000400003&lng=es. Consultado 23 Abr 2022.

Citation: Gómez-Paredes L, Aguado-Benedi MJ, Reinoso-Barbero L (2022) Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes. Arch Community Med Public Health 8(4): 120-127. DOI: https://dx.doi.org/10.17352/2455-5479.000187

9. Álvarez-Fernández C, Romero-Saldaña M, Álvarez-López C. Incidencia de cardiopatía isquémica y accidente cerebrovascular en trabajadores de una administración local del sur de España a lo largo de diez años de seguimiento. Rev Esp Salud Publica. 2020;94:e202001001.

10. Corvalán MP. Guías Chilenas sobre tratamiento del tabaquismo. Anexo1. Glosario. Rev Chil de Enfermedades Respir. 2017;33(3):252-253

11. Unger T, Borghi C, Charchar F, Khan NA, Poulter NR, Prabhakaran D, Ramirez A, Schlaich M, Stergiou GS, Tomaszewski M, Wainford RD, Williams B, Schutte AE. 2020 International Society of Hypertension global hypertension practice guidelines. J Hypertens. 2020 Jun;38(6):982-1004. doi: 10.1097/HJH.0000000000002453. PMID: 32371787.

12. Alomar Cano M, Alvarez García GM, Andrés Plumed MP. Guías de Intervención de Enfermería en Hipertensión Arterial y Riesgo Cardiovascular. Madrid. Asociación Española de Enfermería de Hipertensión y Riesgo Cardiovascular (EHRICA). 2020. Disponible en https://www.ehrica.org/wp-content/uploads/2021/10/Guia-EHRICA-2020.pdf. Consultado 1 May 2022.

13. Williams B, Mancia G, Spiering W. Guía ESC/ESH 2018 sobre el diagnóstico y tratamiento de la hipertensión arterial. Rev Esp Cardiol. 2019;72:160.e1-e78.

14. WHO Consultation on Obesity (1997: Geneva, Switzerland), World Health Organization. Division of Noncommunicable Diseases & World Health Organization. Programme of Nutrition, Family and Reproductive Health. (1998). Obesity : preventing and managing the global epidemic : report of a WHO Consultation on Obesity, Geneva, 3-5 June 1997. World Health Organization. https://apps.who.int/iris/handle/10665/63854

15. American Diabetes Association. 2. Classification and Diagnosis of Diabetes: *Standards of Medical Care in Diabetes-2020*. Diabetes Care. 2020 Jan;43(Suppl 1):S14-S31. doi: 10.2337/dc20-S002. PMID: 31862745.

16. Ascaso JF, Millán J, Hernández-Mijares A, Blasco M, Brea Á, Díaz Á, Mantilla T, Pedro-Botet J, Pintó X; Grupo de trabajo sobre Dislipemia Aterogénica de la SEA. Consensus document on the management of the atherogenic dyslipidaemia of the Spanish Society of Arteriosclerosis. Clin Investig Arterioscler. 2017 Mar-Apr;29(2):86-91. English, Spanish. doi: 10.1016/j.arteri.2016.11.001. Epub 2017 Feb 6. PMID: 28185675.

17. Piepoli MF, Hoes AW, Agewall S, Albus C, Brotons C, Catapano AL, Cooney MT, Corrà U, Cosyns B, Deaton C, Graham I, Hall MS, Hobbs FDR, Løchen ML, Löllgen H, Marques-Vidal P, Perk J, Prescott E, Redon J, Richter DJ, Sattar N, Smulders Y, Tiberi M, van der Worp HB, van Dis I, Verschuren WMM, Binno S; ESC Scientific Document Group. 2016 European Guidelines on cardiovascular disease prevention in clinical practice: The Sixth Joint Task Force of the European Society of Cardiology and Other Societies on Cardiovascular Disease Prevention in Clinical Practice (constituted by representatives of 10 societies and by invited experts)Developed with the special contribution of the European Association for Cardiovascular Prevention & Rehabilitation (EACPR). Eur Heart J. 2016 Aug 1;37(29):2315-2381. doi: 10.1093/eurheartj/ehw106. Epub 2016 May 23. PMID: 27222591; PMCID: PMC4986030.

18. Ryu H, Jung J, Moon J. Health promotion program for office workers with SEM based on the WHO's healthy workplace framework. Health Promot Int. 2020 Dec 1;35(6):1369-1382. doi: 10.1093/heapro/daaa007. PMID: 32068840.

19. He FJ, Li J, Macgregor GA. Effect of longer term modest salt reduction on blood pressure: Cochrane systematic review and meta-analysis of randomised trials. BMJ. 2013 Apr 3;346:f1325. doi: 10.1136/bmj.f1325. PMID: 23558162.

20. Engbers LH, van Poppel MN, van Mechelen W. Modest effects of a controlled worksite environmental intervention on cardiovascular risk in office workers. Prev Med. 2007 Apr;44(4):356-62. doi: 10.1016/j.ypmed.2006.11.005. Epub 2006 Dec 21. PMID: 17187852.

21. Groeneveld IF, Proper KI, van der Beek AJ, van Mechelen W. Sustained body weight reduction by an individual-based lifestyle intervention for workers in the construction industry at risk for cardiovascular disease: results of a randomized controlled trial. Prev Med. 2010 Sep-Oct;51(3-4):240-6. doi: 10.1016/j.ypmed.2010.07.021. Epub 2010 Aug 6. PMID: 20692282.

22. Scapellato ML, Comiati V, Buja A, Buttignol G, Valentini R, Burati V, La Serra L, Maccà I, Mason P, Scopa P, Volpin A, Trevisan A, Spinella P. Combined Before-and-After Workplace Intervention to Promote Healthy Lifestyles in Healthcare Workers (STI-VI Study): Short-Term Assessment. Int J Environ Res Public Health. 2018 Sep 19;15(9):2053. doi: 10.3390/ijerph15092053. PMID: 30235849; PMCID: PMC6164287.

Citation: Gómez-Paredes L, Aguado-Benedi MJ, Reinoso-Barbero L (2022) Evaluation of a nonrandomized workplace health promotion program in a Spanish multinational company and its effects on cardiovascular risk factors and weight-related outcomes. Arch Community Med Public Health 8(4): 120-127. DOI: https://dx.doi.org/10.17352/2455-5479.000187