

Effectiveness of a workplace intervention reducing psychosocial stressors at work on blood pressure and hypertension

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ABSTRACT

Objectives To assess the effectiveness of a workplace intervention reducing psychosocial stressors at work in lowering blood pressure and hypertension prevalence.

Methods The study design was a quasi-experimental pre–post study with an intervention group and a control group. Post-intervention measurements were collected 6 and 36 months after the midpoint of the intervention. Participants were all white-collar workers employed in three public organisations. At baseline, the intervention and the control groups were composed of 1088 and 1068 workers, respectively. The intervention was designed to reduce psychosocial stressors at work by implementing organisational changes. Adjusted changes in ambulatory blood pressure and hypertension prevalence were examined.

Results Blood pressure and hypertension significantly decreased in the intervention group while no change was observed in the control group. The differential decrease in systolic blood pressure between the intervention and the control group was 2.0 mm Hg (95% CI: –3.0 to –1.0). The prevalence of hypertension decreased in the intervention group, when compared with the control group (prevalence ratio: 0.85 (95% CI: 0.74 to 0.98)).

Conclusions Findings suggest that psychosocial stressors at work are relevant targets for the primary prevention of hypertension. At the population level, systolic blood pressure reductions such as those observed in the present study could prevent a significant number of premature deaths and disabling strokes.

INTRODUCTION

Cardiovascular diseases (CVDs) are major causes of illness, disability and death worldwide.¹ High blood pressure (BP) is a major CVD risk factor.² It accounts for about 54% of all strokes and 47% of all ischaemic heart disease (IHD) events globally.³ According to the recently lowered threshold published in the 2017 American College of Cardiology/American Heart Association Guideline, nearly half of the working US population aged 45–54 years would be hypertensive.⁴

In order to address this burden of epidemic proportion, a population-based approach is needed to complement more traditional individual-based approaches of hypertension prevention and management.⁵ The population-based approach relies on primary preventive actions that aim to reduce the prevalence of BP risk factors and to downwardly

Key messages

What is already known about this subject?

► Prospective epidemiological studies have documented the adverse effect of psychosocial stressors at work on high blood pressure and hypertension while evidence from intervention studies is lacking.

What are the new findings?

► The study showed the effectiveness of an organisational-level workplace intervention reducing psychosocial stressors at work in lowering blood pressure (–2.0 mm Hg, 95% CI: –3.0 to –1.0) and hypertension prevalence (prevalence ratio: 0.85, 95% CI: 0.74 to 0.98), 36 months after the intervention.
► This effect was assessed, for the first time, using a sizeable sample of workers (N>2000), a quasi-experimental design with a control group and ambulatory blood pressure measurements.

How might this impact on policy or clinical practice in the foreseeable future?

► Findings suggest that psychosocial stressors at work are relevant targets for the primary prevention of hypertension.
► At the population level, systolic blood pressure reductions such as those observed in the present study could prevent a significant number of strokes and premature deaths.

shift the entire distribution of BP. Even modest decreases in BP means can have a meaningful impact on CVD risk. For instance, at the population level, a 2 mm Hg lowering in mean systolic BP could result in approximately 10% lower stroke mortality and 7% lower mortality from IHDs or other vascular causes in middle-aged adults.⁶ Population-based interventions targeting modifiable BP risk factors have been successful. For example, a UK initiative to reduce salt consumption successfully resulted in a 15% decrease in dietary salt intake from 2003 to 2011.^{7,8} In parallel, a reduction in systolic (3 mm Hg) and diastolic (1.44 mm Hg) BP means occurred during that time.⁸ Population-based approaches targeting modifiable BP risk factors thus appear to be a promising preventive strategy to achieve population-wide reduction in BP levels.

Psychosocial stressors at work are modifiable BP^{9 10} and CVD^{11–14} risk factors for which primary prevention is possible and promising. Between 20% and 25% of men and women from industrialised countries are exposed to these risk factors.¹⁵ Among exposed workers, BP increases ranging around 2–11 mm Hg have been observed in epidemiological studies of high methodological quality (prospective design and ambulatory BP (ABP) monitoring).⁹ Reducing these frequent and modifiable risk factors could thus have the potential to improve public health by shifting the populational distribution of BP. Evidence showed that it is possible to reduce psychosocial stressors at work through organisational-level interventions.^{16 17} However, little is known on the effectiveness of such interventions in lowering BP levels and hypertension prevalence.^{18–21}

The aim of the present study was to assess the effectiveness of an organisational-level workplace intervention reducing psychosocial stressors at work in lowering ABP and hypertension prevalence. The intervention was conducted in a sizeable sample of white-collar workers (N=1088), was based on two validated theoretical models of psychosocial work factors,^{22 23} and followed a rigorous intervention framework and process.²⁴

METHODS

Study design

The study was conducted in Quebec City, Canada. A quasi-experimental before–after design with a control group was used. Pre-intervention measurements were collected between 2000 and 2004. The intervention period took place between 2001 and 2005, ranging from 17 to 24 months, depending on the department (mean=21 months). Post-intervention measurements were collected 6 and 36 months after the midpoint of the intervention. A dynamic cohort design was retained, as a priori planned (per protocol). This approach is recommended for public health interventions conducted among dynamic populations, such as workplaces.²⁵

Study population

The intervention group was composed of all white-collar workers employed by a large public organisation that delivers insurance services to the population. Their jobs covered the full range of white-collar positions, including senior and middle managers (5%), professionals (38%), and technicians and office workers (57%). The organisation was composed of 12 departments of which 9 were targeted by the intervention based on the a priori risk evaluation (described below). All workers currently employed in one of these nine departments were invited to participate in pre-intervention and post-intervention measures. A total of 1165 workers (81.0% of eligible workers) participated in the pre-intervention measure, 1472 (86.3%) participated in the 6-month post-intervention measure and 1347 (85.2%) participated in the 36-month post-intervention measure. At each time, participants who did not consent to wear the BP monitor (n=253), those with less than 5 hours or less than 20 BP measurements (n=25) and those working less than 21 hours per week (n=13) were excluded. After further exclusion for missing information on covariables, the final sample in the intervention group was composed of 1088 workers at baseline, 1344 workers at the 6-month and 1249 workers at the 36-month follow-ups, respectively.

The control group was composed of workers employed in two other public organisations also delivering insurance services to the population and of workers from the three departments of the intervention organisation for which no intervention was

planned or implemented. The control group was not asked to engage in changes and was not assisted in this process. Nevertheless, as expected in any organisation, changes did occur over time, as part human resources activities due, for example, to the acquisition of new work tools or to structural reorganisation. These changes were systematically recorded.²⁶ A total of 1181 workers (80.7% of eligible workers) participated in the pre-intervention measure, 1422 (86.3%) participated in the 6-month post-intervention measure and 1279 (85.4%) participated in the 36-month post-intervention measure. Participants who did not consent to wear the BP monitor (n=291), those with less than 5 hours or less than 20 BP measurements (n=37) and those working less than 21 hours per week (n=20) were excluded. After further exclusion for missing information on covariables, the final sample in the control group was composed of 1068 workers at baseline, 1283 workers at the 6-month and 1163 workers at the 36-month follow-ups, respectively.

Workplace intervention

Four psychosocial stressors at work were targeted by the intervention: high psychological demands (PD), low decision latitude (DL), low social support (SS) and low reward. These factors are encompassed in two well-defined and internationally recognised theoretical models, namely the Karasek demand–control–support (DCS) model²² and the Siegrist effort–reward imbalance (ERI) model.²³ The DCS model postulates that workers experiencing simultaneously high PD, low DL and low SS are more likely to develop stress-related health problems. The ERI model proposes that workers are in a state of detrimental imbalance when workers are exposed to high efforts and low reward and thus more susceptible to health problems.

The intervention was defined as all organisational changes that aimed to reduce these psychosocial stressors at work. Any organisational change introduced with the explicit goal (or the clear consequence) of reducing one or more stressors was considered to be part of the intervention. The changes were mainly implemented at the department level and adapted to each department's priorities and context. The intervention therefore had multiple components. This was required to address a variety of forms and aspects of psychosocial stressors experienced in real work situations. In addition, previous studies in workplaces have shown that multiple-component interventions tend to produce more beneficial effects than single-component interventions.¹⁷

We have previously described the general framework of the workplace intervention,²⁷ which was based on a theory-based intervention framework and process.²⁴ This framework includes three phases aiming to answer complementary questions through corresponding quantitative and qualitative methods (figure 1).

The first phase consisted of a prior risk assessment conducted to identify departments at higher risk within the organisation and priorities for intervention within these departments. It consisted of an assessment of the prevalence of each psychosocial stressor at work, in each department. Their prevalence was compared with those of two external reference populations and with those of the organisation's other workers.²⁷ If a stressor was more prevalent in a department than in one of the reference populations, it was identified as a priority for intervention. These intervention priorities were presented to managers in written reports. Focus groups with workers were conducted. The goal of these focus groups was to identify, from the worker's point of view, organisational changes that would address the intervention priorities.^{27 28} These changes were also presented in written reports to the managers as suggestions for implementation.

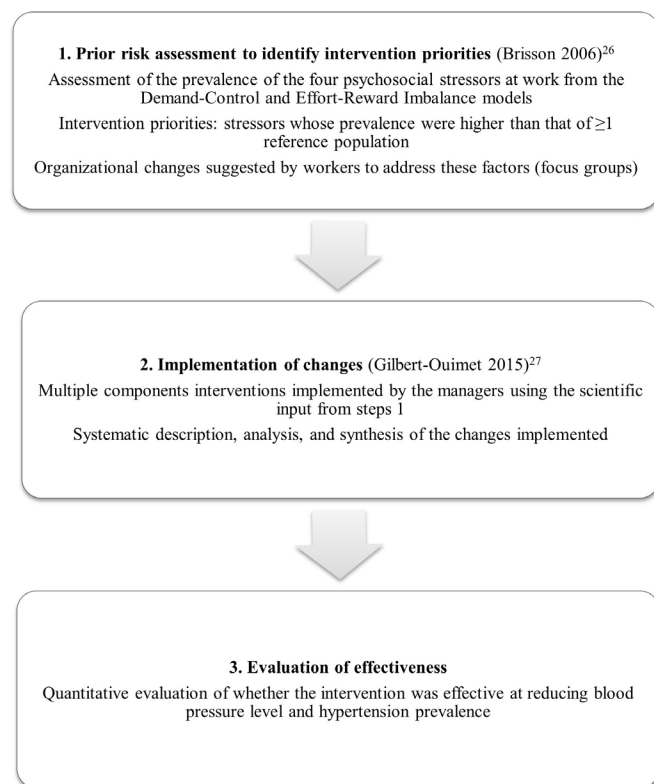


Figure 1 Intervention framework and process.

The second phase was the implementation of changes. The organisational changes were chosen and implemented by the managers. Changes were systematically recorded through logbooks, focus groups with workers, and follow-up meetings with managers and union representatives. The most frequently reported changes are presented in table 1. In total, 87.1% of the employees of the intervention group declared that they were exposed to at least one of these changes (table 1). A more thorough description of the content of the intervention has been previously published.²⁶ To summarise, (1) changes were consistent with intervention priorities and covered all four

psychosocial stressors at work, (2) changes targeting the workload (PD component) were introduced only in the intervention group, (3) SS and reward were the most often targeted stressors. Furthermore, major changes were identified by key informants. These changes: (1) reached a large percentage of employees in the department and (2) brought about a genuine transformation in the work environment from the key informants of the organisation's point of view. The intervention group implemented four times more major changes as compared with the control group.²⁶ Most changes in the control group were organisation-wide and were therefore not fitted to each unit's priorities. Online supplemental table 1 presents all major organisational changes and the psychosocial stressor(s) targeted by each change. Examples of major changes were: slowing down the implementation of a large project to prevent increased workload (high PD), implementing the flexible workhour schedule (low DL), and carrying out individual meetings between managers and employees to discuss day-to-day challenges (low supervisor SS and low reward). Most major changes were implemented in two departments or more and reached between 25.6% and 100% of the employees of the intervention group (online supplemental table 1).

The third and last phase of the intervention consisted of evaluating whether the intervention was effective at reducing the prevalence of psychosocial stressors at work, BP level and hypertension prevalence. We have previously described the effectiveness of the intervention in reducing the prevalence of psychosocial stressors at work.²⁹ During the 36-month follow-up, the prevalence of three out of the four stressors significantly decreased: high PD, low coworker SS and low reward.²⁹

Data collection and variables

Employees were contacted by phone and informed about the study. Appointments were made with those who agreed to participate. All participants signed a consent form describing the study and were free to withdraw at any time. Each of them received a personal health report after the data collection.

Blood pressure

ABP was assessed at the workplace by the Spacelabs 90207 oscillometric devices. This device was validated by the Association

Table 1 Most frequently reported changes, percentage of employees exposed and targeted psychosocial stressors at work

Organisational changes (source: self-administered questionnaire completed by all employees)	% of employees exposed	Targeted psychosocial stressors at work (source: researchers)				
		PD	DL	SS-C	SS-S	R
1. Change in processes (ways of doing things) or tools that concern the workload	49.3	X				
2. Increasing workforce	26.7	X				
3. Filling vacancies/workforce planning (illness, retirement)	20.6	X				
4. Employee consultation or other means of participating in decisions	36.6		X			X
5. Team meetings to express difficulties and identify solutions	38.9		X	X	X	
6. Work-life balance practices (flexible scheduling, compensatory time off instead of paid overtime, accumulation of time off, etc)	20.6		X			
7. Technical and professional support (training, coaching, mentoring)	18.4		X	X	X	
8. Social activities (employee lunches, happy hour, celebration)	29.3			X	X	
9. Change in the availability or approachability of the immediate supervisor	31.9				X	
10. Follow-up meetings with immediate supervisor	33.8				X	
11. Informal office tours by managers	30.1				X	
12. Personnel appraisal with recognition intent	39.7					X
13. Verbal or other emphasis of the employee's contribution	41.4					X
Being exposed to at least one change	87.1	62.3	62.6	55	70	65.9

DL, decision latitude; PD, psychological demands; R, reward; SS-C, social support from colleagues; SS-S, social support from supervisors.

for the Advancement of Medical Instrumentation and the British Hypertension Society.³⁰ In the present study, participants must have been measured at least 20 times, which is in accordance with more stringent criteria recently recommended.³¹ The first three measures were taken in the presence of staff and were then excluded from the analysis. ABP was defined as the mean of all subsequent readings taken every 15 min, during regular working hours (from 08:00 to 16:00). The device was placed on the non-dominant arm if the two arms differed in BP by less than 10 mm Hg. Otherwise, it was placed on the arm with the higher BP. Hypertension was defined as ABP $\geq 135/85$ mm Hg or being treated for hypertension.

Covariates

Several covariates were considered and measured at each time. Smoking status was defined as the daily consumption of at least one cigarette per day. Body weight and height were measured to calculate body mass index (kg/m^2). Alcohol intake was measured using the following three categories, related to weekly intake frequency during the past 12 months: less than one drink per week, one to five drinks per week, and six and more drinks per week. Weekly leisure physical activity frequency ($<1/\text{week}/\geq 1/\text{week}$) was also measured. Family responsibilities were measured using a questionnaire adapted from Brisson *et al.*³² They referred to the number of children and their age along with four tasks capturing main chores related to housework and children care (meal preparation, house cleaning, taking care of the children at home, and being responsible for children care and activities outside the house). The highest tertile indicated a high level of responsibilities. Other factors considered as potential confounders were gender, age (<40 , $40\text{--}49$, ≥ 50 years old), education (less than college, college completed, university completed), household income ($<\$50\,000$, $\$50\,000\text{--}\$79\,999$, $\geq \$80\,000$) and medication for hypertension. Family history of CVD was based on the declaration by the participant of a cardiovascular event suffered by their father, mother, brother or sister before the age of 60 years. The risk factors listed above were evaluated using validated questionnaires and procedures recommended in previous Canadian population-based surveys.³³

Statistical analyses

Student's *t*-test and χ^2 analyses were used to compare baseline characteristics between the intervention and the control group. Generalised estimating equations were conducted to compare BP means and hypertension prevalence in the intervention and control groups while taking into account the potential within-subject correlation due to repeated measurements and baseline differences among groups. An independent correlation structure was assumed and robust variance estimators were used. The evolution of covariates over time was taken into account, using time-dependent covariates.

An interaction term between group and time was calculated to estimate the effect of the intervention. For ABP, changes over time were computed by subtracting the pre-intervention from the post-intervention means in each group. ABP change over time in the intervention group was then subtracted from ABP change over time in the control group. For hypertension, a ratio was calculated to compare the prevalence ratio (PR) in the intervention group at baseline and at follow-up with the corresponding PR observed in the control group. Interaction terms with gender were not statistically significant. Similar results were observed in men and women separately (online supplemental file). We conducted three sensitivity analyses: (1) excluding workers who

Table 2 Characteristics of the intervention and control groups before the intervention

	Intervention group N=1088	Control group N=1068
Age		
<40	284 (26.1)	264 (24.7)
40–49	582 (53.5)	485 (45.4)
≥ 50	222 (20.4)	319 (29.9)
Gender		
Men	418 (38.4)	471 (44.1)
Women	670 (61.6)	597 (55.9)
Education*		
High school or less	331 (30.4)	242 (22.7)
College	342 (31.4)	303 (28.4)
University	415 (38.1)	523 (49.0)
Household income (\$C)		
<50 000	319 (29.8)	275 (25.9)
50 000–79 999	389 (36.4)	372 (35.1)
$\geq 80\,000$	362 (33.8)	413 (39.0)
BMI (kg/m^2)		
<25	523 (48.4)	449 (42.2)
25–27	177 (16.4)	204 (19.2)
≥ 27	382 (35.3)	410 (38.6)
Sedentary behaviour		
No	911 (83.7)	914 (85.6)
Yes	177 (16.3)	154 (14.4)
Family history of CVD		
No	700 (66.2)	705 (68.3)
Yes	357 (33.7)	328 (31.8)
Alcohol intake (servings/week)		
<1	400 (36.8)	342 (32.0)
1–5	440 (40.4)	447 (41.8)
≥ 6	248 (22.8)	279 (26.1)
Smoking status		
No	917 (84.3)	945 (88.5)
Yes	171 (15.7)	123 (11.5)
Medication for hypertension		
No	1010 (92.8)	974 (91.2)
Yes	78 (7.2)	94 (8.8)

Presented as N (%), unless stated otherwise.

*College in the province of Quebec generally provides a 2-year pre-university or a 3-year technical school programme after termination of high school.

BMI, body mass index; CVD, cardiovascular disease.

were treated for hypertension; (2) using a longitudinal sample, where the analyses were restricted to those who participated at baseline and (3) excluding new workers who had been working in the organisation for less than 200 days (online supplemental file). SAS V.9.4 software³⁴ was used for all analyses.

RESULTS

Table 2 summarises the baseline characteristics of the intervention and control groups. There was a slightly higher proportion of women in the intervention group. Participants in the intervention group were also generally younger and had lower formal education. The prevalence of lifestyle-related risk factors was comparable in both groups. Table 3 presents changes in ABP means in the intervention and the control groups. In the intervention group, a decrease in mean systolic (-2.3 mm Hg, $p<0.05$) and diastolic (-1.2 mm Hg, $p<0.05$) ABP was observed 6

Table 3 Changes in blood pressure (BP) before and after the intervention, in the intervention and the control groups

		Systolic BP (mm Hg)			Diastolic BP (mm Hg)	
		N	Mean BP	Intragroup changes (95% CI)	Mean BP	Intragroup changes (95% CI)
Intervention group	Before (M0)	1088	126.6	Reference	81.0	Reference
	After 6 months (M1)	1344	124.3	−2.3 (−2.9 to 1.7)	79.8	−1.2 (−1.7 to 0.8)
	After 36 months (M2)	1249	124.4	−2.2 (−2.9 to 1.5)	79.4	−1.6 (−2.1 to 1.1)
Control group	Before (M0)	1068	124.5	Reference	79.5	Reference
	After 6 months (M1)	1283	124.2	−0.3 (−0.9 to 0.3)	79.2	−0.3 (−0.7 to 0.2)
	After 36 months (M2)	1163	124.3	−0.2 (−0.9 to 0.5)	78.9	−0.7 (−1.2 to 0.1)
Intervention effect*	After 6 months		−2.0 (−2.9 to −1.1)		−1.0 (−1.6 to −0.4)	
	After 36 months		−2.0 (−3.0 to −1.0)		−1.0 (−1.7 to −0.3)	

Adjusted for age, gender, education, household income, family history of CVD, smoking status, alcohol intake, sedentary behaviour, medication for hypertension, body mass index and family responsibilities.

*Intervention effect: [(M1–M0 intervention)–(M1–M0 control)] and [(M2–M0 intervention)–(M2–M0 control)] for 6 and 36 months, respectively.

CVD, cardiovascular disease.

months after the intervention, in models adjusted for all covariates. This decrease was maintained at the 36-month follow-up. In the control group, no significant change in ABP was observed at the 6-month follow-up. However, diastolic ABP slightly decreased at the 36-month follow-up (−0.7 mm Hg, $p<0.05$). The intervention effects, obtained by subtracting changes in the intervention group and changes in the control group, were −2.0 mm Hg (95% CI: −2.9 to −1.1) for systolic ABP and −1.0 mm Hg (95% CI: −1.6 to −0.4) for diastolic BP at 6 months. The intervention effect remained of similar magnitude at 36 months (−2.0 mm Hg (95% CI: −3.0 to −1.0) for systolic ABP and −1.0 mm Hg (95% CI: −1.7 to −0.3) for diastolic ABP). In the intervention group, hypertension prevalence decreased from 31.7% to 28.8%, 36 months after the intervention (figure 2). In the control group, hypertension prevalence slightly increased after 6 months (from 26.2% to 28.2%). There was a beneficial effect of the intervention on hypertension prevalence at 6 months (PR: 0.84; 95% CI: 0.74 to 0.95), which persisted at 36 months (PR: 0.85; 95% CI: 0.74 to 0.98). Analysis conducted using the longitudinal sample yielded slightly lower estimates for BP means while estimates for hypertension prevalence remained of the same magnitude. The analysis excluding new workers (<200 days) yielded similar estimates to those reported in the main results (online supplemental file).

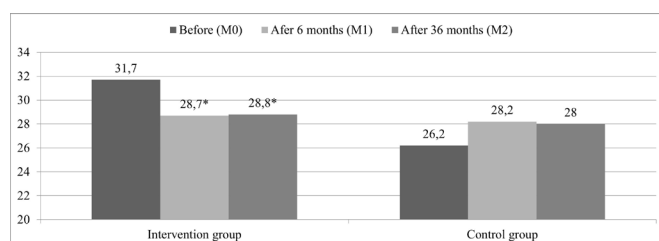


Figure 2 Changes in hypertension prevalence before and after the intervention, in the intervention and the control groups. Intervention effect after 6 months±: 0.84 (95% CI: 0.74 to 0.95), $p=0.0063$; intervention effect after 36 months±: 0.85 (95% CI: 0.74 to 0.98), $p=0.0206$.

* $P\leq 0.05$. Adjusted for age, gender, education, household income, family history of CVD, smoking status, alcohol intake, sedentary behaviours, body mass index and family responsibilities. †Intervention effect: [(M1/M0 intervention)/(M1/M0 control)] and [(M2/M0 intervention)/(M2/M0 control)] for 6 and 36 months, respectively. CVD, cardiovascular disease.

DISCUSSION

The present study showed that a large-scale workplace intervention reducing psychosocial stressors at work led to significant decreases in BP means and hypertension prevalence, when compared with a control group. BP reductions in the range of 2 mm Hg, such as those observed in the present study, are comparable with reductions observed in population-based interventions targeting other modifiable risk factors, such as salt consumption.⁸ At the population level, such reductions could prevent a significant number of premature deaths and disabling strokes.⁶

Previous studies have suggested that workplace interventions aiming to reduce psychosocial stressors at work could subsequently reduce BP.^{18 19 21} However, the current study has a number of strengths which have greatly increased available evidence supporting this effect. First, it relied on a quasi-experimental before–after design with a control group and two post-intervention measures. Findings showed that the observed effect on BP persists over 3 years and provide support for a long-lasting beneficial effect of this workplace intervention on BP. Second, a comprehensive set of CVD risk factors were adjusted for, accounting for baseline differences among groups and limiting the potential for confounding. Third, the retained modelling approach made it possible to take into account the evolution of these risk factors, further reducing the potential for confounding. Finally, the present study is the first on this topic to use ABP measurements. There is strong evidence supporting the superiority of ABP measurements over casual BP measurements.^{35 36}

The present study has some limitations. The validity of pre–post designs relies on the parallel trend assumption. That is, in the absence of the intervention, the average change in the outcome would have been the same for both the intervention and control groups. A design with several (>1) pre-intervention time points would have allowed to evaluate this assumption.³⁷ Second, a regression to the mean (RTM) effect cannot be ruled out, since baseline BP and hypertension prevalence were higher in the intervention group than in the control group. A complementary analysis was therefore conducted excluding participants in the highest quartile of baseline systolic BP. This analysis showed a beneficial effect of the intervention on systolic BP after 6 months, reducing the plausibility of RTM as an alternative explanation for the observed effect. It is also important to note that, for ethical

reasons, workers with hypertension were systematically informed about their condition and referred to their physician. This screening resulted in an increased prevalence of treated workers in both groups. However, a significant effect of comparable magnitude was observed in the analysis restricted to untreated workers (online supplemental file). Finally, the extent to which the results might be generalised can be limited, as the study population is composed of white-collar workers. However, participants held a wide variety of white-collar jobs (office workers, technicians, professionals and managers). This ensures the required exposure diversity while minimizing physical work constraints that may influence BP.

There is no 'one-size-fits-all' solution to improve the psychosocial work environment. Solutions to reduce adverse psychosocial exposures at work must be tailored to the organisation's and to the local priorities and context to have a higher chance of improving workers' health.¹⁷ In the present study, decisions concerning changes were made by the managers and were specific to each department. This intervention was therefore explicitly designed to include multiple components and to target local adverse psychosocial work factors identified as priorities. Despite the context-specific nature of workplace interventions, the implementation process was based on a reproducible theory-based framework. Moreover, the intervention targeted four well-defined psychosocial work factors, whose deleterious effects on CVD^{11 12} and high BP^{9 10} have been observed in various work settings.

Worldwide, high BP remains the leading cause of the global disease burden,³⁸ despite the undeniable effectiveness of individual-based pharmacological strategies to lower BP. Population-wide approaches, targeting whole populations, must be considered as complementary approaches that provide significant benefits on disease prevention, over and above the intensive management of high-risk individuals.³⁹ The need for additional population-level initiatives and multifactorial interventions aiming to achieve a downward shift in the distribution of BP is acknowledged.⁵ In this perspective, determining whether or not psychosocial stressors at work are effective targets to lower BP is of major public health significance. Findings from the present study support the relevance of targeting these factors in primary prevention efforts. Organisations can be supported by public health policies to reach this goal. As an example, public health policies in the province of Quebec (Canada) have integrated a voluntary standard (the Quebec Healthy Enterprise Standard) that includes practices targeting psychosocial stressors at work.⁴⁰

CONCLUSION

In the present study, BP means and hypertension prevalence significantly decreased, following a large-scale workplace intervention targeting psychosocial stressors at work. No such reductions were observed in the control group. Findings from the present study suggest that psychosocial stressors at work are relevant targets for the primary prevention of hypertension.

Contributors CB and MV were responsible for study concept and design, as well as supervising the data collection. AM supervised the cardiovascular aspect of the study. BM and DT were involved in the statistical analyses. XT, MG-O, CB and MV supervised aspects related to occupational epidemiology. All the authors participated in reviewing and drafting of the manuscript. XT and MG-O had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

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