Changes Implemented During a Workplace Psychosocial Intervention and Their Consistency With Intervention Priorities

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Objectives: To describe the changes implemented as part of a workplace psychosocial intervention. **Methods:** The intervention was conducted in a public organization employing 1630 white-collar workers. The intervention was defined as all changes implemented to reduce adverse psychosocial work factors. A logbook was held to describe the changes implemented in the intervention group and in a comparable control group ($N = 1282$). **Results:** Social support and reward were the psychosocial factors most targeted (41% to 83%). In comparison with the control group, the intervention group implemented four times more major changes and implemented changes, improving the employees' workload. **Conclusions:** Changes mainly targeted social support and reward. The intervention group implemented four times more major changes than the control group. The intervention group implemented changes targeting the workload, whereas no such changes were implemented in the control group.

The effect of adverse psychosocial work factors on the development of stress-related health problems has previously been documented.[1–5] A number of intervention studies aimed at improving these factors and consequent health outcomes have likewise been published.[6] Nevertheless, a thorough analysis of the intervention content has often been lacking.[7]

Two major theoretical models are widely used to assess the impact of psychosocial work factors on physical and mental health: the "job demand–control–support" model defined by Karasek, Theorell, and Johnson[1] and the "effort–reward imbalance" model defined by Siegrist.[8] These models identify four adverse psychosocial work factors: high psychological demands, low decision latitude, low social support, and low reward. Previous studies provided support for the impact of these adverse psychosocial work factors on the development of cardiovascular diseases,[4,9–13] of mental health problems,[5,14,15] and of musculoskeletal disorders.[16] Organizational interventions aiming to decrease exposure to any of these work factors have largely been recommended to prevent these negative health outcomes.[17–19] Nevertheless, previous organizational-level interventions have yielded inconsistent findings so far.[20,21] Because they include multiple components and take place in complex social structures,[22] it has been suggested that organizational interventions require elaborate frameworks to pinpoint what seems to work, when, and for whom.[23,24]

A three-phase theory-based framework was proposed by Goldenhar and colleagues[25] to conduct rigorous organizational intervention research. This framework includes an *implementation* phase that systematically documents how an intervention is carried out. This phase comprises a thorough description of the changes implemented to (1) understand how intervention priorities established at the start of the process may be translated by workplace actors into organizational changes and (2) enlighten an intervention success or failure at improving final outcomes.[25,26] The changes implemented as part of an intervention may be regarded as intermediate outcomes because they precede intervention effects. The measurement of intermediate outcomes is recommended to strengthen the internal validity and the understanding of intervention effects.[25–27] Despite this recommendation, a thorough description of the changes implemented as part of an intervention is often lacking. As pointed out in a recent review of studies on the health effects of workplace interventions at the organizational level,[28] many studies referred to implementation, but reporting was generally poor and anecdotal in form. Indeed, previous intervention studies on psychosocial work environment provided limited description of the changes implemented using qualitative methods such as logbooks, "action plans," or lists of planned activities.[29–36] This study will *systematically* document the extent to which the intervention was delivered. This will be done by (1) evaluating whether changes implemented as part of psychosocial work intervention were consistent with problems identified a priori and (2) comparing the changes implemented as part of the intervention with the changes observed in a control group.

In this study, a qualitative report of the intervention content was particularly important because (1) the intervention had multiple components, (2) several work departments were involved, and (3) intervention priorities were translated into organizational changes by managers, instead of researchers, and were specific to each department.

This article has three goals: (1) to determine whether the changes implemented in each department were consistent with the intervention priorities identified a priori; (2) to describe the changes implemented as part of a workplace intervention, in terms of the psychosocial work factors targeted by each change; (3) to compare the intervention group and the control group in terms of implemented changes.

METHODS

A collaboration was established between our research team and the intervention group organization whose high management wanted to improve employees' mental health, by acting on the psychosocial work environment. Researchers provided a diagnosis

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(described below), and management was responsible to identify and implement changes according to priorities identified through the a priori evaluation. Union's input was requested and obtained, for example by the creation of bipartite work organization committees, which held regular meeting to discuss the nature and implementation process of the organizational changes. Employees also contributed to the diagnosis and suggested changes through focus groups.

Study Population: Intervention and Control Group

The intervention was thus conducted in a large public organization that delivers insurance services to the population. At baseline, 1659 white-collar workers were employed, including senior and middle managers, professionals, technicians, and office workers. A total of 1330 workers (86%) participated to this study. The organization was composed of 12 departments at similar hierarchical levels. In the first phase of the study, called "prior risk evaluation,"[37] the prevalence of adverse psychosocial work factors was found to be higher than in reference populations in 9 of the 12 departments. Those nine departments were thus targeted by the intervention ($N = 1165$ workers).

The study population also included a control group, where measurements of the psychosocial work environment and health indicators were also made, but which was not asked to engage in changes and not assisted in this process. It was composed of white-collar workers from two other public organizations that deliver insurance services to the population. At baseline, these two organizations employed respectively 742 and 540 workers, of which 598 (80.6%) and 418 (77.4%) participated in this current study. In those organizations, there was no intervention aimed at reducing adverse psychosocial work factors. Nevertheless, as expected in any organization, changes did occur over time, due for example to the acquisition of new work tools or to structural reorganization. Chi-square analyses showed that baseline demographic and socioeconomic characteristics were similar for workers in the intervention group and in the control group. Indeed, both groups were composed of a majority of women (61.6% and 57%, respectively). The mean age of the participants was also comparable between groups (43.6 and 44.8 years, respectively). In addition, the participants in both groups were generally well-educated with a university degree in 38.3% and 48.6%, respectively. Participants were also comparable according to their job titles (the intervention group: 30% office workers, 27% technicians, 37% professionals, and 6% managers; the control group: 30% office workers, 25% technicians, 40% professionals, and 5% managers). Before the intervention, the prevalence of low decision latitude (58.4% and 59.1%, respectively), low coworker support (54.6% and 52.8%), and supervisor support (51.6% and 54.7%), as well as low reward (56.4 and 58.2%), was comparable in both groups. Nevertheless, in the intervention group, there was a higher proportion of workers exposed to high psychological demands (51.8% and 37.1%), job strain (24.3% and 15.7%), and effort–reward imbalance (31.4% and 21.8%).

Definition of the Intervention

All organizational changes introduced in the workplace with the explicit goal or the plausible consequence of improving employees' situation with regard to one of the four adverse psychosocial work factors were considered to be part of the intervention. Decisions concerning the changes were made by the managers and were specific to each department. Implementation of the intervention was thus the responsibility of the organization and not that of the researchers.

Identification of Intervention Priorities

The first phase of the study, the development phase aimed at identifying intervention priorities (ie, highly prevalent adverse psychosocial work factors at the department level).[37] The researchers provided assistance by performing a quantitative "prior risk evaluation," which consisted in an assessment of the prevalence of adverse psychosocial factors in each department and its comparison with reference populations. Employees completed a self-administered questionnaire with validated scales measuring the psychosocial factors.[38] Data collection took place on-site during working hours. The prevalence of adverse psychosocial factors in each department was compared with that of the rest of the organization and of two other reference populations.* In each department, psychosocial factors whose prevalence was greater than that observed in at least one of the reference populations were identified as intervention priorities.[37] These results were presented to the managerial team of each department through written reports and oral presentations. Measurement of the psychosocial factors and characteristics of the references populations are detailed elsewhere.[37]

In addition to the quantitative assessment of psychosocial work factors, focus groups with employees were also conducted by two members of the research team. Their main goal was to establish five organizational changes, targeting the adverse psychosocial factors identified as intervention priorities.[39–40] Those changes were then presented in a written report to the managers as suggestions for implementation.

Intervention Period

The intervention period took place between 2001 and 2005, ranging from 17 to 24 months, depending on the department (mean = 21 months).

Identification of the Changes and of the Psychosocial Work Factors Targeted: Intervention Logbooks

As there is no standardized way to record changes in this type of multiple-component intervention, there was a need to define both what to record and how. As to "how," in both groups, a logbook was held (see supplemental digital content, Appendix 1, http://links.lww.com/JOM/A166). As to "what," in the intervention group, two levels of changes targeting the psychosocial work factors were recorded: "all" changes, and "major" changes, as given below. In the control group, such changes were also recorded. Descriptions of these types of changes are provided below.

In the intervention group, the head manager of each department was invited to keep a record, in the logbook, of all changes implemented to improve or with the plausible consequence of improving the four psychosocial work factors. Therefore, the logbook aimed to describe each change implemented, groups of employees potentially covered, and targeted psychosocial work factors. A member of the research team met each manager to emphasize the importance of the task and to provide detailed explanations on how to complete the logbook. Definitions of the psychosocial factors and examples of changes targeting each one were provided at that time and were included in the logbook guidelines. To complete the logbook, head managers in four departments (departments 3, 4, 6, and 8A) relied on line managers to identify the changes carried out in their department. In the other departments, head managers used administrative reports of changes, which were also provided to the researchers as complementary information to the changes listed in the logbook. Managers involved in logbook completion were referred to as registrars. Details of the logbooks provided are as follow: some registrars provided a common logbook for their respective departments (departments 1 and 2, and departments 7 and 9) and one department provided two logbooks (departments 8A and 8B).

*The first reference population was made up of 11,485 workers who constituted a representative sample of Quebec workers. The second reference population was composed of 5879 white-collar workers employed in 19 public institutions that participated in a cardiovascular health follow-up study conducted by our team in 2001 in Quebec.[29]

In the control group, a logbook was also completed in a similar fashion, as to control for changes that would have been implemented even if no intervention was carried out. The only difference with the intervention group consisted in asking registrars of the control group to record only "changes carried out in their department to improve one or more psychosocial work factors *in an important manner*." Thereby, registrars were asked to omit changes that were punctual and less likely to improve psychosocial work factors significantly (eg, giving a coffee and a donut once). Thus, fewer changes were reported in the control group than in the intervention group where *all* changes were reported. For this reason, both groups were not compared in terms of the number of changes but rather in terms of psychosocial work factors targeted by each change.

Human resources managers also completed a logbook in the intervention and in the control groups. Those logbooks were analyzed independently because their scope of action was wider (i.e. implementation of overarching policies affecting all employees).

Major changes were identified during meetings with the registrars of both the intervention and control groups. These meetings took place after the logbook completion and aimed to identify "major changes," which from the registrars' point of view (1) reached a large percentage of employees in the department (>50%) and (2) brought about an in-depth transformation in the work environment. The first criterion was based on a public health perspective according to which the greater the number of persons targeted by an intervention, the higher the potential health benefits. The second criterion was based on the idea that some changes may be somewhat more superficial than others and/or in continuity with past practices, whereas others bring about a more in-depth transformation.

Qualitative Analysis of Changes: Potentially Improved Psychosocial Work Factors

A qualitative analysis had to be conducted in relation to the first objective of the study describing the changes implemented in terms of the psychosocial work environment variables targeted. Thus, for each reported change, the psychosocial work factors that were potentially improved were identified using two complementary methods to be compared, as no previous study had provided guidelines and as a way of evaluation the robustness of the analysis. The first method required the registrars to identify, by themselves, "all" psychosocial factors they perceived as potentially improved by each change. Thus, any single change could be associated with more than one factor. This classification was discussed during a meeting between a member of the research team and the logbook registrar and reviewed as needed. For major changes, the psychosocial work factors potentially improved were also identified by the registrars.

Second, the researchers classified the changes according to the "one main" psychosocial factor potentially improved. This supplementary classification had two goals: (1) to circumscribe the analysis to one main psychosocial work factor and (2) to partially overcome potential misclassification resulting from the registrars' coding (eg, as illustrated in Table 1, the department 8b registrar systematically coded all changes as improving all psychosocial work factors). The researcher's classification has been performed in two steps. In a first step, two members of the research team (VC, IL) independently coded all logbook changes into 29 categories, providing a description of the intervention content (see supplemental digital content, Appendix 2, http://links.lww.com/JOM/A167). Inter-rater reliability ranged from 74% to 95% agreement. After discussion, 100% agreement was obtained. The second step aimed to assign "one main" psychosocial work factors potentially improved to each of these 29 categories (see supplemental digital content, Appendix 2, http://links.lww.com/JOM/A167). This classification was performed independently by two researchers (MGO, GBG). The inter-rater agreement was 93%. After discussion, 100% agreement was obtained.

In each department, the consistency between psychosocial work factors potentially improved and intervention priorities (study objective 2) was judged satisfactory if an important proportion of the changes implemented more than 30% aimed at improving these priorities.

RESULTS

In the intervention group, logbooks were completed in eight of the nine targeted departments. These logbooks covered 88% of the employees of the nine departments. The number of changes recorded within the logbooks ranged from 38 to 150 (mean of 71.3) for a number of employees ranging from 48 to 469.

In the control group, logbooks were completed in all targeted departments of both organizations. In the first organization, the number of changes recorded ranged from 2 to 10 (mean of 5). In the second organization, the number of changes ranged from 9 to 14 (mean of 11). The number of employees by department ranged from 110 to 366 in these two organizations.

Intervention Content by Department and Consistency With the Intervention Priorities Identified in the Prior Risk Evaluation

Table 1 presents, for each department, the adverse psychosocial work factors that were identified as intervention priorities in the prior risk evaluation and the proportion of changes implemented to improve each of these factors according to the registrars. The proportions add up to more than 100% because one single change was often described as potentially improving more than one psychosocial factor. In each department, the psychosocial work factor the most acted on was either low social support or low reward. The factor the most acted on was targeted by 41% to 83% of the changes implemented. Decision latitude came after these variables, in terms of the percentage of changes that targets it, with 17% to 56% of changes that are potentially acting on this factor. Psychological demand was generally the factor that arrives last, with 5% to 47% of changes. Similar trends were observed in the logbook held by the human resources department. Department 8B was excluded from this specific analysis because the registrar indicated that all changes ($N = 79$) systematically aimed at improving all four psychosocial factors.

In almost all departments (six of the seven logbooks), a relatively high proportion of changes (35% to 75%) were implemented to improve psychosocial work factors identified as intervention priorities in the prior risk evaluation (Table 1). Nevertheless, in one department (department 4), high psychological demands were identified as intervention priority, but were the aim of only 13% changes. All departments also implemented changes aimed at improving psychosocial factors that had not been identified as intervention priorities (5% to 83%). This occurred most often in department 4 where most changes aimed at improving social support 60% of changes and reward 83% of changes, which had not been identified as intervention priorities.

Major Changes in the Intervention and Control Groups

Major changes introduced in the intervention group are presented in Table 2 along with the psychosocial work factors potentially improved, from the registrars' point of view. For example, in departments 1, 2, and 3, managers started to hold regular meetings with employees. According to the registrars, this major change aimed to improve social support from supervisors in providing employees with the opportunity to discuss difficulties they might be encountering. At the same time, these meetings were intended to provide supervisors with an opportunity to show recognition (ie, reward) to employees by underlining their accomplishments. Table 2 shows a good level of consistency between the major changes implemented and the psychosocial factors identified as intervention priorities. Indeed, in each

TABLE 1. Adverse Psychosocial Work Factors, Intervention Priorities, and Frequency of Changes Implemented in the Intervention Group

Adverse Psychosocial Work Factors	Intervention Priorities* (Source: Prior Risk Evaluation)	Implemented Changes† (Source: Logbooks) % (*N*)
Departments 1 and 2 (48 changes)		
High psychological demands	Yes	35 (17)
Low decision latitude	No	17 (8)
High psychological demands and low decision latitude‡	Yes	35 (17) and 17 (8)§
Low social support	Yes	60 (29)
Low reward	Yes	54 (26)
Effort–reward imbalance‡	Yes	35 (17) and 54 (26)§
Department 3 (150 changes)		
High psychological demands	No	47 (71)
Low decision latitude	Yes	36 (54)
Low social support	Yes	75 (113)
Low reward	Yes	42 (63)
Effort–reward imbalance‡	Yes	47 (71) and 42 (63)§
Department 4 (40 changes)		
High psychological demands	Yes	13 (5)
Low decision latitude	No	18 (7)
Low social support	No	60 (24)
Low reward	No	83 (33)
Department 5 (no logbook was completed)		
High psychological demands	No	No logbook
Low decision latitude	No	
Low social support	No	
Low reward	No	
Department 6 (72 changes)		
High psychological demands	No	15 (11)
Low decision latitude	Yes	56 (40)
High psychological demands and low decision latitude‡	Yes	15 (11) and 56 (40)§
Low social support	No	22 (16)
Low reward	Yes	69 (50)
Departments 7 and 9 (81 changes)		
High psychological demands	No	5 (4)
Low decision latitude	No	20 (16)
Low social support	Yes	41 (33)
Low reward	Yes	41 (33)
Department 8A (38 changes)		
High psychological demands	No	26 (10)
Low decision latitude	Yes	53 (20)
Low social support	Yes	71 (27)
Low reward	Yes	63 (24)
Effort–reward imbalance‡	Yes	26 (10) and 63 (24)§
Department 8B (79 changes)		
High psychological demands	No	100 (79)
Low decision latitude	Yes	100 (79)
Low social support	Yes	100 (79)
Low reward	No	100 (79)
Effort–reward imbalance‡	Yes	100 (79) and 100 (79)§

*Adverse psychosocial work factors whose prevalence was found to be greater than that observed in at least one of the reference populations were identified as intervention priorities in the prior risk evaluation.

†Some changes might have been implemented to improve more than one psychosocial work factor.

‡The combination of psychosocial work factors is only presented when it was identified as an intervention priority.

§These results constitute a repetition of the data presented for the psychosocial work factors taken separately.

TABLE 2. Major Changes, Potentially Improved Psychosocial Work Factors, and Intervention Priorities in the Intervention Group

Major Changes* (Source: Logbook and Meeting Between Registrars and Researchers)	Potentially Improved Psychosocial Work Factor(s) (Source: Meeting Between Registrars and Researchers)	Intervention Priorities† (Source: Prior Risk Evaluation)
Departments 1 and 2‡		
1. Regular meetings and internal communication from the new VP to employees	Reward	Yes
	Social support from supervisors	Yes
2. Organizational restructuring aimed at reducing workload in specific services	Social support from colleagues	Yes
	Psychological demands (workload)	Yes
3. Reducing workload	Psychological demands (workload)	Yes
4. New reward practices	Reward	Yes
5. New health concerns in human resources decisions (eg, flexible work hours)	Decision latitude	No
Department 3‡		
1. Improving management skills: listening, openness, fairness, team spirit, and concern for managers' and employees' health	Social support from supervisors	Yes
2. Reward activities from supervisors	Social support from supervisors	Yes
	Reward	Yes
3. Group meetings with managers	Social support from supervisors	Yes
	Decision latitude	Yes
4. Individual meetings with managers/employees	Social support from supervisors	Yes
	Reward	Yes
Department 4‡		
1. Organizational and physical restructuring	Psychological demands	Yes
	Social support from supervisors	No
	Social support from colleagues	No
Department 6‡		
1. Establishment of a quality insurance system	Psychological demands (manager's workload)	No
	Decision latitude	Yes
	Reward	Yes
Departments 7 and 9‡		
1. Nomination or confirmation of numerous management positions	Social support from supervisors	Yes
	Psychological demands	No
2. Improvement of management practices: consult, orient, and coach	Social support from supervisors	Yes
	Psychological demands	No
	Decision latitude	No
3. Social and reward activities	Social support from supervisors	Yes
	Reward	Yes
4. Participatory approach aiming at improving employees' job satisfaction	Decision latitude	No
5. Skills recognition and career development	Reward	Yes
	Decision latitude	No
Department 8A‡		
1. Service offer update	Psychological demands	No
2. Career and skills development	Decision latitude	Yes
	Reward	Yes
3. Team meetings	Decision latitude	Yes
4. Annual meetings and social activities	Social support from supervisors and colleagues	Yes
	Reward	Yes
Department 8B‡,§		
1. Organizational restructuring and definition of management orientations	Multiple factors (potentially all)	–
2. Changes to work organization	Psychological demands	No
3. Career and skills development (eg, coaching)	Decision latitude	Yes
4. Participative management	Decision latitude	Yes
5. Messages to highlight good work and accomplishments	Reward	No

*Registrars' descriptions of major changes may have been modified to emphasize the specific activities that were implemented instead of the objectives pursued. Because of space constraints, the table summarizes the activities related to each major change in less detail than provided by registrars. We observed great variability in how registrars interpreted the concept of major changes. We therefore considered it inappropriate to take into account the number of major changes.

†Adverse psychosocial work factors whose prevalence was found to be greater than that observed in at least one of the reference populations were identified as intervention priorities in the prior risk evaluation.

‡All psychosocial factors identified as intervention priorities were targeted.

§Analysis of the department 8B logbook is incomplete because of uncompleted steps in the qualitative analysis (the registrar was not available to meet with the research team to describe the changes implemented). Thus, the classification conducted by the research team could not be discussed with the registrar. The registrar's decision to indicate that each activity reported in the logbook targeted all adverse psychosocial work factors also considerably limits the analysis.

VP, vice president.

department, all the psychosocial factors identified as intervention priorities are targeted by at least one of the major changes reported (except for social support in department 8B). It is worth noting that even if psychological demand is not the factor the most acted on if we look at *all* changes, in eight of the nine logbooks, at least one *major* change aimed to improve this work environment factor. Moreover, two departments implemented one major change aimed at improving the workload itself, a specific dimension of psychological demands.

Major changes introduced in the control group are presented in Table 3 along with the psychosocial work factors potentially improved, according to the registrar. Compared with the intervention group, fewer major changes were reported in the control group. Most major changes (four of the six) aimed at improving supervisors' social support and reward to employees. Psychological demands were targeted by two major changes, which mainly aimed to make tasks easier using new technologies, instead of directly reducing the workload. Decision latitude was targeted by only one major change.

Implemented Changes and Main Improved Psychosocial Work Factor

With the intent of reducing the "noise" eventually associated with the attribution of more than one psychosocial factor as target of each change, and to compare modes of identifying changes' targets, Table 4 presents the changes implemented in the intervention group according to the "one main" psychosocial work factor potentially improved by each change on the basis of the researchers' classification.

TABLE 3. Major Changes and Potentially Improved Psychosocial Work Factors in the Control Group

Major Changes* (Source: Logbook and Meeting Between Registrars and Researchers)	Potentially Improved Psychosocial Work Factor(s) (Source: Meeting Between Registrars and Researchers)
Organization 1	
Departments 11	
1. New computer software to make it easier to take notes while speaking on the phone with customers	Psychological demands
2. Team meetings	Social support from supervisors
Department 12	
None†	–
Department 13	
1. Reward activities	Reward
Organization 2	
Department 14	
1. Improving the insurance quality program	Social support from supervisors
Department 15	
1. Reward activities	Reward
Department 16	
1. Procedures restructuring (increasing the importance of technologies and networking)	Psychological demands Decision latitude

*Descriptions of major changes may differ from those of the registrars to emphasize not only the objectives but also the actual activities that were implemented. Because of space constraints, activities for each major change are described in the table in less detail than in the logbooks. Because of differences in how the registrars interpreted the concept of major changes, it was considered inappropriate to take into account the number of major changes.

†During a meeting, the registrar indicated that no major changes had been introduced.

In five of the nine departments, this analysis indicates that decision latitude was the psychosocial factor most acted on, followed by social support or multiple factors. After grouping departments together (total column), decision latitude and social support still remained the most targeted psychosocial factors. Psychosocial demand was the factor least targeted, as for previous modes of attributing psychosocial targets to each change. The same trends can be observed for changes reported by the human resources department. Every department acted on all psychosocial factors identified as intervention priorities, except for department 4, which did not act on psychological demands. Every department also acted on psychosocial factors that had not been identified as intervention priorities.

Table 5 presents the changes implemented in the control group according to the "one main" potentially improved psychosocial factor. Decision latitude and multiple factors were the factors most acted on. There were no changes targeting the workload component of psychological demands. Nevertheless, differences between the two organizations forming the control group are noticeable. Indeed, compared with the second organization of the control groups, the first one (1) implemented less than half the number of changes ($N = 14$ vs $N = 32$) for a similar number of workers, (2) did not act on social support, and (3) had only one department targeting psychological demands or decision latitude.

In addition, as expected, differences were observed between the intervention and control groups (study goal 3): (1) changes targeting the workload were introduced only in the intervention group, and (2) there were four times more major changes implemented in the intervention group than in the control group ($N = 25$ vs $N = 6$), for similar numbers of employees.

DISCUSSION

In this study, a structured method was used to describe, analyze, and synthesize the content of a multiple-component intervention. A logbook was used to record the changes implemented during the intervention period. Among these, major changes were identified.

The first study goal was to describe the changes implemented as part of the intervention, in terms of the psychosocial environment variables targeted. In each department, changes and major changes were classified according to the psychosocial work factors potentially improved using two complementary perspectives. For each change, the first classification according to registrars allowed to identify *all* psychosocial factors potentially improved. The second classification according to researchers emphasized *the one main* psychosocial factor potentially improved.

In the intervention group, the psychosocial work factors most acted on were social support, reward, and decision latitude. A possible explanation for these choices is that these factors, which moderate the deleterious effects of psychological demands,[41] may be easier to implement. It is also worth mentioning that the intervention group was involved in a program promoting reward at the time of the study. This program could contribute to explain the management interest to act upon this factor. In addition, changes to improve decision latitude may be seen as a way for management to increase functional flexibility, which is in keeping with current work organization tendencies. Changes in work organization and workload may be perceived as more complex and more costly to implement, especially in a context of work intensification.[42] Indeed, psychological demand was generally the factor least acted on. It is worth noting, however, that in most departments (eight of the nine) at least one major change was aimed at improving this factor. Also, compared with the control group, only the intervention group acted on the workload component of the psychological demands (Tables 4 and 5).

Psychosocial work factors most acted on were partly different depending on the coding method used to classify changes. Indeed, when *all* psychosocial factors potentially improved were identified by registrars, social support and reward were the most acted on.

TABLE 4. Changes Implemented in the Intervention Group According to the Main Potentially Improved Psychosocial Work Factor (Source: Researchers)

	Departments 1 and 2	Department 3	Department 4	Department 6	Departments 7 and 9	Department 8A	Department 8B	Total of All Departments	Human Resources
Workers at follow-up, *N*	469	120	359	80	201	48	127	1404	60
Changes* implemented in each department, % (*N*)									
Psychological demands	12.5 (6)†	0.7 (1)	0 (0)†	13.9 (10)	17.3 (14)	5.3 (2)	8.9 (7)	7.9 (40)	6.3 (2)
Workload	12.5 (6)	0 (0)	0 (0)	4.2 (3)	17.3 (14)	5.3 (2)	3.8 (3)	5.5 (28)	6.3 (2)
Other	0 (0)	0.7 (1)	0 (0)	9.7 (7)	0 (0)	0 (0)	5.1 (4)	2.4 (12)	0 (0)
Decision latitude	31.3 (15)	48.7 (73)†	15.0 (6)	50.0 (36)†	25.9 (21)	55.3 (21)†	35.4 (28)†	39.4 (200)	25.0 (8)
Skill discretion	8.3 (4)	30.7 (46)	10.0 (4)	29.2 (21)	13.6 (11)	31.6 (12)	27.8 (22)	23.6 (120)	15.6 (5)
Decision authority	22.9 (11)	18.0 (27)	5.0 (2)	20.8 (15)	12.3 (10)	23.7 (9)	7.6 (6)	15.7 (80)	9.4 (3)
Social support	14.6 (7)†	20.7 (31)†	40.0 (16)	8.3 (6)	33.3 (27)†	10.5 (4)†	2.5 (2)†	18.3 (93)	3.1 (1)
From supervisors	14.6 (7)	14.0 (21)	22.5 (9)	4.2 (3)	13.6 (11)	5.3 (2)	0 (0)	10.4 (53)	0
From colleagues	0 (0)	6.7 (10)	17.5 (7)	4.2 (3)	19.8 (16)	5.3 (2)	2.5 (2)	7.9 (40)	3.1 (1)
Reward	16.7 (8)†	10.7 (16)†	22.5 (9)	19.4 (14)†	14.8 (12)†	5.3 (2)†	3.8 (3)†	13 (64)	9.4 (3)
Respect and esteem	12.5 (6)	8.7 (13)	22.5 (9)	13.9 (10)	11.1 (9)	2.6 (1)	1.3 (1)	9.6 (49)	3.1 (1)
Income	2.1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Occupational status control	2.1 (1)	2.0 (3)	0 (0)	5.6 (4)	3.7 (3)	2.6 (1)	2.5 (2)	2.8 (14)	6.3 (2)
Multiple variables	20.8 (10)	16.0 (24)	20.0 (8)	8.3 (6)	8.6 (7)	23.7 (9)	51.9 (41)	20.7 (105)	34.4 (11)
Other	4.2 (2)	3.3 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.01 (7)	25.0 (8)
Total, *N*	48	150	40	72	81	38	79	508	32

*Some changes might have been implemented to improve more than one psychosocial work factor.
†Psychosocial work factor targeted for intervention.

TABLE 5. Changes Implemented in the Control Group According to the Main Potentially Improved Psychosocial Work Factor (Source: Researchers)

	Organization 1				Organization 2				
	Department 11	Department 12	Department 13	Total 11–13	Department 14	Department 15	Department 16	Total 14–16	Human Resources
Workers at follow-up, *N*	142	110	366	618	145	204	202	551	50
Activities* implemented in each department, % (*N*)									
Psychological demands	30.0 (3)	0 (0)	0 (0)	21.4 (3)	0 (0)	11.1 (1)	0 (0)	3.1 (1)	4.69 (3)
Workload	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Other	30.0 (3)	0 (0)	0 (0)	21.4 (3)	0 (0)	11.1 (1)	0 (0)	3.1 (1)	4.7 (3)
Decision latitude	40.0 (4)	0 (0)	0 (0)	28.6 (4)	35.7 (5)	0 (0)	55.6 (5)	31.3 (10)	45.3 (29)
Skill discretion	30.0 (3)	0 (0)	0 (0)	21.4 (3)	14.3 (2)	0 (0)	33.3 (3)	15.6 (5)	15.6 (10)
Decision authority	10.0 (1)	0 (0)	0 (0)	7.1 (1)	21.4 (3)	0 (0)	22.2 (2)	15.6 (5)	14.1 (9)
Social support	0 (0)	0 (0)	0 (0)	0 (0)	21.4 (3)	22.2 (2)	0 (0)	15.6 (5)	7.8 (5)
From supervisors	0 (0)	0 (0)	0 (0)	0 (0)	21.4 (3)	22.2 (2)	0 (0)	15.6 (5)	3.1 (2)
From colleagues	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	4.7 (3)
Reward	0 (0)	0 (0)	0 (0)	0 (0)	14.3 (2)	11.1 (1)	22.2 (2)	15.6 (5)	6.3 (4)
Respect and esteem	0 (0)	0 (0)	50.0 (1)	7.1 (1)	7.2 (1)	11.1 (1)	11.1 (1)	9.4 (3)	3.1 (2)
Income	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Occupational status control	0 (0)	0 (0)	0 (0)	0 (0)	7.2 (1)	0 (0)	11.1 (1)	6.3 (2)	3.1 (2)
Multiple variables	30.0 (3)	100.0 (2)	0 (0)	35.7 (5)	28.6 (4)	44.4 (4)	22.2 (2)	31.3 (10)	20.3 (13)
Other	0 (0)	0 (0)	50.0 (1)	7.1 (1)	0 (0)	11.1 (1)	0 (0)	3.1 (1)	15.6 (10)
Total, *N*	10	2	2	14	14	9	9	32	64

*Some changes might have been implemented to improve more than one psychosocial work factor.

Nevertheless, when researchers emphasized *the one main* psychosocial factor potentially improved, social support and decision latitude were the most acted on. The principal explanation is probably the fact that, in the analysis of *all* psychosocial factors potentially improved, 55% ($N = 128$) of the changes targeting reward also targeted other psychosocial work factors. When these changes were coded according to *the one main* psychosocial factor potentially improved, those related to the "meeting on day-to-day matters" ($N = 49$) and "establishment of workgroups" ($N = 14$) were then identified as improving *mainly* decision latitude. Therefore, although our two classification methods led to partly different findings, we believe in their complementarity and robustness.

The second study goal was to determine whether the changes implemented in each department were consistent with the intervention priorities identified a priori. In general, a relatively high proportion of changes (35% to 75%) were implemented to improve the psychosocial work factors identified a priori as intervention priorities. There was one department, however, where most of the changes implemented were aimed at improving psychosocial factors that were not identified as intervention priorities, with the exception of one major change targeting psychological demands.

Finally, the third study goal was to compare the changes implemented in the intervention and control groups, in terms of psychosocial work factors targeted. There were four times fewer major changes implemented in the control group than in the intervention group ($N = 6$ vs $N = 25$), for similar numbers of employees. Although the number of major changes reported in the intervention group may have been influenced by the presence of the researchers, by the expectations of upper management, and by social desirability, the fact that there were four times more major changes reported in the intervention group than in the control group suggests a true difference in implemented changes.

The logbook analysis allowed to describe the intervention in terms of different variables, namely groups involved, targeted psychosocial work factors, correspondence between targeted psychosocial work factors and intervention priorities, and differences between the intervention and control groups in terms of the psychosocial factors targeted. As already mentioned, various methods were used in previous job stress intervention studies to record the changes implemented.[29–36] In those previous studies, organizational changes were developed and implemented by various workplace actors. Even if this study involved workers and their representatives via focus groups[39] and joint union–management committees, the logbooks only presented the point of view of the employer's representatives; this limitation is further discussed below.

To our knowledge, only one previous job stress intervention study explicitly analyzed changes implemented in terms of adverse psychosocial work factors that were potentially improved.[36] Moreover, previous studies omitted to compare the nature of changes implemented in the intervention versus control groups.

Strengths

The structured method presented here has several strengths. First, the systematic documentation of changes implemented to improve psychosocial work factors allowed to consider the multiple components of the intervention. Second, this documentation plus the two data reduction steps (ie, identifying the psychosocial factors targeted for each change and classifying changes into major changes) provided a detailed, all-encompassing description of the intervention content. Documenting the changes implemented in the process of an intervention may be regarded as intermediate outcomes, for which the measurement is recommended to strengthen the internal validity of intervention studies.[27] Third, the use of complementary methods of classifying changes according to (1) *all* psychosocial work factors potentially improved and (2) the "one main" potentially improved factor, which led to consistent findings. Fourth, our method showed good interrater reliability. Its validity is supported by the involvement of two different researchers in its development and by the registrars' validation of the changes classification. Fifth, a comparison of the changes implemented in the intervention group versus the control group highlighted differences between these groups. Sixth, this method provides insights into how to interpret the effectiveness results. Seventh, the fact that the intervention targeted four well-defined, theory-based adverse psychosocial work factors, whose deleterious health effects have been observed in various work settings, favors its generalization. Although solutions to improve psychosocial work factors may be specific to each workplace, the process used to identify intervention priorities (ie, the quantitative prior risk evaluation and the methods used to monitor the intervention content) may be exportable. In addition, the use of such a theory-based framework increases the possibilities of observing beneficial effects because it provides a greater understanding of how the intervention might affect the target population.[25]

Limitations

One limitation is the use of frequencies, the number of changes to describe the intervention. Some changes that are easier to implement, such as offering donuts and coffee on employees' birthdays, are likely to be more frequent than large-scale changes, such as work redesign or replacement of employees on sick leave, that are more difficult to implement but result in more lasting and beneficial effects. Nevertheless, results on the basis of major changes compensated for this limitation and allowed an evaluation of changes on the basis of their potential impact. As such, the approach provides two complementary perspectives on the changes implemented that allow for a comparison of the departments' strategies. It is important to note, however, that the impact of major changes may depend on contextual factors. For example, the impact of "regular meetings and internal communication from the new VP to employees" or "individual meetings with managers/employees" on reward and social support from supervisors (Table 2) may depend on the content of the communication, actual presence of reward and support. Also, the impact of "organizational and physical restructuring" on psychological demands (Table 2) may depend on the effectiveness of the reorganization in facilitating and clarifying operations.

Another limitation lies in the inherent variability, between departments, in logbook note-taking. There could be differences in how registrars conceptualized adverse psychosocial work factors and in their comprehension of what types of changes to include and the level of detail to provide. Because the main premise is that the content of the logbook reflects each department's strategy for improving adverse psychosocial work factors, it was judged more appropriate to leave it to the departments to determine what constitutes a meaningful intervention. To counter such variability, managers and registrars were carefully trained on the meaning of each psychosocial work factor. In addition, researchers realized a supplementary coding of the changes to partially overcome misclassification resulting from registrars' coding. It is our belief that these two coding methods were complementary.

Moreover, during the course of the project, joint union–management committees were created in four departments targeted by the intervention.[38] These local committees helped the researchers gain a better understanding of the context of the intervention and complemented the information recorded in the logbook. Unfortunately, such helpful information was not available in the other departments.

In addition, the intervention group's logbooks might have been positively biased in two ways. First, departments were asked to report changes implemented to improve psychosocial work factors. In future research, logbooks should also include a section on changes potentially having a negative impact. Second, it must also be pointed out that the logbooks constituted the management's point

of view on the changes implemented. Overreporting social desirability or underreporting recall bias could explain the large variation observed between the departments. Major changes were also identified by managers. Employees' perception of the intervention would have provided complementary information of the actual impact of changes. To partly circumvent this limitation, workers were asked, in the questionnaire completed at the last follow-up, to indicate whether they had experienced changes with respect to 14 work environment categories during the previous 2 to 3 years. A study from our research team compares this information with that reported in the logbooks.[27] This report suggests that although employees perceived some of the changes implemented, their perception of the changes did not fully correspond to that of the managers.

It is also possible that the control group registrars were less motivated to record changes because they were not involved in the intervention process. This limitation would lead to an underestimation of the changes implemented in the control group. The human resources department logbook held a record of organization-wide changes, which could partly circumvent this limitation.

In conclusion, the psychosocial work factors identified a priori as intervention priorities were all covered by at least one major change in each department (except department 8B). Changes mainly targeted social support and reward. The intervention group implemented four times more major changes than the control group. The intervention group implemented changes targeting the workload, whereas no such changes were implemented in the control group.

These results show that it is possible to systematically document the changes implemented as part of a multiple-component psychosocial intervention and to demonstrate the extent to which priorities identified a priori are translated into organizational changes.[25] The results also suggest the extent to which there were differences between the intervention and control groups in terms of the number and types of changes implemented. Such documentation of intermediate outcomes contributes to enlighten potential intervention effects on related health indicators.

Human Participant Protection

This study was approved by the ethical review board of the Centre hospitalier *affilié* universitaire de Québec. The participants provided a written informed consent and were free to withdraw at any time.

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