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Effects of a participatory organisational, core work task focused workplace intervention on employees' primary healthcare consultations: secondary analysis of a cluster RCT

Elisabeth Framke ¹, Ole Henning Sørensen ¹, Line R M Pedersen,¹ Jacob Pedersen ¹, Ida E H Madsen ¹, Jakob B Bjorner ^{1,2,3}, Reiner Rugulies ^{1,2,4}

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¹National Research Centre for the Working Environment, Copenhagen, Denmark

²Department of Public Health, University of Copenhagen, Copenhagen, Denmark

³QualityMetric, Johnston, RI USA

⁴Department of Psychology, University of Copenhagen, Copenhagen, Denmark

Correspondence to

Dr Elisabeth Framke, National Research Centre for the Working Environment, Copenhagen 2100, Denmark; elf@nfa.dk

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ABSTRACT

Objectives We aimed to examine whether a participatory organisational workplace intervention focusing on core tasks at work resulted in lower primary healthcare utilisation of employees.

Methods The cluster randomised controlled trial included 78 preschools, 44 allocated to the intervention group (1745 employees) and 34 allocated to the control group (1267 employees). The intervention aimed to involve employees in improving the psychosocial work environment while focusing on core tasks at work. Using Poisson regression, we tested the rate ratios (RRs) of consultations in the intervention compared with the control group in terms of all consultations in primary healthcare and general practitioner (GP) consultations, respectively, per person-year during 31 months of follow-up. The fully adjusted model included adjustment for sex, age, job group, workplace type and size, and previous primary healthcare utilisation.

Results During the follow-up, intervention group employees had 11.0 consultations/person-year, while control group employees had 11.6 consultations/person-year (RR 0.97, 95% CI 0.92 to 1.01). Employees in the intervention group had 7.5 GP consultations/person-year, while control group employees had 8.2 GP consultations/person-year (RR 0.95, 95% CI 0.90 to 0.99). Post hoc analyses indicated that the effect of the intervention was particularly strong in employees in preschools with a moderate or high level of implementation.

Conclusions The participatory organisational workplace intervention focusing on core tasks at work among preschool employees had a small, statistically non-significant effect on overall primary healthcare utilisation and a small, statistically significant effect on GP consultations. These results suggest a beneficial effect of the participatory organisational intervention on employees' health.

Trial registration number ISRCTN16271504

OBJECTIVES

Participatory organisational workplace interventions are interventions aiming to improve working conditions while involving employees.¹ They often constitute primary and work-directed preventions to prevent or reduce exposure to stressors at work² and have the advantage of addressing the source

What this paper adds

What is already known about this subject?

- Participatory organisational workplace interventions have shown mixed results.
- There is a need for well-designed intervention studies to provide more knowledge whether workplace interventions have an effect on workers' health.

What are the new findings?

- The participatory organisational workplace intervention focusing on core tasks at work among preschool employees had a small effect on overall primary healthcare utilisation (statistically non-significant) and on general practitioners' consultations (statistically significant).
- The effects of the intervention were particularly strong in employees in preschools with a moderate or high level of implementation.

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

- These results support the interpretation that the participatory organisational intervention had a beneficial effect on employees' health.
- Other public sector preschools may benefit from using a similar approach.
- Future intervention studies should examine whether results from this study also apply to private sector preschools and other types of workplaces.

of work stressors rather than symptoms or consequences of work stressors. It has been argued that these types of interventions have more sustainable effects on employees' health than person-directed and secondary or tertiary prevention approaches.^{3,4} However, evaluations of participatory organisational workplace interventions have shown mixed results, and high-quality studies are lacking.^{5,6}

This study concerns a cluster randomised controlled trial (RCT) of a participatory organisational workplace intervention focusing on core tasks at work, the



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'Pioneer project'. The project included two key components, the participatory approach, where intervention activities are shaped in accordance with employees' needs and knowledge,^{4,7,8} and a focus on core tasks at work where the level of illegitimate tasks, that is, the combined measure of unnecessary and unreasonable work tasks, are lowered.^{9,10} Illegitimate work tasks are defined as tasks perceived by employees to be peripheral as opposed to core tasks that are perceived to be core to what an employee can be expected to do. Observational research studies have shown that higher levels of illegitimate tasks may be risk factors for employees' health and well-being.⁹ Further, we expected that focusing on conducting and improving the performance of core tasks at work would help overcoming hindrances and enhancing the implementation of the intervention.^{11,12} In this study, we examined the effects of the Pioneer intervention on employees' health as measured by the frequency of consultations in primary healthcare.

The original aim of the Pioneer project was to evaluate the effect of the intervention on employees' well-being and sickness absence. We have previously reported that the intervention had beneficial effects on self-reported psychosocial working conditions^{13,14} and on register-based short-term and long-term sickness absence.¹⁵ However, contrary to hypothesis, there was no effect on employees' self-reported well-being¹⁶ which was surprising, as self-reported well-being is closely linked to risk of sickness absence.^{17–20}

One explanation is methodological limitations in the self-reported well-being data.¹⁶ However, it is also possible that the lower sickness absence rates in the intervention group¹⁵ did not reflect a beneficial effect of the intervention on employees' health but was due to other reasons. For example, that the intervention may have led to increased social pressure on the employees to take fewer days of sickness absence.

To further examine the health effects of the intervention, we conceived the present secondary data analysis, testing the hypothesis that the Pioneer project had led to a lower risk of primary healthcare consultations in the intervention compared with the control group. We examined all consultations and consultations at general practitioners (GPs) only. Further, we conducted two preplanned supplementary analyses. First, we examined whether the intervention effect would differ when excluding employees employed at one of the workplaces for less than 6 months during the follow-up. This was motivated by the reasoning that less than 6 months might be a rather short time period for affecting outcomes. Second, we examined whether the effect of the intervention would differ when excluding employees hired after the end of the implementation period to investigate whether a possible intervention effect would depend on employees being a part of the actual implementation period. Finally, we conducted post hoc analyses repeating the main analyses stratified by degree of implementation.

METHODS

Setting

The Pioneer project (in Danish: 'Pionerprojektet') was a cluster randomised psychosocial work environment intervention study. The intervention aimed to improve the psychosocial work environment by focusing on improving core job task performance and significance. The primary endpoints were improvement in employees' well-being and reduction in risk of short-term sickness absence.^{15,16} The present study is a secondary effect evaluation, examining the intervention effect on primary healthcare consultations. The Pioneer project was conceived, funded and planned during the years 2009–2011, and implemented from 2011 to 2013 in preschools in the Children and Youth Administration in Copenhagen, Denmark.

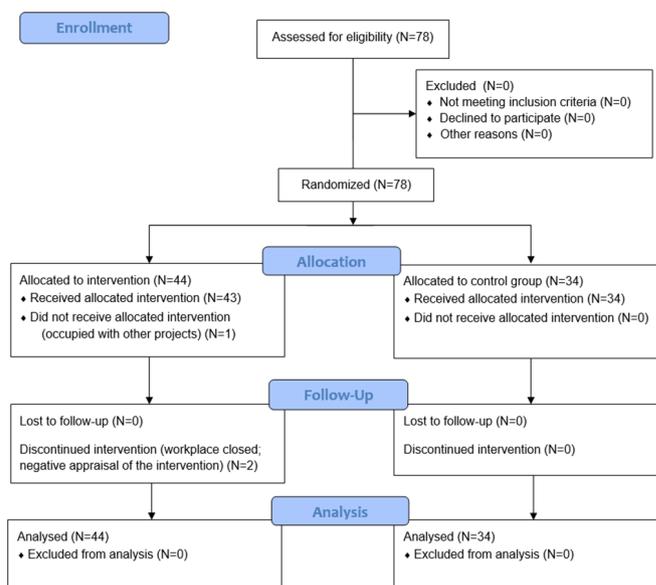


Figure 1 Consort Flow Diagram

We uploaded data from the Pioneer project to a secured drive at Statistics Denmark. Data on consultations in primary healthcare were retrieved from Statistics Denmark, using participants' civil registration number, assigned to all Danish residents. We replaced the civil registration number with an anonymised serial number and conducted all analyses with fully anonymised data.

Study design and participants

In total, 78 preschools formed the cluster RCT that was parallel with two arms (intervention and control group). The selection of workplaces is described in details elsewhere.¹⁵ Resources were available to implement the intervention at 44 workplaces, selected by a random list, computer generated by an external statistician. The remaining 34 workplaces served as the control group. Three of the 44 intervention workplaces did not complete the intervention (see figure 1 for the reasons). In accordance with the intention-to-treat principle, we kept the three drop-out workplaces (n=86 employees) and all employees in the analyses.

The study sample consisted of all 3039 employees (pedagogical leaders, nursery nurses, nursery nurse assistants and other employees), who were employed at the 78 workplaces for at least 1 month from June 2011 to December 2013: 1760 intervention group and 1279 control group employees. Of those, we could link 3012 participants to the health service register, yielding a final sample of 1745 participants in the intervention and 1267 in the control group.

The follow-up period started 1 June 2011, when participants were informed about study group allocation, and ended 31 December 2013, that is, 6 months after completion of the implementation phase. Employees hired at one of the 78 workplaces after 1 June 2011 were followed from date of hiring. Employees who left before end of study were followed until date of termination of their work contract.

The intervention

The intervention targeted the organisational level, that is, aimed to change aspects of work rather than of the individual. Examples of this type of interventions are job redesign, implementation of autonomous teams, rearranging working-resting and resting times, improving communication and increasing social support.¹²

The intervention content is described in online supplemental appendix 1. Briefly, the cluster randomisation was performed in June 2011. The intervention was introduced to steering group members (the leader and two employee representatives) and employees in September 2011. The joint involvement of leader and employees in this type of participatory intervention was assumed to increase relational resources at workplaces. Intervention activities were finalised in June 2013.

In addition to the organisational approach, the participatory approach and the core job task focus were key elements of the intervention. Participants' involvement in the development and implementation of activities tailored to the local needs of the workplaces was pivotal. Steering group members participated in seminars and workshops on how to develop and implement intervention activities while involving employees, change management training, workplace culture and how to evaluate workplace changes. Steering group members and employees received support from work environment consultants during the whole intervention period. Based on seminars and consultants' support, steering group members and employees developed and implemented workplace specific activities with a focus on improving performance of core job tasks.

Examples of workplace specific intervention activities included improving communication and professional feedback; changes in allocation of overtime, work schedules and holiday schedules; reorganisation of staff meetings to advance professional reflection; modifications to work culture; and reorganisation of physical indoor and outdoor environment.¹¹

Effect measure

The effect measures were the number of all consultations in primary healthcare per person-year and the number of consultations at GPs in primary healthcare per person-year, respectively, during the 31 months of follow-up.

Data on primary healthcare consultations were retrieved from the Danish National Health Service Register (NHSR).²¹ NHSR contains data from all health professionals (GPs, practising medical specialists, physiotherapists, dentists, psychologists, chiropractors and chiropractists) contracted with the Danish primary healthcare system. In Denmark, the GP is the first point of contact (gatekeeper) with the responsibility either to provide the adequate treatment or to refer patients to more specialised treatment.²² About 98% of the population in Denmark are assigned to a specific GP through a list system, and services are free of charge. The remaining 2% have chosen the right to consult any GP or specialist at any time, in return for paying a part of the fee. Services to individuals in both groups are registered in the NHSR.²¹ Consultations in the primary healthcare are direct contact between the citizen and the provider, that is, visit of citizen at the providers' practice or contact between citizen and provider via telephone, email or home visit. The completeness and accuracy of the NHSR is high, as all residents in Denmark are covered by the Health Insurance Service and register with their civil registration number when receiving services in the healthcare system. To identify GP consultations, we used the two-digit specialisation code in NHSR.

Since new participants were added to the study population during the follow-up, and since some participants ended their employment at the workplaces during follow-up we used for each participant a variable indicating monthly updates on employment status (employed or not employed) to determine the contribution of person-years. To make use of all data for the entire follow-up period, we divided the 31 months of follow-up from 1 June 2011 to 31 December 2013 into five time periods, each with a duration

of 6 months except from the fifth time period that had a duration of 7 months. For each participant within each of the five time periods, we counted the number of all consultations and the number of GP consultations, respectively, per person-year accounting for employment status, resulting in up to five repeated outcome measurements for each participant for each of the two outcomes. Finally, for each participant, a baseline measurement for each of the two effect measures was also calculated based on a time period of 6 months, that is, the six months preceding the intervention start (1 June 2011).

Statistical analysis

All analyses were conducted using SAS V.9.4 statistical software.

We used Poisson regression to model differences between the intervention and the control group in the number of all consultations and GP consultations, respectively, per person-year during the follow-up.

We used random effects to account for repeated measurements within each participant and for the nesting of participants within workplaces.²³ Due to overdispersion, we included a dispersion parameter in all analyses. We tested for an interaction effect between time and group (the five time periods*intervention vs control group) and found no evidence of dependence.

We calculated unadjusted rate ratios (RRs) (crude) and RR adjusted for sex and age (continuous) (model 1) and further adjusted for job group, workplace type, workplace size (continuous) and baseline levels of outcomes (model 2).

We conducted two supplementary analyses for each of the two effect measures. First, we examined whether the intervention effect would differ when excluding all employees employed at the workplaces for less than 6 months during the 31 months of follow-up. Second, we examined whether the intervention effect would differ when excluding all employees hired after the end of the implementation period, that is, after 1 June 2013.

In post hoc analyses, we repeated the main analyses stratified by degree of implementation, measured by three items from follow-up questionnaires asking participants about the extent to which (1) they had influence on intervention activities, (2) they participated in interventions activities and (3) their closest leader supported intervention activities. The implementation degree measure is described in detail elsewhere.¹⁴ We identified 27 workplaces with a medium or high implementation degree and 17 workplaces, including the three drop-out workplaces, with a low implementation degree.¹⁴

RESULTS

Baseline characteristics of participants

Table 1 shows employee and workplace characteristics in the intervention and the control group. The two groups were similar regarding age, sex distribution, job types and type of workplace, suggesting that the cluster randomisation successfully achieved comparable groups. The mean number of consultations (of any type) per person-year during the 6 months preceding the intervention was 10.4 in the intervention group (number of participants=1745, number of months=10470, number of all consultations=9066) and 11.3 in the control group (number of participants=1267, number of months=7602, number of all consultations=7131). The mean number of GP consultations per person-year during the 6 months preceding the intervention was 7.3 in the intervention group (number of GP consultations=6335) and 7.9 in the control group (number of GP consultations=5025).

Effect of the intervention on all primary healthcare consultations

Table 2 shows the results for all primary healthcare consultations. During 31 months of follow-up, the mean number of all

Table 1 Employee and workplace characteristics and levels of outcomes in the intervention and control group

	Intervention group				Control group			
	Mean	SD	%	N	Mean	SD	%	N
Employees				1745				1267
Age	36.4	12.0			37.7	12.2		
Women			80.2	1400			81.1	1028
Job groups								
Pedagogical leaders			4.4	76			4.6	58
Nursery nurses			45.8	799			45.5	576
Nursery nurse assistants			38.4	670			39.1	495
Other job groups			11.5	200			10.9	138
Workplace				44				34
Size	24.1	9.0			22.3	9.8		
Integrated			76.3	1332			78.9	1000
Day care			20.2	353			17.2	218
Kindergarten			3.4	60			3.9	49
Consultations per person-year in the 6 months preceding the intervention								
All consultations*	10.4	11.8			11.3	11.6		
GP consultations†	7.3	7.9			7.9	8.3		

*Intervention group: 9065 consultations during 10470 person-months of observations. Control group: 7133 consultations during 7602 person-months of observations.

†Intervention group: 6334 consultations during 10470 person-months of observations. Control group: 5024 consultations during 7602 person-months of observations.

GP, general practitioner.

consultations per person-year was 11.0 (SD=13.11) (participants=1745, number of months=29023, number of all consultations=26629) in the intervention group and 11.6 (SD=12.78) (participants=1267, number of months=20079, number of all consultations=19457) in the control group. Compared with the control group, the RR for all consultations in the intervention group was 0.95 (95% CI 0.90 to 1.00, $p=0.04$) in the crude model, 0.96 (95% CI 0.91 to 1.01, $p=0.09$) with adjustment for sex and age (model 1), and 0.97 (95% CI 0.92 to 1.01, $p=0.12$) with further adjustments for job group, workplace type, workplace size and baseline level of all healthcare consultations (model 2).

Effect of the intervention on GP consultations

Table 3 shows the results for GP consultations. During 31 months of follow-up, the mean number of GP consultations per person-year was 7.5 (SD=8.7) in the intervention group (participants=1745, number of months=29023, number of GP consultations=17992) and 8.2 (SD=9.1) in the control group (participants=1267, number of months=20079, number of GP consultations=13613). The RR for comparing the intervention group with the control group was 0.92 (95% CI 0.87 to 0.97, $p<0.01$) in the crude model and 0.92 (95% CI 0.88 to 0.97, $p<0.01$) when adjusting for sex and age (model 1). The RR remained statistically significant in the

fully adjusted model (model 2) that included further adjustment for job group, workplace type, workplace size and baseline level of outcome (RR 0.95, 95% CI 0.90 to 0.99, $p=0.02$).

Supplementary analyses

When repeating the fully adjusted main analysis models while excluding all employees who were employed at one of the workplaces for less than 6 months during follow-up (359 employees in the intervention and 321 employees in the control group), the RR for all consultations was 0.96 (95% CI 0.92 to 1.01, $p=0.09$), and the RR for GP consultations was 0.94 (95% CI 0.90 to 0.99, $p=0.01$). When repeating the fully adjusted model while excluding all employees who were not employed at one of the workplaces during the implementation period, but were hired at one of the workplaces after 1 June 2013 (139 employees in the intervention and 91 employees in the control group), the RR for all consultations was 0.96 (95% CI 0.92 to 1.01, $p=0.12$) and the RR for GP consultations was 0.94 (95% CI 0.90 to 0.99, $p=0.01$).

Post hoc analyses

Post hoc results are shown in online supplemental appendix 2. The fully adjusted model showed that the intervention effect was

Table 2 Rate ratios (RRs) for comparing rates of all consultations (allowing recurrent events) in the intervention group with rates in the control group during 31 months of follow-up

	Consultations per person-year (SD)	Crude		Model 1		Model 2	
		RR	95% CI	RR	95% CI	RR	95% CI
Intervention group*	11.0 (13.1)	0.95	0.90 to 1.00, $p=0.04$	0.96	0.91 to 1.01, $p=0.09$	0.97	0.92 to 1.01, $p=0.12$
Control group†	11.6 (12.8)	1	Reference	1	Reference	1	Reference

Model 1: adjusted for sex and age (continuous); model 2: further adjusted for job group (pedagogical leader, nursery nurse, nursery nurse assistant, other job group), workplace type (integrated, day care, kindergarten), workplace size (continuous) and level of all consultations during the 6 months preceding the intervention (continuous). All models accounted for repeated measurements of each of the participants and further that employees were nested within workplaces.

*26 629 consultations during 29 023 person-months of observations.

†19 457 consultations during 20 079 person-months of observations.

Table 3 Rate ratios (RRs) for comparing rates of GP consultations (allowing recurrent events) in the intervention group with rates in the control group during 31 months of follow-up

	GP consultations per person-year (SD)	Crude		Model 1		Model 2	
		RR	95% CI	RR	95% CI	RR	95% CI
Intervention group*	7.5 (8.7)	0.92	0.87 to 0.97, p≤0.01	0.92	0.88 to 0.97, p≤0.01	0.95	0.90 to 0.99, p=0.02
Control group†	8.2 (9.1)	1	Reference	1	Reference	1	Reference

Model 1: Adjusted for sex and age (continuous); model 2: further adjusted for job group (pedagogical leader, nursery nurse, nursery nurse assistant, other job group), workplace type (integrated, day care, kindergarten), workplace size (continuous) and level of GP consultations during the 6 months preceding the intervention (continuous). All models accounted for repeated measurements of each of the participants and further that employees were nested within workplaces.

*17 992 consultations during 29 023 person-months of observations.

†13 613 consultations during 20 079 person-months of observations.

GP, general practitioner.

stronger in employees in workplaces with a medium or high implementation degree (RR 0.91, 95% CI 0.87 to 0.96, $p < 0.01$ for all consultations and similarly RR 0.91, 95% CI 0.87 to 0.96, $p \leq 0.01$ for GP consultations) than in employees in workplaces with a low implementation degree (RR 1.04, 95% CI 0.99 to 1.10, $p = 0.15$ for all consultations and RR 0.98, 95% CI 0.93 to 1.04, $p = 0.58$ for GP consultations).

DISCUSSION

The participatory organisational workplace intervention focusing on core tasks at work among pre-school employees had a small, statistically non-significant effect on overall primary healthcare utilisation, and a small, statistically significant effect on consultations at the GP during 31 months of follow-up. Supplementary analyses supported the results from the main analyses. Post hoc analyses stratified by degree of implementation showed larger effects in employees in workplaces with a moderate or high degree of implementation.

This study contributes with knowledge on the occupational group of childcare work.²⁴ To our knowledge, this study is the first RCT showing that a participatory organisational workplace intervention affected employee health measured as primary healthcare utilisation. Our result is in agreement with key assumptions within the literature of participatory workplace interventions^{4 7 8} and of the role of core job tasks.^{9 10} Results from supplementary analyses suggest that the intervention effect did not depend on whether employees were hired at one of the workplaces for a shorter or longer duration and on whether employees were hired before/during or after the implementation period. Results from the supplementary analyses should, however, be interpreted with caution, since the numbers of employees excluded for the purpose of each of the two analyses were relatively small. The results from the post-hoc analyses considering implementation degree suggest that employees' influence and participation and management support were important facilitators for successful interventions.

We have previously reported that the Pioneer intervention had led to a lower risk of sickness absence in the intervention group compared with the control group.¹⁵ However, because we could not find an effect of the intervention on employees' well-being,¹⁶ it was unclear, whether the lower risk of sickness absence in the intervention group was due to an effect of the intervention on employees' health or was due to other reasons. The results of the present analyses, showing an effect of the intervention on healthcare utilisation, support the interpretation that the previously reported effect on sickness absence reflected a beneficial effect of the intervention on employees' health.

Consulting a GP is likely an indicator of poor health due to the need of medical advice or treatment. However, consulting a GP may also be an indicator of healthcare seeking behaviour and that

an individual shows an awareness of ensuring good health. Thus, it is possible that the lower number of GP consultations in the intervention group during follow-up did not indicate a beneficial effect of the intervention on employees' health but an adverse effect on employees' healthcare seeking behaviour. However, considering that the intervention focused on working conditions and well-being, we find it difficult to imagine that the intervention could have reduced employees' health awareness. If any, it is more likely that the intervention has increased health awareness. Consequently, the lower number of consultations in the intervention group likely indicates better health and not less healthcare seeking behaviour.

Control group workplaces did not receive the intervention after the study was completed. Results and experiences from the study were, however, shared with the Children and Youth Administration of the Municipality of Copenhagen, and this knowledge was used in the future occupational health and safety work in their administration.

Strengths and limitations

Strengths of the study include the RCT design with 78 workplaces, professional work environment consultants securing that all intervention workplaces received the same overall intervention and register-based intention-to-treat analyses. Further, the outcome measurement constructed based on combining information from the Danish NHR with register-based monthly updates on employment status is innovative. The outcome measure is, however, only an indirect measure for employee health, since it assesses the primary healthcare utilisation by measuring the type and number of consultations and since it does not include information on diagnosed diseases and disorders.

We cannot rule out that control group participants learnt about and adopted aspects of the intervention in their workplaces. However, due to the comprehensive intervention content and due to the 78 workplaces being located in 78 different physical locations, we find this unlikely.

As Pioneer was a two-arm trial, with an intervention group and a control group that did not receive the intervention, one might be concerned that effects in the intervention group were due to an unspecific effect of being in an intervention arm. However, as the post hoc analyses showed a stronger effect in employees in intervention group workplaces with moderate or high implementation degree and no detectable effect in employees in intervention group workplaces with a low degree of implementation, we infer that the overall effect in the main analyses was not driven by belonging to the intervention group but was driven by the specific content of the intervention.

Finally, this workplace intervention was implemented in public sector preschools. Future intervention studies may examine whether results from this study also apply to private

sector preschools and other types of workplaces since the mechanisms related to the psychosocial work environment in this intervention may affect different types of workplaces differently.

CONCLUSIONS

The participatory organisational workplace intervention focusing on core tasks at work among preschool employees had a small, statistically non-significant effect on overall primary health-care utilisation, and a small, statistically significant effect on GP consultations. These results support the interpretation that the participatory organisational intervention had a beneficial effect on employees' health.

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Contributors EF and RR formulated the hypothesis. OHS conceived and coordinated the Pioneer intervention study. OHS and EF collected the questionnaire data. EF retrieved data from Statistics Denmark. EF, LRMP, JP and RR designed the data analysis. LRMP conducted the data analysis in collaboration with JP and EF. All authors contributed to the interpretation of results. EF wrote the first draft of the manuscript, and all authors revised the manuscript critically. All authors read and approved the final version of manuscript.

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ORCID iDs

Elisabeth Framke <http://orcid.org/0000-0002-5702-3954>
 Ole Henning Sørensen <http://orcid.org/0000-0002-1782-1660>
 Jacob Pedersen <http://orcid.org/0000-0003-4429-3485>
 Ida E H Madsen <http://orcid.org/0000-0003-3635-3900>
 Jakob B Bjørner <http://orcid.org/0000-0001-7033-8224>
 Reiner Rugulies <http://orcid.org/0000-0002-7752-131X>

REFERENCES

- Semmer NK. Job stress interventions and organization of work. In: Quick JC, Tetrick LE, eds. *Occupational health psychology*. Washington, DC: American Psychological Association, 2003: 325–53.
- Kompier MAJ, Kristensen TS. Organizational work stress interventions in a theoretical, methodological and practical context. In: Dunham J, ed. *Stress in the workplace past, present and future*. London: Whurr Publishers Ltd, 2001: 164–90p.
- Murphy LR, Sauter SL. Work organization interventions: state of knowledge and future directions. *Soz Präventivmed* 2004;49:79–86.
- Nielsen K, Randall R, Holten A-L, et al. Conducting organizational-level occupational health interventions: what works? *Work Stress* 2010;24:234–59.
- Semmer NK. Job stress interventions and the organization of work. *Scand J Work Environ Health* 2006;32:515–27.
- Montano D, Hoven H, Siegrist J. Effects of organisational-level interventions at work on employees' health: a systematic review. *BMC Public Health* 2014;14:135.
- Aust B, Ducki A. Comprehensive health promotion interventions at the workplace: experiences with health circles in Germany. *J Occup Health Psychol* 2004;9:258–70.
- Bambra C, Egan M, Thomas S, et al. The psychosocial and health effects of workplace reorganisation. 2. A systematic review of task restructuring interventions. *J Epidemiol Community Health* 2007;61:1028–37.
- Semmer NK, Tschan F, Jacobshagen N, et al. Stress as offense to self: a promising approach comes of age. *Occup Health Sci* 2019;3:205–38.
- Semmer NK, Jacobshagen N, Meier LL, et al. Illegitimate tasks as a source of work stress. *Work Stress* 2015;29:32–56.
- Framke E, Sørensen OH. Implementation of a participatory organisational-level occupational health intervention - focusing on the primary task. *IJHFE* 2015;3:254–70.
- Sørensen OH. Improving the primary task: effects of implementation intensity on employee health and organizational performance. *JOEPP* 2016;3:343–59.
- Framke E, Sørensen OH, Pedersen J, et al. Can illegitimate job tasks be reduced by a participatory organizational-level workplace intervention? results of a cluster randomized controlled trial in Danish pre-schools. *Scand J Work Environ Health* 2018;44:219–23.
- Framke E, Sørensen OH, Pedersen J, et al. Effect of a participatory organizational workplace intervention on workplace social capital: post-hoc results from a cluster randomized controlled trial. *BMC Public Health* 2019;19:693.
- Framke E, Sørensen OH, Pedersen J, et al. Effect of a participatory organizational-level occupational health intervention on short-term sickness absence: a cluster randomized controlled trial. *Scand J Work Environ Health* 2016;42:192–200.
- Framke E, Sørensen OH, Pedersen J, et al. Effect of a participatory organizational-level occupational health intervention on job satisfaction, exhaustion and sleep disturbances: results of a cluster randomized controlled trial. *BMC Public Health* 2016;16:1210.
- Janssen N, Kant IJ, Swaen GMH, et al. Fatigue as a predictor of sickness absence: results from the Maastricht cohort study on fatigue at work. *Occup Environ Med* 2003;60 Suppl 1:71i–6.
- Peterson U, Bergström G, Demerouti E, et al. Burnout levels and self-rated health prospectively predict future long-term sickness absence: a study among female health professionals. *J Occup Environ Med* 2011;53:788–93.
- Thorsen SV, Rugulies R, Hjarsbech PU, et al. The predictive value of mental health for long-term sickness absence: the major depression inventory (MDI) and the mental health inventory (MHI-5) compared. *BMC Med Res Methodol* 2013;13:115.
- Pedersen J, Thorsen SV, Andersen MF, et al. Impact of depressive symptoms on worklife expectancy: a longitudinal study on Danish employees. *Occup Environ Med* 2019;76:838–44.
- Andersen JS, Olivarius NDF, Krasnik A. The Danish National health service register. *Scand J Public Health* 2011;39:34–7.
- Pedersen KM, Andersen JS, Søndergaard J. General practice and primary health care in Denmark. *J Am Board Fam Med* 2012;25 Suppl 1:S34–8.
- Johnston G, Stokes M. Repeated measures analysis with discrete data using the SAS system, 1996. Available: <https://support.sas.com/rnd/app/stat/papers/abstracts/gee.html>
- Rasmussen CDN, Sørensen OH, van der Beek AJ, et al. The effect of training for a participatory ergonomic intervention on physical exertion and musculoskeletal pain among childcare workers (the TOY project) - a wait-list cluster-randomized controlled trial. *Scand J Work Environ Health* 2020;46:429–36.