Chapter 8

The effectiveness of a prevention programme at construction worksites on work ability, health and sick leave: results from a cluster randomised controlled trial

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Under Review

Abstract

Objective: To investigate the effectiveness of a prevention programme at construction worksites on work ability, health and sick leave.

Methods: A total of 15 departments (n=297 workers) from six construction companies participated in this cluster randomized controlled trial, and were randomly allocated to the intervention group (eight departments; n=171 workers) or control group (seven departments; n=122 workers). The intervention consisted of two individual training sessions with a physical therapist to lower the physical workload, a Rest-Break tool to improve the balance between work and recovery, and two empowerment training sessions to increase influence at the worksite. Data on work ability, physical and mental health status, and musculoskeletal symptoms were collected at baseline, and at three, six and 12 months follow-up. Sick leave data were obtained from the companies.

Results: Overall, no differences in work ability (β 0.02, 95% confidence interval (CI) -0.34;0.37) and physical and mental health status (β -0.04, 95% CI -1.43;1.35 and β 0.80 95% CI -1.43;1.35, respectively) were found between the intervention and control group. The intervention showed an overall decline in musculoskeletal symptoms (ranging from odds ratio [OR] 0.68, 95% CI 0.34;1.33 to OR 0.86, 95% CI 0.47;1.57) and long-term sick leave (OR 0.44, 95% CI -0.34;0.37) among construction workers. Both reductions were not statistically significant.

Conclusion: The prevention programme seems to result in a beneficial but not statistically significant decline in the prevalence of musculoskeletal symptoms and long-term sick leave among construction workers, but showed no effects with regard to work ability, physical health and mental health.

Introduction

In the next decades, a shortage of workers is expected in the Dutch construction industry due to a delay of young workers entering the labour force.[1] In addition, many workers are expected to leave the labour force before their official retirement age.[2] The age of retirement among Dutch construction workers has been strongly influenced by collective agreements, which offer the opportunity of retiring at the age of 62, instead of the official retirement age of 65. In order to face the challenges of the expected shortages, it is considered necessary that construction workers extend their working life until their official retirement age. However, due to their physical workload, construction workers run an increased risk for sick leave[3] and disability pension[4]. Thus, retaining the labour force in the construction industry is not only a matter of rising the retirement age in the collective agreements, but also a matter of improving the ability and intention of workers to remain in the labour force.[5]

To support sustainable employability of construction workers, policies and intervention programmes focusing on work ability and health seem useful. Focusing on these factors could be beneficial as they are major contributors of sustainable employability. Previous studies showed that blue collar workers with a poor work ability were at an increased risk for early retirement[6], and poor work ability predicted long-term sick leave[3,4,6] and disability pensions[4,7]. Regarding health, a poor physical and mental health status were associated with a diminished ability to continue working until the age of 65[8], whereas studies also found an association between physical health and early retirement[9] and disability pensions[9,10].

To date, only one study for construction workers at risk for early retirement and disability pensions was found that aimed to improve work ability.[11] This six-month counselling and education programme showed no significant differences on work ability or disability pensions. The authors hypothesized that a more comprehensive intervention starting at an earlier stage in the working lives of construction workers could potentially be more effective.

Therefore, a comprehensive prevention programme was developed using the Intervention Mapping approach, meaning that theoretical information from the literature was combined with practical information from stakeholders.[12,13]

Following from this, a prevention programme was developed consisting of three components in order to improve the health and work ability of the construction workers. First, construction workers run an increased risk for musculoskeletal symptoms[14,15], lower work ability[16] and sick leave[3] because of the high physical job demands such as awkward postures and repetitive movements placed on them[17]. In order to lower physical work demands, and to prevent musculoskeletal symptoms and work ability, the first intervention component consisted of two individual visits of the physical therapist at the worksite. Second, as a consequence of the high physical work demands, older construction workers experienced more fatigue and a higher need for recovery after work.[18]. Therefore, the second intervention component, a Rest-Break tool, was introduced to improve the balance between the physical workload and need for recovery during and after work. Third, literature and focus groups showed that more job control, job satisfaction and social support from management at construction worksites might improve work ability[16] and reduce sick leave.[3] Two group empowerment training sessions were therefore organized as the third intervention component in order to achieve a cultural change at the worksites.

In a recent publication, the process of this worksite prevention programme was evaluated.[19] However, the effectiveness of the prevention programme still has to be established. Thus, the aim of the present study was to evaluate if this worksite prevention programme for construction workers could improve their work ability and health, and reduce sick leave.

Methods

Study design and population

The study was a cluster randomized controlled trial (RCT) at department level conducted at the departments of six construction companies, which were specialized in house, commercial or industrial building. All workers of these companies performing actual construction work were allowed to participate in the study. Inclusion criteria at baseline were: (i) construction workers were able to complete questionnaires written in the Dutch language, and (ii) construction workers had signed a written informed consent. No exclusion took place based on age or gender. The study protocol was approved by the Medical Ethics Committee of the VU University Medical Center (Amsterdam, The Netherlands). More details on the study design and methods have been described elsewhere.[13]

Randomisation, blinding and sample size

Cluster randomization took place at the department level within each company. In order to avoid intervention group contamination, to accommodate this worksite program, to obtain maximal cooperation of employers and employees, and to enhance participants' compliance, cluster randomization was considered the best randomization strategy for this study. Clusters were departments between 12 and 123 construction workers within each company in the Netherlands. In each company, the departments were randomly assigned to the worksite prevention programme or to the control group (i.e., no intervention). The randomization procedure was performed by a research assistant who had no prior information about the departments. Because the intervention took place at the worksite, the construction workers, their supervisors and the trainers could not be blinded to the allocation. The sample size was calculated based on the number of cases needed to identify an effect on health status. Because the outcome measure SF-12 has rarely been used in intervention studies among the general population, the SF-36 was used for the sample size calculation.[20,21] Previous studies presented effect sizes ranging from 0.58 to 0.96.[22] Because of the cluster randomization design, a certain loss of efficiency associated with cluster randomization relative to individual randomization was taken into account.[23] Therefore, an effect size of 0.40 was considered to be the lower boundary of a medium effect size.[24] This effect size can be detected with two groups of 100 (with a power of 80% and a two-tailed significance level of 5%). Taking a loss to follow-up of about 10% into account, 220 construction workers were needed at baseline.

Intervention

The intervention was developed according to the Intervention Mapping protocol[25], a six-step protocol that facilitates a stepwise process for theory- and evidence-based development of health promotion programmes.[12] The six-month prevention programme consisted of a physical component and a mental component.

The physical component comprised of two individual training sessions of approximately 30 minutes by a physical therapist and a Rest-Break tool. During the first physical therapist's training session at the worksite, a quick scan questionnaire was followed by a 15-minute observation at the workplace. Based on this, a maximum of three individual advices on how to reduce physical workload (e.g., improvements in work technique, work methods and/or rest breaks) were written down on a pocket-size card. During the second training session, which took place after four months, the physical therapist discussed the workers' experiences so far and evaluated the impact of the advice with the worker. Next, the Rest-Break tool was introduced by the physical therapist to raise awareness about the importance of reducing fatigue by taking flexible rest breaks, and to stimulate actually taking rest breaks in order to reduce fatigue. The Rest-Break tool is a flowchart and consists of four steps; (i) the expectations of the workers about their fatigue at the end of the working day; (ii) short-term advice to take mini rest breaks or an additional break of 10 minutes;, (iii) selection of the possible causes of fatigue; and (iv) long-term advice about structurally lowering fatigue. The workers were asked to fill in the tool on a weekly basis, alone or with colleagues, and to discuss the results with their supervisor.

For the mental component, the construction workers received two interactive empowerment training sessions of approximately one hour in the construction trailer at the worksite. The training sessions aimed to improve construction workers' influence at the worksite regarding; (i) taking responsibility for their own health;, (ii) discussing with colleagues the responsibility for their own behaviour (e.g., taking rest breaks, asking for assistance during physically demanding work tasks);, and (iii) improving communication with the supervisor. The first training session consisted of five steps, in which the workers created a list of topics they wanted to change during the intervention period. Finally, they signed an action plan. After four months, during a follow-up meeting, the empowerment trainer and workers discussed and reconsidered the action plan as well as the results that were achieved. More details on the development and content of the intervention have been described elsewhere.[13]

Outcome measures

The present study investigated the effectiveness of the intervention concerning work ability, health (i.e., mental and physical health status, and the occurrence of musculoskeletal symptoms), and sick leave. Other outcome measures that were assessed but not presented in this paper included the following short-term outcomes: work engagement, physical workload, need for recovery, and social support. The baseline measurement took place before randomization, and follow-up measurements were performed at three, six, and 12 months after baseline. Sick leave data were gathered from continuous registration systems of the companies after 12-month follow-up.

Work ability

Work ability was measured using the Work Ability Index (WAI), which originally consists of seven items.[26] Different studies have shown that the reliability and validity of WAI are acceptable to good.[27,28] Because subitems of the WAI could also be used as a simple indicator for assessing the status and progress of work ability[29,30], two of the seven items were assessed in the present study: current work ability (one question), and work ability in relation to physical and mental job demands (two questions). A total score of the WAI (range 2-20) was obtained by adding the weight scores of these individual items.[31]

Health

Health status was assessed using the Short-Form Health Survey (SF-12).[32,33] This measure provided two weighted scores assessing physical health status and mental health status.[34]. Different studies among general populations (respondents of 15 years and older) have shown that the reliability and validity of the SF-12 are adequate.[33,35] The mean physical and mental health status of the general population are 50, with a standard deviation of 10.[35] A higher score means a better physical or mental health. Musculoskeletal symptoms were measured using the Dutch Musculoskeletal Questionnaire (DMQ).[36,37] The workers were asked to rate the occurrence of pain or discomfort in the neck, shoulders, upper and lower back, elbows, wrists/hands, hips/thighs, knees and ankles/feet during the previous seven days using a four-point scale (never, sometimes, frequent, and prolonged). These regions were grouped into four larger body regions: back (upper and lower back), neck/shoulders, upper extremities (elbows and wrist/hands), and lower extremities (hips/thighs, knees and ankles/feet). For each of the body region, workers who answered 'frequent' or 'prolonged' on one or more of the questions were classified as having musculoskeletal symptoms, whereas the others were classified as having no musculoskeletal symptoms.

Sick leave

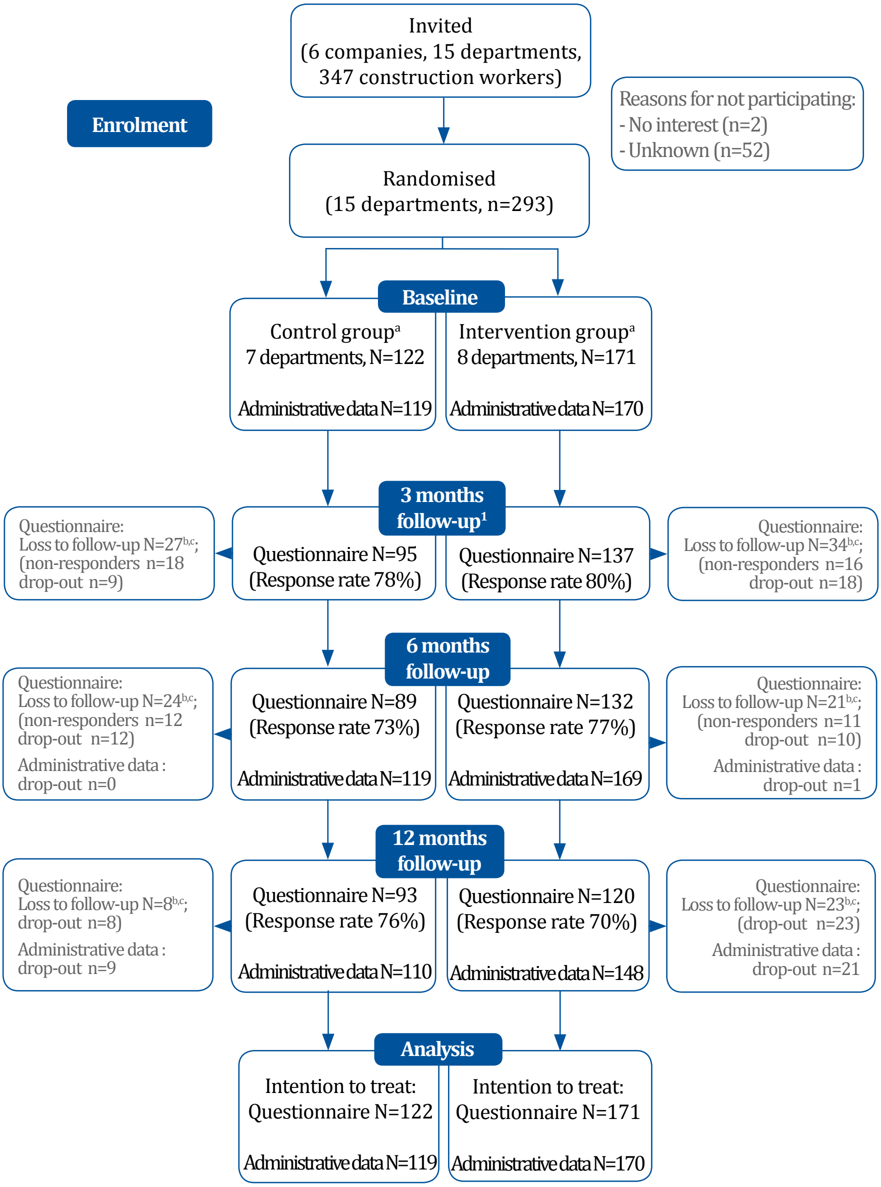
Sick leave data were obtained from databases of the six participating companies. For the analyses, sick leave data from three periods of six months were used: prior to the intervention, during the intervention, and after the intervention. Sick leave was defined as the total number of working days during the six month period of concern in which the workers were on sick leave. Because of the skewed distributions, sick leave was dichotomized into 6-month prevalence of no or short-term sick leave (0-5 days), and the 6-month prevalence of long-term sick leave (≥ 6 days).

Statistical analyses

All analyses were performed according to the intention-to-treat principle. Baseline differences between the intervention and control group were checked using the unpaired Student *t*-test (continuous variables) and Pearson's chi-square test (dichotomous variables).

To evaluate the effects of the intervention, multilevel analyses were performed for all outcome variables. Multilevel analyses were more suitable than standard regression analyses due to the dependency of observations (clustering of workers within departments, and repeated measurements within one worker) and unbalanced data (participants were not equally divided among departments).[38] Four levels were identified: time (four measurements), worker (n=293), department (n=15), and company (n=6). Linear mixed models were used to evaluate the effects on work ability, mental health and physical health, and logistic mixed models to evaluate the effects on musculoskeletal symptoms and sick leave. For each outcome variable, two analyses were performed. A crude analysis was performed to determine the differences between the intervention and control group at three, six and 12 months of follow-up, adjusted for the corresponding baseline outcome variable. Next, an adjusted analysis was performed encompassing the analysis as described earlier, but adjusted for potential confounders (i.e., age and educational level (i.e., primary school, lower and intermediate secondary education versus higher secondary education intermediate vocational and university)). Confounding was considered if > 10% change occurred in the regression coefficient. Effect modification was considered for age and educational level. A p-value <0.05 of the interaction term was used to indicate effect modification. For all analyses the intervention effect of interest was the interaction between group and measurement time. The measure of intervention effect was expressed by betas (β) and the 95% confidence interval for the linear regression analyses and odds ratios (OR) and the 95% confidence interval for the logistic regression analyses.

All nonmultilevel statistical analyses were performed using the Statistical Package of Social Sciences version 17.0 (SPSS Inc, Chicago, IL). The multilevel statistical analyses were performed using MLwiN version 2.24.



[a] Sick leave data were not available for four workers (3 in control group, and 1 in intervention group).
[b] Workers who were loss-to-follow- up due to non-responding were again included in the following measurements.
[c] Drop-out was defined as workers that ended participation in follow-up measurements.

Figure 1. Flow diagram of the participants through the phases of the trial

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Results

Participants flow

After recruitment, 37 companies expressed an interest in the intervention programme. Finally, six companies actually participated in the program, and the departments within each company were randomized to either the intervention or control group. The randomization procedure allocated eight departments to the intervention group (n=171) and seven departments to the control group (n=122; Figure 1). All construction workers in the intervention group were working in departments which were specialized in house- and utility building. Three of these departments consisted largely of carpenters whereas the other departments consisted of carpenters, bricklayers, tilers and plasterers. Regarding the control group, one department was specialized in renovation and maintenance whereas the other departments focused on house- and utility building. In two departments, the majority of workers were carpenters, whereas the professions varied in the other departments.

The baseline questionnaire was distributed to 347 construction workers, of whom 293 (84%) responded. After 12 months, 29 workers of the control group (24%) and 51 workers of the intervention group (30%) were lost-to-follow-up. These subjects were significantly lower educated. The main reasons for loss-to-follow-up were that construction workers were on sick leave, the (un)voluntary ending of the contract, and workers were discharged due to the economic crisis.

Baseline characteristics

The baseline characteristics of construction workers in the intervention and control group are presented in table 1. No significant differences regarding age, gender, profession, work ability, physical health, and the occurrence of musculoskeletal symptoms were found between the two groups. However, construction workers in the intervention group were higher educated, and showed a slightly higher mental health status compared to the construction workers in the control group.

Table 1. Baseline characteristics

	Intervention group		Control group	
	n=171		n=122	
Individual characteristics				
Age (yr) [mean (SD)]	41.8	(12.7)	44.3	(12.7)
Gender (male) (% [n])	100%	(171)	98%	(120)
Education (% [n])				
Lower education	74%	(127)*	84%	(103)*
Intermediate/higher education	26%	(44)*	15%	(18)*
Missing		(1)		(1)
Profession				
Bricklayer	23%	(39)	23%	(39)
Carpenter	68%	(116)	68%	(116)
Other	9%	(16)	9%	(16)
Outcomes				
Work Ability [mean (SD)] ¥	15.8	(2.2)	15.8	(2.2)
Health status [mean (SD)] ¥				
Physical health status	50.2	(8.2)	49.4	(8.9)
Mental health status	55.0	(5.5)*	53.4	(7.7)*
Musculoskeletal symptoms in the past 7 days				
Back [n (%)]	34	(20%)	29	(24%)
Neck/shoulder [n (%)]	23	(13%)	15	(13%)
Upper extremities [n (%)]	21	(12%)	16	(13%)
Lower extremities [n (%)]	32	(19%)	22	(19%)
Sick leave (6 months prior to the intervention)				
Mean (SD)	6.8	(15.9)	6.4	(19.8)
Median (number of sick leave days)	0		0	
Number of sick leave days in the 6 months prior to baseline [n (%)]				
- no or short-term sick leave (0-5 days; n (%)]	128	(75%)	99	(83%)
- long term sick leave (≥ 6 days; [n (%)]	42	(25%)	20	(17%)

Abbreviations: yr, years; SD, standard deviation; n, number; * $p<0.05$, indicating a significant differences between the intervention and control group at baseline; ¥ Higher score indicates a higher physical and mental health score, and a better work ability.

Work ability

Table 2 presents the means for work ability at baseline and at three, six and 12 months follow-up per study group, as well as the results of the multilevel linear regression analyses. No overall intervention effect or an effect at any of the time measurements was found.

Health

The intervention did not result in significant effects on physical health status, nor on mental health status (Table 2). Construction workers in the intervention group reported, in general, fewer symptoms of the back, neck/shoulders, upper extremities and lower extremities at three, six and 12-month follow-up compared to the construction workers in the control group (Table 3). However, neither the overall intervention effects nor the effects on any of the time measurements were statistically significant.

Sick leave

Table 3 shows the values for sick leave at baseline, and at six- and 12-month follow-up, as well as the effectiveness of the intervention on sick leave. For the overall effect and both follow-up periods, the 6-month prevalence of long-term sick leave was lower in the intervention group compared to the control group. However, this was not statistically significant.

Table 2. Intervention effects (β (95% CI)) on work ability, physical and mental health status between the intervention and control group after three, six and 12 months of follow-up

	Intervention group		Control group			
	n	mean (SD)	n	mean (SD)	β	(95% CI)‡
Work Ability[1]						
Baseline	170	15.8 (2.2)	121	15.4 (2.5)		
3-months	134	15.7 (1.8)	92	15.4 (2.2)	0.15	(-0.31 0.62)
6-months	131	15.4 (2.4)	88	15.3 (2.2)	-0.26	(-0.73 0.22)
12-months	115	15.5 (2.1)	89	15.1 (2.3)	0.15	(-0.34 0.63)
overall effect					0.02	(-0.34 0.37)
Health status[1]						
Physical health status (PCS)						
Baseline	155	50.2 (8.2)	112	49.4 (8.9)		
3-months	121	51.4 (7.1)	85	50.7 (7.5)	0.04	(-1.77 1.85)
6-months	113	50.1 (7.9)	78	50.0 (8.9)	-0.39	(-2.30 1.51)
12-months	104	49.8 (8.4)	80	49.2 (8.1)	0.28	(-1.65 2.20)
overall effect					-0.04	(-1.43 1.35)
Mental health status (PCS)						
Baseline	155	55.0 (5.5)	112	53.4 (7.7)		
3-months	121	54.6 (4.9)	85	53.2 (7.0)	0.63	(-1.07 2.33)
6-months	113	54.1 (7.2)	78	53.5 (5.8)	0.12	(-1.65 1.89)
12-months	104	54.5 (5.3)	80	52.6 (7.5)	1.71	(-0.08 3.49)
overall effect					0.80	(-0.51 2.11)

‡ Adjusted model corrected for age and education; [1] a positive βèta (β) means higher work ability, physical and mental health status in the intervention group compared to the control group.

Table 3. Intervention effects (β (95% CI)) on musculoskeletal symptoms and sick leave between the intervention and control group

	Intervention group		Control group			
	n	%	n	%	OR	(95% CI)‡
Musculoskeletal symptoms[1,2]						
Back symptoms						
Baseline	34	20 %	29	24 %		
3-months	20	14 %	16	17 %	0.82	(0.34 1.98)
6-months	18	14 %	15	17 %	0.99	(0.39 2.52)
12-months	19	16 %	20	22%	0.83	(0.35 1.98)
overall effect					0.86	(0.47 1.57)
Neck/shoulders symptoms						
Baseline	23	13 %	15	13 %		
3-months	13	9 %	17	18 %	0.39	(0.15 1.03)
6-months	15	12 %	9	10 %	1.24	(0.42 3.62)
12-months	14	12 %	13	14 %	0.72	(0.26 1.95)
overall effect					0.68	(0.34 1.33)
Symptoms in the upper extremities						
Baseline	21	12 %	16	13 %		
3-months	15	11 %	11	12 %	0.92	(0.34 2.47)
6-months	19	15 %	17	19 %	0.86	(0.35 2.13)
12-months	12	10 %	15	17 %	0.59	(0.22 1.58)
overall effect					0.79	(0.42 1.51)
Symptoms in the lower extremities						
Baseline	32	19 %	22	19 %		
3-months	14	10 %	21	22 %	0.43	(0.18 1.02)
6-months	24	19 %	20	23 %	0.89	(0.40 2.02)
12-months	22	18 %	19	21 %	0.97	(0.43 2.20)
overall effect					0.75	(0.43 1.31)
Sick leave[1]						
Baseline	170		119			
no or short-term sick leave	128	75%	99	83%		
long term sick leave (≥ 6 days)	42	25%	20	17%		
6-months	169		119		0.49	(0.17 1.20)
no or short-term sick leave	139	82%	90	76%		
long term sick leave (≥ 6 days)	30	18%	29	24%		
12-months	148		111		0.40	(0.15 1.57)
no or short-term sick leave	169	76%	78	70%		
long term sick leave (≥ 6 days)	63	24%	33	30%		
Overall effect					0.44	(0.13 1.26)

‡ Adjusted model corrected for age and education;[1] an odds ratio (OR) below 1 indicates that the prevalence of musculoskeletal symptoms and sick leave is lower in the intervention group compared to the control group;[2] Number of construction workers that were included for musculoskeletal symptoms. At baseline: intervention group n=171 and control group n=119; 3 months follow-up: intervention group n=137 and control group n=95; 6months follow-up: intervention group n=130 and control group n=89; 12 months follow-up: intervention group n=120 workers and control group n=91 workers.

Discussion

The preventive intervention in the current study was not effective in improving work ability, physical and mental health status. However, the intervention showed a decline in the prevalence of musculoskeletal symptoms and long-term sick leave among construction workers, although neither was statistically significant.

To our knowledge, this is the first study that evaluated an intervention in the construction industry that targeted both physical and psychosocial factors. These factors were described as important to prevent quitting labour force participation by the construction workers in the development of the intervention[12], and by previous researchers.[9,39] Until now, most health promotion programmes in the construction industry have focused on physical factors by improving the physical health of construction workers through a lifestyle program.[40-42], or by decreasing the physical work demands by means of ergonomic measures[43].

By performing the intervention in a cluster RCT according to corresponding quality standards[44], strengths of the present study include randomization, the control group, and the intention-to-treat principle. This standardized design reduced the effects of the interference of other initiatives at the companies during the intervention, and allows for an interpretation of the effects of this prevention program. Moreover, the randomisation at department level minimized the risk of contamination. Avoiding contamination is especially important in the construction industry, where workers are working at worksites that are temporary and mobile. Additionally, the generalizability of the study findings towards construction workers is strengthened by the fact that the current study population consisted of construction workers with different professions from all over the Netherlands and of all ages. Lastly, sick leave data were gathered from the continuous registration systems, which eliminated information or recall bias, and limited loss-to-follow up.

Some limitations deserve attention as well. First, most data were obtained from questionnaires collected at the worksite. As a result, data were self-reported inducing a potential risk of bias due to socially desirable answers. The second concern is the limited statistical power. We chose to base the power calculation on the number of cases needed to identify an effect on mental and physical health status, and not on the other outcome measures. Additionally, the loss-to-follow-up was higher than expected due to the economic crisis (i.e., workers in one company were laid-off or worked part-time) and because workers were on sick-leave during the measurements. It should be noted that, even without the economic crisis, the loss-to-follow-up of 10% in the sample size calculation appeared to be an underestimation. Third, a relative high rate of data was missing for the physical and mental health score because workers did not complete all 12 items of the questionnaire.

In accordance with previous studies on work ability[11,45,46] and mental and physical health status[47], the intervention in the current study showed no improvements on these outcomes. The lack of statistically significant results in the present study is in line with the findings of the short-term outcomes (i.e., social support, need for recovery, work engagement, and physical workload) which were also not statistically significant in favour of the intervention group (data not shown).

First, the lack of impact on work ability might be explained by the broad concept of work ability as defined in the present study, including several individual characteristics and work-related factors.[48] Even though the current intervention incorporated the physical and psychosocial factors into an intervention tailored to the construction workers[13], the dose (i.e., four training sessions and Rest-Break tool) might be insufficient to result in an effect on work ability and health. This is especially true when taking into account the moderate compliance to the intervention.[19] Of all workers in the intervention group, 61% of them followed at least three of the four training sessions and the majority of the workers did not fill in the tool on a weekly basis. Moreover, it would be of interest to know which parts of the empowerment training sessions were applied to actually change the workers' behaviour or not as this could explain the lack of effect. Unfortunately, because of the rapidly changing worksites, we were unable to detect which actions were taken as a result of the empowerment training sessions. Second, the lack of impact of the intervention on work ability and health status may be due to the fact that we studied a relatively healthy group of workers. At baseline, the mean scores of work ability, physical and mental health status of the construction workers could be considered as good.[49,50] Thus, by enrolling these workers, it was more difficult to detect an intervention effect on both primary outcomes. Moreover, physical and mental health status were measured using the SF-12, which is more commonly used among patient populations. To date, we found no other intervention studies among workers including this outcome measure. Probably, this outcome is insufficiently sensitive to change within workers.

While no effects were found for physical health status, the preventive intervention showed a slight, but not significant, decline in musculoskeletal symptoms in favour of the intervention group. Both outcomes distinctively assessed the physical status of the construction workers, but concerned different aspects (i.e., daily limitations in physical functioning versus musculoskeletal symptoms). Several intervention studies were found for workers with physically demanding jobs which implemented an integrated approach of several components (e.g., group training session, individual education, and exercises) and investigated the effects on musculoskeletal symptoms.[45.47.51] All these studies failed to show a significant intervention effect on musculoskeletal symptoms as well. While a review showed no evidence of advice and devices to prevent back pain[52] , the present study showed that individual advice about working techniques at the worksite is promising to prevent musculoskeletal symptom (i.e., neck pain and lower extremities). It could be argued that the present study provided insufficient dose regarding the training sessions of the physical therapists, which led to non-significant improvements on the outcomes. In order to achieve a behavioural change with regard to working techniques and rest breaks, and consequently a decline in the prevalence of musculoskeletal symptoms, it could be hypothesized that a longer duration or a higher frequency of the training sessions from the physical therapist are needed.

With regard to sick leave, a favourable decline on the prevalence of long-term sick leave at six- and 12- month follow-up was found in favour of the intervention group. As expected, the power of the study population was insufficient to detect a statistically significant effect on sick leave. At the start of the project, a power analysis was based on finding an effect on health status, which was our primary outcome measure. Sick leave data have a skewed distribution and a large standard deviation. As a consequence a large sample size is needed which is not often feasible in studies such as randomized controlled trials. The beneficial decline in the present study was not in accordance with other intervention programmes among blue collar workers[45.53.54], which revealed no differences on sick leave at all. It is hypothesized that the reduction in long-term sick leave could be attributed to the beneficial decline in musculoskeletal symptoms in the intervention group. Unfortunately, data from the personnel administration of the six participating companies did not include sick leave diagnoses, which hampered the interpretation of the sick leave data in the present study.

Although construction worksites are temporary and mobile, the current study illustrated the feasibility of a preventive intervention at these worksites. However, the worksite intervention consisting of individual training sessions with a physical therapist, the use of a Rest-Break tool, and two empowerment training sessions did not results in improvements on the primary outcomes (work ability, physical and mental health). Therefore, the intervention should not be implemented directly on a larger scale in the Dutch construction industry. Considering the moderate to high satisfaction of the workers towards the training sessions with the physical therapist[19] and the slight decline in the prevalence of musculoskeletal symptoms, these training sessions seems promising and ask for more research. It is recommended that further studies investigate if a longer duration or a higher frequency will lead to a significant decline in the prevalence of musculoskeletal symptoms and long-term sick leave. More research is also needed to identify factors to keep construction workers healthy in the future and to prevent early retirement. Based on these factors, it might be possible that more comprehensive actions are needed to promote work ability and health, including organizational and environmental interventions. Additionally, the intervention addressed the individual level of the construction workers. As postponing early retirement could be facilitated by increasing social support from colleagues and supportive leadership[55], future interventions should put more emphasis on a comprehensive multidisciplinary approach by actively involving supervisors and managers.

Concluding remarks

As a shortage of construction workers is expected in the next decades, effective intervention programmes are needed to promote a healthy working life and to prevent early retirement. The results of the prevention worksite programme in this study showed no effects on work ability, physical and mental health status. The effectiveness with respect to the prevalence of musculoskeletal symptoms and long-term sick leave was in favour of the intervention group, although the differences between the two groups were not statistically significant.

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