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Effect Evaluation of a Self-Management Program for Dutch Workers with a Chronic Somatic Disease: A Randomized Controlled Trial

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Abstract *Purpose* The objective of this study is to investigate the effect of a Self-Management Program for workers with a chronic disease. This program is based on the Chronic Disease Self-Management Program of Stanford University, modified for workers with a chronic somatic disease. *Methods* In a randomized controlled trial, the effectiveness of a Self-Management Program was evaluated. Participants were randomly assigned to the experimental group (n = 57) and the control group (n = 47). The experimental group received an intervention, the control group received care as usual. Primary outcome measures were self-efficacy at work and the attitude towards self-management at work. Secondary outcomes were the SF-12 health survey questionnaire, job satisfaction and intention to change job. The results were measured at baseline, after the intervention and 8 months after the intervention. *Results* The attitude towards self-management at work (enjoyment) improved after 8 months for the intervention group ($p = 0.030$). No other outcome variable differed significantly. As an interaction effect, it was found that low educated workers developed a better physical health quality (SF-12) in the intervention group compared with the control group. The attitude towards self-management at work (importance) improved in the intervention group for older and female workers and the attitude toward enjoying self-management at work improved for female workers only. *Conclusion* The results show that low educated workers, older workers and women benefit significantly more from the training than higher educated workers, younger workers and men.

Keywords Workers · Chronic disease · Self-management · Randomized controlled trial

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Introduction

Chronic diseases have a serious negative effect on workforce participation among others through low rates for job starters, high work disability and high early retirement rates. Other negative effects are a decrease in labor productivity and an increase in job turnover rates. In Europe, between 28 and 33 % of the working population has a chronic disease such as diabetes, asthma or depression, a figure similar to 39 % of the U.S. working age population [1, 2]. Prognostic studies predict for the next 20 years an increase of the prevalence of chronic diseases like asthma, chronic obstructive pulmonary disease (COPD), diabetes and rheumatoid arthritis (RA) in the working population [3].

In 2005, 44 % of the American population had at least one chronic condition and 13 % had three or more [4]. Many people with a chronic disease experience problems at the workplace which may lead to job loss or permanent

disability [5–8]. In the Netherlands only one-third of the people between 16 and 64 years old with a chronic disease has a paid job in comparison to two-thirds of the general population [9]. In addition, 30 % of the workers who have a chronic disease experience problems at the workplace related to the disease [10, 11]. Although a number of them experiences problems, most workers with a chronic disease are able to lead productive lives if supported to do so. Recently, occupational health services in the Netherlands have shifted their focus away from work disability assessments, with greater focus on improving the workability of workers through health promotion and empowerment intervention programs [12, 13]. Recent Dutch disability pension legislation has made employers and workers themselves more responsible for job retention [14].

Verbeek et al. [15] proposed to classify occupational health intervention programs into three categories: interventions oriented (1) on exposure, (2) on knowledge, attitude, skills and behavior, and (3) on disease and disability changes. In the past few decades a growing number of occupational health intervention programs are based on the second category aimed at empowerment at the workplace. The aim for workers with a chronic disease can be to support learning how to acquire psychological support, how to request for work accommodations, how to communicate better and how to encourage feelings of self-confidence or self-efficacy in dealing with work-related problems [16–19].

There is some but no ample evidence that occupational health interventions for workers with a chronic disease based on the empowerment perspective are effective [18, 20]. In this study we have constructed a Self-Management Program for workers with a chronic disease as an adaptation of the Chronic Disease Self-Management Program of Stanford University (CDSMP). The CDSMP was developed by Lorig et al. [21] in 2006 to be performed by lay leaders. The aim of our training was to influence the determinants of self-management at work and finally to improve self-management behavior at work. There is some evidence that self-management programs by lay leaders can lead to short-term improvements in patients' confidence to manage their condition, subjective health status and self-efficacy behavior [22, 23]. The original CDSMP focuses on personal lifestyle factors and disease-related factors like coping with symptoms of the disease. In the adapted program [24] we have included work-related factors like, for instance, how to communicate with colleagues and supervisors, acquiring resources at work and dealing with symptoms of the disease at work. The objective of this study is to evaluate the effect of the adapted Self-Management Program on the determinants of self-management behavior at work (attitude and self-efficacy), and to improve mental and physical health quality (SF-12) and work satisfaction (Fig. 1). Furthermore we will investigate the (interaction) effect of gender, age and educational level on the primary and secondary outcomes.

Methods

Intervention

The course consists of six weekly sessions, each two and a half hours, conforming to the program plan of the original CDSMP. An overview of the adapted CDSMP for workers is shown in Table 1. For this target group, two new sessions have been developed based on the model of work load and work capacity [25] by using the methods of the original CDSMP (e.g., consciousness raising, improving

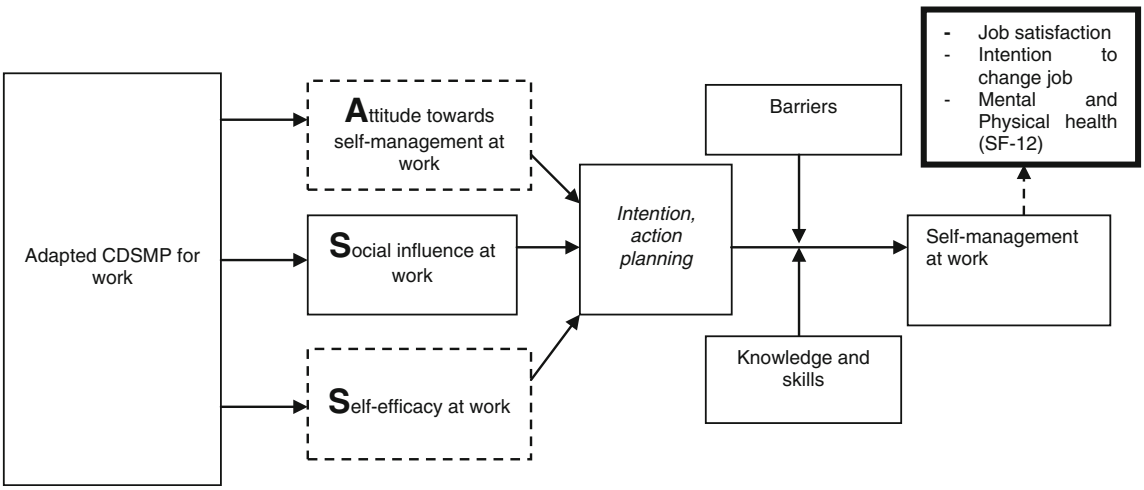

Fig. 1 The ASE-model representing how the adapted CDSMP program can influence determinants of self-management behavior at work

Table 1 Content of the Self-Management Program for workers with a chronic disease

Timing	Lesson	Activities
Week 1	Introduction	Inventory of problems encountered at work by the chronic disease
	Importance of physical exercise	Introduction to coping with symptoms by using guided imagery and the importance of physical exercise
		How to make an action plan
Week 2	Coping with pain, fatigue and stress at work	When do stress, pain and fatigue interfere with the ability to work?
		How can one deal with stress, pain or fatigue (at work)?
		Breathing exercises and cognitive symptom management
Week 3	Importance of healthy nutrition	Introduction to healthy nutrition
	Problems encountered at work	Introduction to the model of work load and work capacity
		Solutions at the workplace
Week 4	Communication techniques at the workplace	Communication with supervisor and colleagues about the problems encountered at work
		Communication with family and friends about the problems encountered at work
Week 5	Working with occupational health professionals	Working together with occupational health professionals and HRM advisors at work
Week 6	Plans for the future	What has been learned and accomplished the past 6 weeks?
		Formulating long-term plans

risk perception, skill mastery and goal setting, positive reframing). Furthermore, the original CDSMP topics were enriched with topics on the work situation of workers with a chronic disease. For example, the original theme 'working with health professionals' was adapted into 'working with occupational health care professionals'. The theme communication with family and friends was adapted into 'communicating with supervisor and colleagues'. The themes coping with fatigue, pain and stress were in the adapted training related to the work context (Table 1).

The program plan was produced and implemented to conform to the boundary limits of the original CDSMP. This to guarantee the quality of the original program. The CDSMP is intended for (lay) trainers who have completed the Master trainers program at Stanford University. The original CDSMP design is a high feasible, low-cost program which can be implemented in almost every setting. The only boundary limits for the program are: two trainers (one must be a master trainer educated at Stanford University and the other must have received a leaders training by the master trainer), inset time approximately 5 h per trainer per session (training plus preparation time), an accessible accommodation (room) for minimal fifteen participants, and facilities like access to beverages, toilet access and an elevator.

Study Design and Power Analysis

The effect-evaluation consists of a randomized controlled trial supplemented by a qualitative evaluation among the participants of two training groups. The outcomes were measured for both the intervention group and the no treatment control group at baseline, directly after the intervention (only for the experimental group) and 8 months after the intervention. The control group received care as usual and this consisted of primary and secondary health care in the Netherlands. The primary health care in the Netherlands consists of a strong medical system through integrative care for people with chronic diseases. Therefore no ethical problems have arisen by excluding the control group from the intervention. Results of the qualitative study will be reported separately. In the RCT, we wanted to include at least 70 patients (35 patients in both the intervention and control group) in order to be able to detect statistically significant differences on the Mental and Physical scales of the SF-12. The SF-12 is a short-form (SF) generic measure of health status, most questions are related to the consequences of mental or physical health for daily activities including work. The SF-12 has been validated for the Dutch population and also been used for people with a chronic disease [18, 26]. This sample size was based on a similar study in which 70 patients (35 patients in each group) were needed to detect an effect-size of 0.8 on the SF-12 with a power of 80 % and an alpha at <5 % (two tailed) [27]. Assuming a drop-out rate of 20 % during the trial, a total of 84 patients had to be included in the randomization process. The study design and operationalization of the evaluation study have been approved by the Medical Ethics Committee of the Radboud University Nijmegen and are registered in the Dutch Trial Register (NTR 1737).

Participants and Randomization

Participants for the course were recruited through the departments of Human Resource Management from companies and through the practices of general practitioners and occupational health services in the region of Arnhem and Nijmegen in the Netherlands. An information letter and leaflet of the course were sent to 82 companies, 88 general practitioners and 10 occupational health services in both municipalities. Furthermore, several advertisements have been placed in regional newspapers. The inclusion criteria to select participants for the course were: a diagnosed chronic somatic disease like rheumatoid arthritis or diabetes mellitus, having a paid job at the moment of the course, encountering problems at work because of the disease and motivation to follow the course. The exclusion criteria were: predominantly psychiatric conditions, being more than 3 months totally absent from work or fully work-disabled. Participants were requested to contact the researcher (SD) by telephone or email for more information or to apply directly for the program. Before being admitted to the research study participants were screened by telephone on the inclusion criteria. Participants who were on the basis of the inclusion criteria eligible for the research study, were allocated at random to the intervention group or the control group (Fig. 2). After allocation, the participants received a written confirmation, the informed consent form, the first questionnaire and information about the procedures. Equal numbers of participants in the parallel running control groups could not always be created. Each training group had to consist of minimum eight to maximum twelve participants to guarantee the effectiveness of the training [28] and the trainings started shortly after the randomization process to prevent drop–outs in the intervention group. For each training group the randomization started with attribution to the intervention group. Based on the total number of recruited participants per training, 59 % of the patients were allocated to the intervention group and 41 % to the control group. This procedure has also been used in similar RCT's [18, 29]. Based on the sample size calculation, for each group 35 participants were [27, 30]. The second questionnaire (T1) was sent to the intervention group directly after the training of 6 weeks. The second questionnaire consisted of the same scales as the first but without the demographic questions. The third questionnaire (T2) was sent 8 months after the end of the intervention to both the control group and the intervention group. The third questionnaire was equal to the second one.

Outcome Measures

The following outcome measures were chosen as primary outcomes measures: self-efficacy at work and attitude towards self-management at work (importance and enjoyment). The self-efficacy at work scale and the attitude towards self-management at work scale have been developed based on the information obtained from focus groups with professionals and patients [31, 32]. The internal consistency of these scales has been rated as good (alpha 0.8). Secondary outcome measures were: job satisfaction and intention to change job, two scales from the Perception and Evaluation of Work questionnaire [33]. Also used as secondary outcomes were the mental and physical health scales from the SF-12, a generic instrument to measure health status and quality of life [34]. Furthermore the following demographical variables have been analyzed: gender, age, educational level. The outcomes were measured for both the intervention group and the control group at baseline, directly after the intervention (only for the experimental group), and 8 months after the intervention. We have chosen for a follow-up of 8 months as according to the stages of change model it is assumed that a person enters the maintenance phase if the new behavior has been continued for more than 6 months [35]. In order to analyze the determinants of self-management behavior at work the Attitude-Social influence–Self-efficacy (ASE) model was applied [36, 37] (Fig. 2). In the intervention we have tried to influence the self-efficacy at work and the attitude towards self-management at work and social influence at work) as they all influence self-management behavior at work [37]. The primary outcome measures of this study are indicated in the dotted line boxes in Fig. 2, the secondary outcomes in the bold line box. Knowledge, skills and the withdrawal of barriers are also needed to be able to carry out certain behavior. The knowledge and skills needed for self-management are offered in the training through patient education and skills and overcoming barriers can be trained through the action plans. There is some evidence that self-management interventions are effective if they focus on participants' action planning activities [38–40]. A questionnaire has been developed to assess all primary and secondary outcome measures.

Statistical Analysis

Statistical analyses were performed with SPSS version 18.0 (SPSS, Inc, Chicago, IL, 2009). *Firstly*, independent *T* tests were used to test if there was a significant difference ($p < 0.05$) between the pre-test and follow-up test (T2-T0) for the control group and the intervention group without controlling for gender, age, education and baseline level. *Secondly*, to be able to control for differences in gender, age, education and baseline level the results were analyzed by multivariate analysis (General Linear Model). General linear model (multivariate analysis of variance) can be used to predict more than one dependent variable at the same

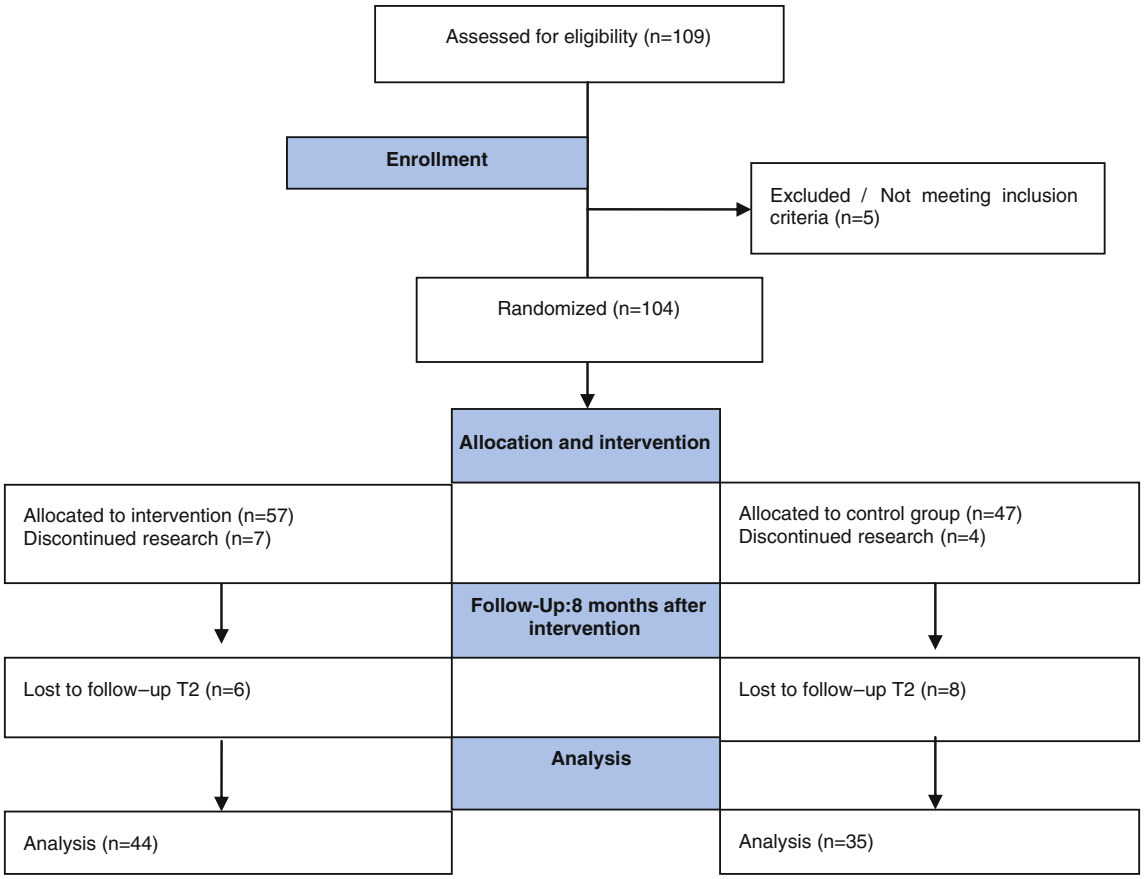

Fig. 2 CONSORT flow diagram for randomized controlled trials

time. *Thirdly*, a multivariate analysis (General Linear Model) was conducted in SPSS with the design of intercept (Wilks' Lambda) to test the interaction effect of gender, education, age and baseline level on the primary and secondary outcomes. The intercept is the predicted value of the dependent variable when all the independent variables are zero. Cases were not analyzed if questionnaires were missing at T0 or T2. Patients who missed more than three sessions of the training were not included in the analysis.

Results

Study Population

Participants for the training program were recruited from June 2006 until May 2009. The training programs were held between December 2006 and December 2009. A total of 109 workers applied for the study, and 104 participants were randomly placed in one of both groups after the telephone admission interview (Fig. 2). Of the participants 11 refused to participate in the program and dropped out of the study before the intervention started. The final study population consisted of 79 participants. The study population consisted 68 % of women, the mean age was 48 years and 25 % of the total population had more than one chronic disease (Tables 2, 3). A majority of the participants in both groups had a job in the sector of education, healthcare and social services (Table 3). We used Chi square statistics to test the differences between the intervention group and the control group at baseline on the categorical variables gender ($p = 0.653$), age ($p = 0.708$), education ($p = 0.116$), type of occupation ($p = 0.116$) and perceived work hindrance because of chronic disease ($p = 0.612$). No significant differences were found.

Difference Between Control Group and Intervention Group on Primary and Secondary Outcomes

Firstly, an independent-samples t-test was conducted to compare the outcomes of the intervention group and the control group (unadjusted for age, gender, education and baseline-score) 8 months after the intervention (difference between T2 and T0). With the independent sample test no significant difference with respect to any outcome was found. The results at baseline, directly after the intervention for only the intervention group and 8 months after the intervention for both groups are presented in the Figs. 3, 4,

Table 2 Classification of chronic diseases in the study population (ICD-10)

Dominant chronic disease	N	Percentage (%)
Neoplasms	9	11
Endocrine, nutritional and metabolic diseases	13	16
Diseases of the respiratory system	19	24
Diseases of the digestive system	6	8
Diseases of the musculoskeletal system and connective tissue	25	32
Other diseases (infectious diseases, diseases of the nervous system, the ear, the circulatory system, the digestive system, the skin)	7	9
Total	79	100
Additional chronic diseases		
+1 (25 %)		
+2 (8 %)		

Table 3 Characteristics of the study population

	Intervention group (n = 44)			Control group (n = 35)		
	%	Mean	SD	%	Mean	SD
Age (years)		46.6	8.0		48.9	11.4
Women	70			66		
Education						
Lower	20			38		
Middle	25			27		
High	55			35		
Sector of Industry						
Industry and construction	7			20		
Education, healthcare and social services	71			68		
Professional and business services	3			6		
Government	11			0		
Other (agriculture, leisure and hospitality, financial activities)	8			6		
Hindered the past 2 weeks at work due to health problems (n = 75)						
Yes	81			72		
No	12			18		
Missing	7			10		

5 and 6. The results in Figs. 3, 4, 5 and 6 were not adjusted for differences in gender, age, educational level and baseline values. The unadjusted results showed no significant difference between the intervention group and the control group after 8 months on the scale attitude towards self-management at work (importance). On the scale self-efficacy at work, both groups improved after 8-months, the intervention group slightly more but the means of both groups were not significantly different from each other. On the scale attitude towards self-management at work (enjoyment) the intervention group improved directly after the training and declined slightly after 8 months. The control group had a lower baseline value on the scale attitude towards self-management at work (enjoyment) and declined further on this scale after 8 months. The control group deteriorated on the scale physical health quality (SF-12) and the intervention group deteriorated slightly on the scale physical health quality (SF-12) after the intervention but improved at 8 months.

Secondly, a multivariate analysis was carried out to compare the estimated marginal means of the intervention and control group after 8 months (difference between T2 and T0), adjusted for age, gender, education and baseline score (Table 4). The estimated marginal means in the multivariate analysis were based on the mean of the intervention group and the control group at baseline. The estimated marginal were corrected for the following covariates: gender, age, educational level and baseline value. The Attitude towards self-management at work (enjoyment) improved significantly ($p = 0.030$) for the intervention group compared to the control group. No other direct intervention effect on the primary outcomes was found after adjusting for the same variables. Physical health improved for the intervention group but the results were not significant ($p = 0.052$). No other significant results were found for the secondary outcomes.

Interaction Effect of Gender, Age and Education on Primary and Secondary Outcomes

Thirdly, the multivariate analysis was conducted in SPSS with the design of intercept (Wilks' Lambda) to test the interaction effect of gender, education, age and baseline level on the primary and secondary outcomes. On the basis of the subgroup analysis we found that low educated workers in the intervention group scored better on the

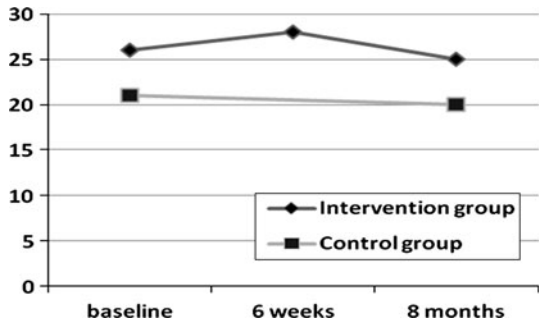

Fig. 3 Effect of intervention on the attitude (importance), for the intervention group at baseline, 6 weeks and 8 months and for the control group at baseline and at 8 months unadjusted for differences in gender, age, educational level and baseline values

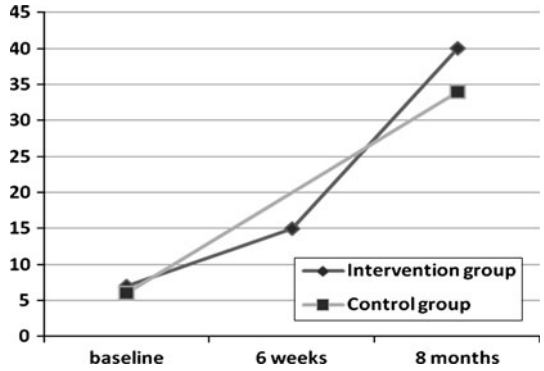

Fig. 4 Effect of intervention on the self-efficacy for the intervention group at baseline, 6 weeks and 8 months and for the control group at baseline and at 8 months unadjusted for differences in gender, age, educational level and baseline values

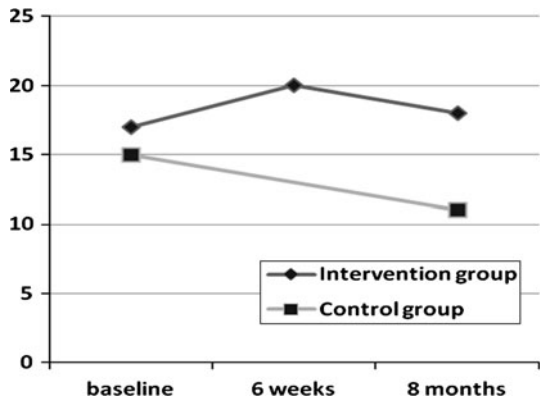

Fig. 5 Effect of intervention on the attitude (enjoyment), for the intervention group at baseline, 6 weeks and 8 months and for the control group at baseline and at 8 months unadjusted for differences in gender, age, educational level and baseline values

outcome physical health than low educated workers in the control group ($p = 0.021$). On the outcome attitude (importance) women in the intervention group scored better than women in the control group ($p = 0.019$) and older workers in the intervention group scored better than older workers in the control group ($p = 0.045$). On the attitude towards self-management at work (enjoyment), women in the intervention group scored higher than women in the control group ($p = 0.001$) (Table 5). The results of the multivariate analysis in step three are also based on the estimated marginal means of the intervention group and the control group at baseline. The estimated marginal means have been corrected for the following covariates: gender, age, educational level and baseline value.

Discussion

This study evaluated the effectiveness of a self-management program for workers with a chronic disease, including

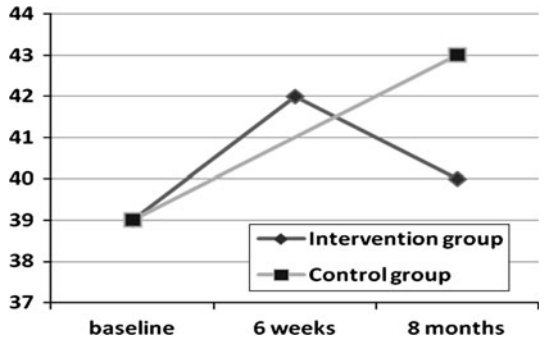

Fig. 6 Effect of intervention on the scale physical health quality, for the intervention group at baseline, 6 weeks and 8 months and for the control group at baseline and at 8 months unadjusted for differences in gender, age, educational level and baseline values

stratified analyses to assess which workers benefitted most from the program. At 8 months the intervention group scored higher on the primary outcome variable attitude towards self-management at work (enjoyment) than the control group ($p = 0.030$) when controlling for gender, age, educational level and baseline level. No other primary or secondary outcome variables differed significantly between the intervention group and the control group. Analyzing the results per subgroup, an interaction effect was found between education and physical health quality: low educated employees profited more from the intervention than middle and high educated employees. Another interaction effect was found between the outcome Attitude towards self-management at work (importance) and age and gender. Older workers profited more than younger and middle-aged workers from the intervention and women in the intervention group had a higher score than women in the control group. Female participants in the intervention group had a higher score on the scale attitude towards self-management (enjoyment) after 8 months than females in the control group. These findings suggest that low educated workers, older workers and women benefit significantly more from the training than higher educated workers, younger workers and men.

Previous research on the effects of the CDSMP on health outcomes found benefits for participants with lower education levels, better cognitive status, lower quality of life and younger participants [29, 41, 42]. Also participants with lower self-efficacy and a lower health-related quality of life at baseline demonstrated more positive health outcomes [41]. The CDSMP may have a protective effect on health-related quality of life for patients with poor health and low confidence. Younger people benefited substantially more than older people. A meta-analysis of the effects of the CDSMP on health outcomes found no interaction effect with gender, education and age [43]. In our study we found that older people profited more from the intervention than younger people. Probably older workers have more physical health complaints, and thus the

Table 4 *T* tests differences between the marginal means of the intervention group (n = 44) and the control group (n = 35) on the primary and secondary outcomes (difference between T2 and T0), adjusted for age, gender, education and baseline score

Outcome	Intervention group (estimated marginal means)*	SE	CI	Control group (estimated marginal means)[a]	SE	CI	*p* value
Attitude (importance) (a higher value indicates that it is more important)	24.3	2.0	20.4–28.2	22.3	1.8	18.6–26.0	0.435
Covariates evaluated at T0 = 23.5							
Attitude (enjoyment) (a higher value indicates more enjoyment)	17.4	2.5	12.5–22.3	10.3	2.4	5.4–15.1	0.030**
Covariates evaluated at T0 = 16.3							
Self-efficacy (a higher value indicates a more positive change in self-efficacy)	15.4	3.0	9.4–21.4	15.2	2.9	9.4–21.0	0.956
Covariates evaluated at T0 = 6.9							
SF-12 mental health quality (a lower value indicates a higher mental quality of life)	48.2	1.8	44.7–51.7	44.5	1.8	40.9–48.0	0.117
Covariates evaluated at T0 = 43.8							
SF-12 physical health quality (a lower value indicates a higher physical quality of life)	40.9	1.2	38.4–43.3	44.1	1.2	41.6–46.6	0.052
Covariates evaluated at T0 = 39.3							
VBBA job satisfaction (a higher value indicates a higher job satisfaction)	6.8	3.1	5.6–13.1	12.6	3.0	6.5–18.6	0.160
Covariates evaluated at T0 = 12.7							
VBBA change jobs (a lower value indicates less thinking about changing jobs)	31.4	5.8	19.9–43.0	20.4	5.7	9.0–31.7	0.150
Covariates evaluated at T0 = 32.2							

SE standard error, *CI* confidence interval

[a] The estimated marginal means in the multivariate analysis are based on the mean of the intervention group and the control group at baseline

** Significant difference (*p* value = <0.05)

content may have been more relevant and helpful. Also female workers in the intervention group seemed to improve on the scale attitude towards self-management at work. Due to the small group sizes it was not possible to make extensive subgroup analysis.

Effect-evaluations of other self-management programs have found positive benefits on health-related quality of life, feelings of mastery and self-efficacy for participants with high education; those with only a primary education did not benefit from the intervention [44, 45]. In a study on gender difference in the utilization of self-management services it has been found that men are less inclined than women to participate in self-management groups. One explanation is that support groups that involve sharing of emotions and experiences do not easily comply with the characteristics of hegemonic masculinity (notions of strength) [46]. If men participate in self-management groups they prefer to talk about the chronic disease as a "technical problem to be solved". Gibbs also suggests that gender variations can necessitate different educational approaches to meet different needs. Men might feel more comfortable with more anonymous types of services like telephone assistance or e-health [46, 47].

In the literature it has been hypothesized that persons who have a diminished sense of control might profit the most from interventions aimed at increasing knowledge and skills to manage a disease [44, 48]. Persons with less education and young people have in general less self-efficacy and might benefit the most form a self-management intervention. Caution is necessary in interpreting the current analyses, as a relatively large number of outcome variables were tested in a small group. The randomized controlled trial was not powered on all the predictor outcomes and the effect sizes could not be calculated for all the primary outcome measures, but were estimated based on similar studies using the same primary outcome. The limited number of participants in the experiment may also have led to a type 2 error (false negative) for the outcome physical health quality (SF-12) ($p = 0.052$) and several subgroup analyses might have been significant if the number of participants were higher. As the possibility of making a type 2 error is present with this type of intervention research, many intervention studies in the behavioral and social sciences are willing to accept an alpha-level of 0.10 as significant to prevent the chance of making a type 2 error [49, 50].

Table 5 *T* tests differences on subgroup level between the marginal means of the intervention group (n = 44) and the control group (n = 35) on the primary and secondary outcomes (difference between T2 and T0), adjusted for age, gender, education and baseline

Outcome	Subgroup analysis	Intervention (mean) (estimated marginal means)*	SE	CI	Control (estimated marginal means)[a]	SE	CI	*p* value
SF-12 physical health quality (a lower value indicates a higher physical quality of life)	Education: low	37.3	2.4	32.3–42.4	44.9	2.1	40.1–49.6	0.021**
	Education: middle	40.1	2.2	35.0–45.2	47.3	2.1	42.5–52.1	0.058
	Education: high	42.3	1.5	39.3–45.3	40.3	2.0	36.2–44.3	0.389
Attitude (importance) (a higher value indicates that it is more important)	Age: 20–39	28.4	6.7	13.5–43.2	30.1	4.9	19.3–40.9	0.742
	Age: 40–54	24.3	2.8	18.6–30.0	22.3	2.7	16.6–27.9	0.590
	Age: 55–65	30.6	3.7	22.8–38.4	16.6	4.0	8.0–25.2	0.045**
Attitude (importance) (a higher value indicates that it is more important)	Gender: female	24.6	1.9	20.8–28.3	17.7	2.0	13.6–21.8	0.019**
	Gender: male	27.0	6.4	13.5–40.6	30.0	4.3	20.9–39.1	0.584
Attitude (enjoyment) (a higher value indicates more enjoyment)	Gender: female	19.2	2.7	13.7–24.6	5.5	2.7	0.2–11.1	0.001**
	Gender: male	18.4	3.8	10.4–26.4	28.9	3.6	14.2–29.5	0.463
Self-efficacy (a higher value indicates a more positive change in self-efficacy)	Gender: female	16.3	2.9	10.3–22.3	8.8	3.2	2.4–15.3	0.331
	Gender: male	24.1	9.8	3.3–45.0	31.6	7.1	16.4–46.8	0.097

SE standard error, *CI* confidence interval

** Significant difference (*p* value = <0.05)

[a] The estimated marginal means in the multivariate analysis are based on the mean of the intervention group and the control group at baseline

Other possible limitations of our study are common research flaws in intervention research for people with chronic disease like the regressive fallacy and the Hawthorne effect, The control group has just like the experimental group improved on the scale self-efficacy and deteriorated on the score physical health quality (SF-12) after 8 months. This parallel improvement self-efficacy and deterioration on the scale physical health quality SF-12 can imply a common phenomenon in relation to chronic disease; the regressive fallacy. People will look out for interventions when they are feeling at their worst. This is especially true for most control groups of a randomized controlled trial, whereby in this study, the control group has a high level of problems but is also highly motivated to participate in the intervention. Due to 'regression to the mean', their condition will also improve with time as a consequence of 'spontaneous' variations in a value that is showing variances over time: given a selection on high values at the start, statistically the chance for a lower value a time period after the high value is more likely to happen than a still higher value. The Hawthorne effect, implies that for the control group participating in a study and filling in a questionnaire two times might have caused patients in the control group to score better on the scale self-efficacy and worse on the scale physical health quality (SF-12) [25]. Due to reactivity of measurement, i.e., patients in the control group became more conscious of the self-management behavior associated with a chronic disease and of their physical and mental quality of life at the moment of filling in the questionnaires. As a consequence, they might have adopted such behavior more often, and this also might have led to an improvement in other variables.

If we look at the content and length of the training, the training (6 weeks) might be too short to change the behavior of the participants and may only have an effect on the attitude of the participants. In future studies the intervention could either be increased in length (which might not be feasible) or be combined with an e-health program or with individual coaching on the job through for instance a HRM advisor, occupational physician or occupational health nurse, so that the techniques learned in the training can be implemented throughout a longer period. In future studies the content of the intervention should be re-examined and revised to be able to improve the mental health quality and work satisfaction of workers. Furthermore the SF-12 is a generic instrument for measuring general health quality and this instrument might not be sensitive enough to measure coping at work. In future studies it would be interesting to examine the effect of the training on other mental and physical work related outcomes such as general fatigue, need to recover from work, sickness absence and work-productivity.

Another limitation of the study might be the short follow-up (8 months). A longer follow-up period may have resulted in a clearer evaluation of the program effectiveness. The fact that the attitude improved after 8 months is

promising. Probably it takes longer to detect a response shift in the self-efficacy and behavior of workers with a chronic somatic disease. Other CDSMP studies had measurement moments ranging from 6 months to 2 years [21–23]. It is possible that a period of 6 months was too short for the program to be effective and to observe improvements in this sample of workers with a chronic somatic disease. Varekamp et al. [18] also only found effects on self-efficacy after 24 months.

Another point of interest for future studies would be to select participants in the intake based on the Stages of Change model [51]. This model screens to which extent participants are considering to change their behavior. If patients are selected based on their level of behavior change then it would be much easier to focus the training on the needs of participants and focus the effect-evaluation on the specific change. Now all participants may work on different goals making the results of the training difficult to quantify. The results of the qualitative evaluation study in which the participants were interviewed two times, at the beginning and directly after the course, show that participants have started to change their behavior on many different topics during the training and that they were more confident of dealing with their disease at the workplace than before the training. Most participants were also more aware of their limitations and strengths. The results of the qualitative evaluation will be presented separately. Changing internal standards, values and the conceptualization of general health and quality of life is also part of the adaptation process of having a chronic disease. Therefore it is difficult to assess the effects of a treatment or intervention on general health and quality of life as 'response shift' could be present [52].

To conclude, we found on the attitude towards self-management at work (enjoyment) a statistically significant difference between the intervention group and the control group at 8 months, in favor of the intervention group ($p = 0.030$) when controlling for gender, age, occupation and baseline level. The differences between groups of participants as found in the effect evaluation can have important practical implications as they can be used by health professionals, occupational health services and HRM to select the patients that could be referred to the training like women, low-educated workers and older workers, especially those with poor health and a diminished sense of control. Probably older workers have more physical health complaints, and thus the content may have been more relevant and helpful. More attention is needed in the future to make the Self-Management Program more attractive and suitable for men. Therefore, we recommend focusing in future research on adaptation of the content and image of the course to fit the learning needs of different groups.

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