Defeating Back Pain at the Workplace: Results of the "Healthy Back" Program

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Abstract. A holistic occupational health management system was implemented at the German tax administration. It integrates a multi-component health program that focuses on back pain prevention. The present study reports results from the evaluation of the program. It consists of a health screening (N =1043) which measured 13 risk factors followed by tailored interventions. One half of the participants exhibit moderate to high risk for future back pain. Participation-rate of the program is 48.46%. Results reveal a significant increase in physical activity. Results of the pre-post-test evaluation show moderate changes in the psychological variables, except for a decrease in catastrophising. In addition, a substantial decrease in back pain frequency, -intensity and impairment through back pain could be observed. The results of the interventions are discussed with regard to participation issues of work site health programs.

Keywords: worksite health promotion program, multilevel program, back pain, health management,

1 Introduction

In Western countries musculoskeletal disorders are widespread and constitute a major problem that may affect a person's quality of life, including the ability to work, family life, and psychosocial well-being (Sjöström, Alricsson, & Asplund, 2008). Musculoskeletal disorders are with 26.7% the number one cause of disability and sick-leave in Germany (Zimolong, Elke, & Bierhoff, 2008), causing Germany's health system at least 10-15 billion Euro each year on direct medical costs (Hildebrandt, Müller & Pfingsten, 2005). Due to the serve of musculoskeletal disorders, extensive research has focused on the aetiology, prevention and treatment of musculoskeletal disorders, expecially lower back disorders (LBDs). Winkel and Mathiassen (1994) differentiated possible risk factors for LBDs into three groups: individual/socio-demographic, biomechanical and psychosocial. This distinction could be verified empirically (e.g. Haldorsen, Indahl, & Ursin, 1998). Based on these risk factors, researchers have conducted many interventions designed to reduce the prevalence and/or incidence in different occupational settings (Smedley et al., 2003). In recent years worksites have often been viewed as optimal settings for health promotion programs. Not only do worksites provide a good longitudinal access to a large number of employees, they also offer the possibility to conduct multi-

component interventions, directed at individual, organizational, and environmental determinats of health. Tuncel et al. (2006) categorized these interventions into six main groups: (1) organizational environment changes, (2) job design, (3) job placement (worker selection), (4) education/training, (5) physical exercise, and (6) back supports.

Empirical data on the effectiveness of these interventions shows that many documented interventions to reduce occupational musculoskeletal disorders have been unsuccessful (Westgaard & Winkel, 1997). In spite of the reduction in occupational exposure level over time, musculoskeletal disorders still constitute a significant problem. Disorders may even occur frequently at workplaces offering ergonomic work station and tool design. One reason could be that interventions generally focus on a minor fraction of the problem, for instance concentrating on individual factors, or workstation and tool design, but neglect the basic assumption that LBDs are determined multi-causal.

1.1 Worksite health programs

Comprehensive and multi-component worksite health programs are able to face the multicausal causation of several disorders (Pelletier, 2005; Wilson, Holman & Hammock, 1996). Nine core elements of holistic health programs are described, repeatedly (cf. Heirich, Erfurt & Foote, 1992; Tones & Green, 2004; Zimolong & Elke, 2006): (1) decision about the strategy for health-promotion, (2) development of a healthy organizational culture, (3) implementation of health-screenings, (4) provision of a menu-approach, (5) recommendations for employees about health-promoting interventions and activities, (6) offer of personal counseling and follow-up support, (7) health-events to support activities, (8) networking with communal healthcare providers, and (9) evaluation and continuous improvement of the program.

The success of health programs depends on several program determinants and is to some extent program specific, but it is possible to specify super-ordinate factors that have of crucial influence on the success of occupational health programs (cf. Kreis & Bödeker, 2003; Richardson & Rothstein, 2008). First, the topic „employee health" must be positioned in the organizational culture and the health program must be integrated in the human resource strategy of the organization, in order to be accepted as an obligatory norm (Pelletier, 2001). The psychosocial work environment is of a significant relevance for the success of the program. Employees need to perceive that their senior management, supervisors, and co-workers have positive attitudes towards "health at the workplace" since these factors have been associated with improved employee health status (cf. Della, 2008). Changes in the work environment could serve as an observable sign for importance of health issues in the organization.

Second, an anticipatory program planning is necessary to minimize organizational barriers and to maximize supporting organizational conditions. That needs a flexible design of the work processes in order to enable the employees to attend the program and to remain in it. As a basic principle it appears to be beneficial to include anticipated program participants as well as management at an early stage. An early strategy development is essential for a successful collaboration with the employees and an adequate supervision (intensity, length, frequency). The continuous contact to

the employees, through for example regular monitoring of the follow-ups, individual counselling and support, are promising predictors for a successful program (Heaney & Goetzel, 1997).

Third, it could be shown that programs have to be conducted with a run-time of a minimum of one year to decrease employees' health risks. Additional follow-ups and support offered after the end of the program showed positive effects, too. In general, for a program to be effective in reducing overall morbidity, it needs the sustained involvement of high risk employees. An individualized counselling concerning individual risks and risk behavior combined with risk specific intervention that focuses primarily on high risk employees offers the possibility of both clinical effectiveness and cost-effectiveness in a relatively short time period (Goetzel et al., 1998; Pelletier, 2005).

Finally, comprehensive programs incorporating all activities, policies, and decisions related to the health of employees, their families, the communities in which they reside, and the company's customers are seen as beneficial for the participating and reaming in programs and for the behavioral change process. These strategies have proven to be effective if they are linked to the offering of a menu of interventions (Heaney & Goetzel, 1997; Peletier, 2001; Wilson et al., 1996).

2 Initial Situation

Within the implementation of a holistic health management system (HMS) in a German tax administration[1] (research project INOPE; Elke, Zimolong, Schwennen & Gurt, 2007) the multi-component health program Healthy Back was realized, which focuses on back pain prevention. The aim of INOPE is the implementation of a holistic health management system in order to systematize, coordinate, evaluate and advance the occupational health promotion activities of the tax offices. Starting point of the one year Healthy Back program was the current health situation in the tax offices: Data of the yearly health survey showed that 40-50% of the employees suffer on back pain, several times a week to almost every day with an increasing trend over the years (Schwennen & Zimolong, 2008).

2.1 The health program „Healthy Back"

The Healthy Back program started with a kick-off event for all participating and non-participating tax offices in North Rhine-Westphalia. Subsequently, back health screenings (called "Back-Check") were conducted in all nine pilot tax offices. The Back-Check tested for 13 risks, e.g., previous back pain episodes, depression, pain handling, physical fitness, work satisfaction which are linked to back pain, empirically, were tested (Lühman, Müller, & Raspe, 2004). Participants were allocated to a low, medium, or high risk group for future back pain depending on the total score of the back check. They were offered a risk group specific intervention

[1] INOPE (Health promotion and prevention through Integrated Network, Organizational, and Personnel development) is a project funded by BMBF (federal ministry of education and research. (www.inope.de)

menu. Participants at low risk got a menu of preventive interventions to choose from (e.g. Nordic walking, relaxation, preventive back pain training, fitness, massage, promotion of mental health). Participants at medium and high risk were offered three additional behavioral change programs: "posture in motion", "back support for every day", or "e-back coach" (Lehnhoff, 2008). The program *"back support for every day"* is a behavioral change program with the main training elements "information and knowledge", "self-management", and "trying and practicing". These elements all center on participants learning relaxation/recovering (simple exercise for every day: balance), getting instructions for activities (muscle formation), and learning coping strategies (coping with back pain, health behavior). The program *"posture in motion"* aims mainly on changes at the behavioral and physical level. Core elements are the development of movement-experiences and perception-abilities, recognition of habitual behavior, testing of alternative ways to act, improvement of physical performance, and integration of alternative ways to react with back pain in work and everyday-life. The *"e-back coach"* is a web-based self-management tool similar to classical behavioral trainings. It consists of knowledge transfer, behavior modification, workaday support, animation for activity and exercise. Figure 1 shows the three main intervention areas of the Healthy Back program

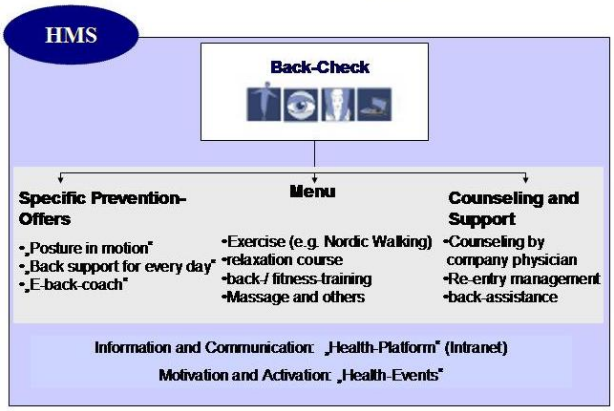

Fig. 1. Intervention areas of Health Back program.

3 Evaluation of the "Healthy Back" program

3.1 Objective of evaluation

The objectives of the evaluation of the Healthy Back program was to examine the participation rate of the employees, and the outcomes on changes in health promoting activities, of psychological risks (vitality, well-being, catastrophizing, health perception, and health condition), and in back pain intensity, frequency und

impairment. Furthermore, changes in sick leave caused by musculoskeletal disorders were calculated.

3.2 Method

A pre-post comparison was conducted. The measurement variables were arranged into 3 categories „physical activities“, „well-being“, and „back health“.

Multivariate analysis of variance (MANOVA) with repeated measures were conducted in order to examine the longitudinal changes of the interval-scaled (psychological and back health) variables (Cohen et al., 2003). Ordinal-scaled variables (activities) were tested of changes over time with the Wilcoxon-Test.

3.3 Setting

The German fiscal authority provides 645 local tax offices in all federal states in Germany. North Rhine-Westphalia consists of 137 local tax offices with more than 30.000 employees. The Healthy Back program within the project INOPE took place in nine pilot local tax offices in North Rhine-Westphalia with 2.136 employees. Every tax office employs between 155 and 367 employees in 10-15 departments. The tasks of the tax offices are the administration of community-taxes (e.g., income- and wage income-tax) as well as state-taxes (e.g., property- and road tax), and federal taxes.

3.4 Participants

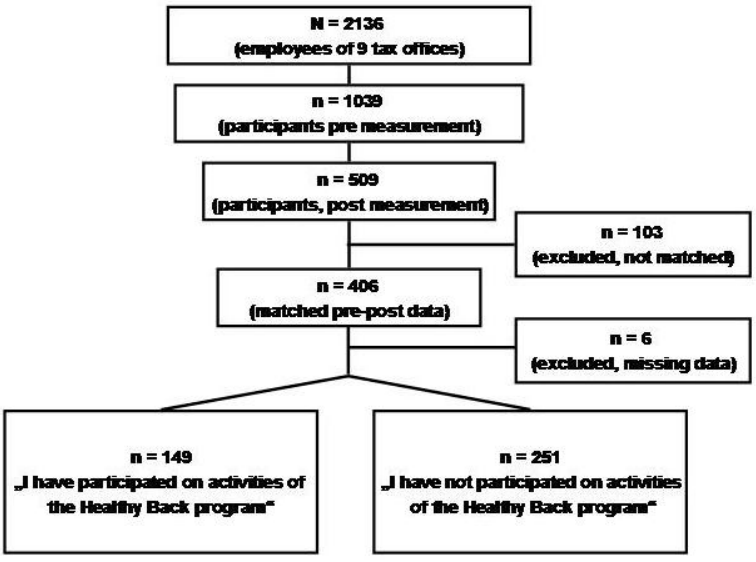

Fig. 2. Flowchart of clusters and participants through the surveys.

1039 employees (67.1% women, 32.9% men) of the 9 pilot tax offices volunteered to participate at the first time of measurement (s. figure 2).

These are 48.46% of the employees of the nine pilot tax offices. The age of the participants ranges from 19 to 65 years (M = 44.27 years, SD = 9.82). Participants were primarily high school (39.6%) and middle school (30.2%) alumni. The sample of the second point of measurement consisted of 406 employees, 70.2% women and 29.8% men between 19 and 62 years (M = 43.08, SD = 9.53). Concerning gender (χ^2 (1, 1039) = 1.70, p = .19) and educational degree (χ^2 (1, 1039) = 7.76, p = .35) the participants of both measurement times did not differ (s. table 1). However, concerning age they did: The participants of the post sample were younger (t (1037) = -3.12, p < .01).

Table 1. Socio-demographic data of the participants of both investigations.

Time of Measurement I	Time of Measurement II
1039 persons - *697 (67,1%) women* - *342 (32,9%) men*	406 persons - *285 (70.2%) women* - *121 (29.8%) men*
44.27 (SD = 9.82) years	43.08 (SD = 9.53) years
Level of education - *middle school 30.2%* - high school, vocational deg. *20.7%* - *High school 39.6%*	Level of education - *middle school 32.4%* - high school, vocational deg. *21.9%* - *High school 37.8%*

3.5 Measures

In order to measure *participation rate in health-promoting activities* we used two items at point 2 that differentiated between tax office intern versus private activities (e.g. “In which health promoting activities did you participate?”). Response categories were: 1 = do not participate, 2 = participated already before implementation of HMS, 3 = participate since implementation of HMS, 4 = participate due to Healthy Back program. *Physical activity* was measured with one item „How often do you work out?” (Lühmann, Müller, & Raspe, 2004). Response categories were: 1 = no physical activities, 2 = less than one hour per week, 3 = 1-2 hours a week, regularly, 4 = 2-4 hours a week, regularly, 5 = more than 4 hours a week, regularly.

Vitality was assessed with four items of a subscale of the SF 36 (e.g. „How often have you been full of energy during the last 4 weeks?“; Ware, 1992; Bullinger & Kirchberger, 1998). Response categories for these items were: 1 = never, 2 = rarely, 3 = sometime, 4 = frequently, 5 = mostly, 6 = always. Estimated Cronbach’s alpha at time 1 was .85 and .88 at time 2, respectively. *Well-Being* was measured with five items of a SF 36 subscale. Estimated Cronbach’s alpha at Time 1 was .84 and .87 at Time 2, respectively. *Health-Perception* was surveyed with a subscale of the SF 36, too. The scale comprises four items (e.g. „I seem to get ill more easily than others.“ Estimated Cronbach’s alpha at time 1 was .59 and .57 at time 2, respectively. In order to assess *catastrophizing* we used a nine item subscale from the FSS (e.g.

„When I suffer pain, I'm thinking that I cannot stand it any longer"; Flor & Turk, 1988). The 6-point scale was at its end verbally fixed (1 = almost never, 6 = almost always). The estimated Cronbach's alpha for this scale was .91 for time 1 and .93 for time 2. *General state of health* was measured by the item "How would you describe your health in general?" (Lühmann et al., 2004). Response categories for all items were: 1 = bad, 2 = suboptimal, 3 = good, 4 = very well, 5 = excellent.

Back pain frequency, -intensity and impairment through back pain (BP) were measured with one item for each construct following von Korff, Ormel, Keefe, and Dworkin (1992). An example-item is: „How intense was your average BP in the last 4 weeks?" Response categories for these items were: 1 = never, 2 = every few month, 3 = every few weeks, 4 = every few days, 5 = almost daily (BP frequency), 1 = no pain, 2 = light pain, 3 = moderate pain, 4 = severe pain, 5 = very severe pain (BP intensity), 1 = no impairment, 2 = light impairment, 3 = moderate impairment, 4 = severe impairment, 5 = very severe impairment (impairment trough BP). *Sick leave* was measured with the single item "On how many days were you on sick leave due to back pain in the last 12 months?".

4 Results

50.74% of all employees attended the Back-Check. About one half of the participants were allocated into the medium or high risk group. They have an increased risk of suffering from back pain in the future (51.45%). This group were offered the risk-group-specific behavior programs. 125 (27.90%) employees of these target-groups participated on these trainings. Regarding the participation rate in health-promoting activities in the tax offices, 42% attended overall. 6% of the respondents had already been active before the implementation of the health management system. 18% have been active since the HMS was implemented, another 18% got active due to the Healthy Back program.

Concerning the physical activity, a significant increase in time spent for work out was found ($Z = -.14.85$, $p < .01$). The amount of time for regularly (2-4 hours a week and more than 4 hors a week) activities increased about 11%.

Comparing participants with non-participants (s. table 2), two MANOVAs show different trends in the two groups over 6 months period. Whereas non-participants did not change in catastrophising ($F (1, 250) = .45$, $p = .50$) and health perception ($F (1, 250) = .54$, $p = .46$), a significant decrease in vitality ($F (1, 250) = 26.64$, $p < .01$, $\eta^2 = .10$), well-being ($F (1, 250) = 11.13$, $p < .01$, $\eta^2 = .04$) and general state of health ($F (1, 250) = 8.27$, $p < .01$, $\eta^2 = .03$) was found. Participants of the interventions did not show these impairments. Vitality ($F (1, 148) = 3.57$, $p = .06$), well-being ($F (1, 148) = .98$, $p = .33$), health perception ($F (1, 148) = 1.17$, $p = .28$) and the general state of health ($F (1, 148) = 1.94$, $p = .17$) did not change over time. Moreover, a decrease in catastrophising was found ($F (1, 148) = 5.85$, $p < .01$, $\eta^2 = .04$).

Concerning the back health variables significant changes over time were found. Back pain frequency decreased, significantly (pre: $M = 3.19$, $SD = 1.19$; post: $M = 3.07$, $SD = 1.15$; $F (1, 1190) = 6.49$, $p < .05$, $\eta^2 = .003$) as well as back pain intensity (pre: $M = 2.37$, $SD = 1.03$; post: $M = 2.24$, $SD = .98$; $F (1, 964) = 6.15$, $p < .01$, $\eta^2 =$

.003) and the impairment trough back pain (pre: M = 2.13, SD = 1.07; post: M = 1.95, SD = .97; F (1, 964) = 11.34, $p < .01$, $\eta^2 = .005$).

Furthermore, the decrease in back pain frequency led to an estimated reduction of sick days caused by musculoskeletal disorders about 540 days per year (12.32%).

Table 2. Pre-/post-treatment mean and within-group change on psychological variables.

Variable (range)	participant (treatment, n = 149)			non - participant (control, n = 251)		
	Pre-treatment, mean (SD)	Post-treatment, mean (SD)	Change, mean	Pre-treatment, mean (SD)	Post-treatment, mean (SD)	Change, mean
vitality (1-6)	3.82 (.68)	3.72 (.91)	- .11	3.89 (.77)	3.66 (.90)	- .23
well-being (1-6)	4.41 (.84)	4.36 (.86)	- .05	4.54 (.71)	4.41 (.86)	- .13
catastrophizing (1-6)	.80 (.83)	.66 (.85)	- .14	.62 (.74)	.59 (.83)	- .03
health-perception (1-5)	3.64 (.76)	3.71 (.71)	+ .07	3.82 (.70)	3.79 (.78)	- .03
general state of health (1-5)	3.03 (.62)	2.97 (.71)	- .07	3.20 (.68)	3.08 (.78)	- .12

5 Discussion

The health program Healthy Back was developed, implemented and evaluated on the basis of the current health-situation in the financial administration. The results of the evaluation point to a positive development: Participation-rates are auspiciously high, compared to the reported rates of 20-30% of attained employees in worksite health-programs by Dishman et al. (1998). The physical activities of the employees increased within Healthy Back over time. Moderate changes in the psychological variables of well-being can be observed, especially in the variable “catastrophising”, which is an important risk factor for future back pain, a decreasing trend over time can be stated. The success of the health-program is substantiated by an increase of back health and a decrease of absenteeism due to musculoskeletal problems.

Regarding the enduring effect, it has to be analysed if the structures and networks with local health providers that were established through the HMS can ensure the intended sustainable success of the health-program.

A general problem health programs have to face is the participation bias. The characteristics of program participants are generally different from non-participants. Mooney, Kron, Rummerfield, and Holmes (1995) stated that about 90% of program participants had self-reported low back diseases, whereas the information of this important predictor for future back pain is missing for non-participants in many studies which may lead in sum to a underestimation of the effect sizes (c.f. Tuncel et al, 2006). Post-data of the present study support this suggestion. Participants of the initial health screening reported a lower general health status than non-participants ($t (1049) = -2.68$, $p < .01$). In addition, pre-data reveals that participants of the health program show a lower general health status, too ($t (335) = 2.42$, $p < .05$).

Notably, participants and non-participants did not differ in physical activities ($Z = .66$, $p = .51$) at the first time of measurement. This is a promising result because usually, preventive and exercise interventions and appeal only to healthy workers or

those who have healthy habits (cf. Lewis, Huebner, & Yarborough, 1996). This may be an effect of the HMS.

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