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Effects of a brief worksite stress management program on coping skills, psychological distress and physical complaints: a controlled trial

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Abstract Objectives: To examine the effects of single-session, small-group stress management program on knowledge about stress, coping skills, and psychological and physical distress. **Methods:** A total of 300 employees from a company in western Japan were invited to participate in the study. Those who consented to enter the study were assigned to an intervention ($n=149$) or waiting list control group ($n=151$). Participants in the intervention group received a small-group stress management program. The program was primarily aimed at increasing knowledge about stress and improving coping skills. To investigate the intervention effect, change scores in outcome variables were calculated by subtracting the scores at pre-intervention from those at post-intervention (8 weeks after the pre-intervention survey). Next, the difference in the scores between groups was examined using analyses of covariance (ANCOVA) with the pre-intervention score as the covariate. **Results:** Favorable intervention effects were found on knowledge about stress and on coping skills ($P<0.001$ and $P=0.012$, respectively) and adverse effects on psychological distress ($P=0.022$). However, this adverse effect on psychological distress did not exist among those who initially perceived higher levels of job control. **Conclusion:** The single-session stress management program was effective on improving knowledge about stress, and coping skills, where job control moderated the effect of the program on psychological distress.

Keywords Stress management · Coping skills · Stress · Job control

Introduction

The increasing awareness of the adverse impact of poor psychosocial work environments on employee health has fostered a growing interest in stress management interventions in the last two decades (McLeroy et al. 1984; Pelletier 1991; Murphy 1996; Wilson et al. 1996; Bunce 1997; Kompier et al. 1998; Ganster and Murphy 2000; Palmer et al. 2001; Van der Klink et al. 2001). Interventions designed to reduce occupational stress can be categorized according to their focus, content, method, and duration (Van der Klink et al. 2001). Regarding their focus, intervention can be categorized as (1) aiming to increase individual psychological resources and responses such as coping (individual-focused interventions) or (2) aiming to improve stressful work environments (organization-focused interventions) (Kawakami et al. 1999; Murphy 1996; Micie 2002). The first category of intervention is usually referred to as stress management interventions, while the second category refers to interventions such as organizational development and job redesign (Heaney et al. 1995; Schurman and Israel 1995). A recent meta-analysis shows that occupational stress-management interventions that focus on the individual are effective in reducing employees' stress-related complaints (Van der Klink et al. 2001). Therefore, the current study focused on individual employees as well (i.e., an individual stress management intervention).

Stress management intervention is defined as techniques and programs that are designed to help employees modify their appraisal of stressful situations or to deal more effectively with the symptoms of stress, or both (Murphy 1996). There are various kinds of intervention techniques and programs such as, cognitive-behavioral training, personalized feedback based on systematic assessment, meditation, relaxation training, and physical fitness training (Murphy 1996; Bunce 1997). Accumulated

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experience from individual-focused interventions shows that cognitive-behavioral training is more effective than other techniques in enhancing psychological resources and responses, and reducing complaints (Murphy 1996; Ganster and Murphy 2000; Van der Klink et al. 2001).

Most cognitive-behavioral trainings originate from clinical psychology (Bunce 1997) and originally targeted psychiatric patients with mood and anxiety disorders. These trainings follow the rationale that the way an individual conceptualizes a situation will determine his or her emotional reaction and these trainings are, therefore, mainly aimed at modifying specific cognitive patterns (Meichenbaum 1973; Timmons et al. 1997; Dolezal-Wood et al. 1998; Gruber et al. 2001). However, employees in the workplace are generally not psychiatric patients who suffer from distorted thinking or impaired cognitive functioning. Rather, they use various kinds of coping strategies (behavioral and cognitive) to deal with the wide range of stressors they experience in the workplace. This suggests that trainings that help employees to develop appropriate coping strategies rather than to modify specific their thinking or cognitive patterns can contribute to improving their health. The current study used the problem solving technique (D'Zurilla and Nezu 1999), a specific cognitive-behavioral training program, in which participants acquire skills to deal with potential problems that they might be confronted with in the future.

In planning the program, the training format (procedure) as well as the content should be considered (Van der Klink et al. 2001). The number of sessions is important from the point of view of efficiency. According to the meta-analysis of Van der Klink et al. (2001) there was an inverse correlation between the number of sessions and the effect size for cognitive-behavioral interventions ($r = -0.27$, $P < 0.05$), meaning that shorter programs were more effective. However, plotting effect size against number of sessions did not result in an optimum number of sessions. Although Barkham and Shapiro (1990) reported a reliable and clinically significant improvement for mild depression after two sessions only, there are, to our knowledge, few empirical studies that examined the effectiveness of single-session intervention in the workplace (Takada et al. 2002).

The delivery means is also of interest from the point of view of efficiency. Both individualized and small-group intervention programs have been found effective in managing job-related stress (Eriksen et al. 2002; Rahe et al. 2002; Takada et al. 2002; Shimazu et al. 2003; Van Rhenen et al. 2005). Although individualized programs meet the specific needs of individual employees, time (especially professional's time) and cost constraints may limit the feasibility of the delivery of individualized intervention programs to employees (McCarty et al. 2003). Indeed, lack of experts to deliver mental health services to the workplace is among the most prevalent barriers that impede mental health activities in Japan (Japanese Ministry of Health, Labor and Welfare 2002). Therefore, small-group intervention programs seem to be a promising avenue for efficient preventive intervention.

In addition, small-group interventions have further strong points. Valentijn et al. (2005) pointed out that group sessions have a comforting and motivating effect because participants can share problems with a relevant peer group. Bandura (1989) also pointed out that vicarious observation and social influences or verbal persuasion are important sources of self-efficacy, and these sources are provided by group participation. Furthermore, the group process can enable participants to meet challenges and to create new and more positive experiences (Kristenson et al. 2004).

The main purpose of this study was to examine the effectiveness of a single-session small-group stress management program on knowledge, coping skills, psychological distress, and physical complaints among workers. We expected that the program exercise would increase knowledge and coping skills (primary outcomes), which, in turn, would decrease psychological distress and physical complaints (secondary outcomes) at post-assessment (Van den Heuvel et al. 2000, 2002). More specifically, two hypotheses are formulated:

- Hypothesis 1 A single-session small-group stress management program increases participants' knowledge and coping skills (primary outcomes).
- Hypothesis 2 A single-session small-group stress management program decreases participants' psychological distress and physical complaints (secondary outcomes).

Worksite interventions take place within an organizational context, and thus there are organizational factors, which may moderate the intervention effect (Bunce 1997). Studies on coping in the workplace claim that active coping strategies (i.e., problem-solving behavior) have a favorable effect on employee health, but only among those with high job control (Daniels 1999; De Rijk et al. 1998). A recent review of worksite interventions also claimed that cognitive-behavioral interventions appear particularly effective in jobs with high job control because high control allows employees to exercise the coping skills they learned through an intervention program (Van der Klink et al. 2001). Therefore, we formulated the third hypothesis to examine whether or not job control moderates the intervention effect:

- Hypothesis 3 The effectiveness of the intervention is stronger for those with high job control compared to those with low job control.

Method

Study participants and procedure

The current study was part of a company-wide mental health promotion program planned by a construction

machinery company in western Japan. The program mainly consisted of two interventions, one being an organization-focused intervention that aims to improve stressful work environments and the other being an individual-focused intervention that aims to enhance coping skills of employees. The former intervention was offered to blue-collar workers engaged in the production assembly line. The latter was offered to engineers engaged in research and development of new products. The current study reports the results of the latter.

All 300 employees who belonged to the R&D division were invited to participate in the study that was carried out by industrial health staff. Before entering the study, all participants were informed about the project with an information pamphlet as well as in meetings by their supervisors. Random assignment of participants to each group was *not* possible due to organizational constraints and staff availability. In order not to interfere with business, managerial staff, who was in charge of the R&D division, stratified the participants according to job position (supervisor or worker) and section (nine sections). Then, they assigned them to an intervention ($n=149$) or waiting list control group ($n=151$).

In November 2004, a baseline survey (T1) was conducted with both the intervention and the waiting list control group. After filling out the baseline questionnaire, participants in the intervention group were asked to participate in a stress management program, while those in the waiting list control group were asked to wait 8 weeks before participating. A post-intervention survey (T2) was conducted among both groups 8 weeks after the program. Approval was obtained from the ethics review board of the university before starting the study.

Outline of the stress management program

The program that was developed to improve coping skills of the participants followed the principles of problem-solving training (D’Zurilla and Nezu 1999). In this study the “problem” refers to the “stressor”, whereas the “solution” refers to the “coping response” that is effective in bringing about a solution that maximizes positive gains and minimizes adverse effects (Linden 2005).

The first author, who is trained in cognitive-behavioral therapy, administered the program. The program took 2 h and was carried out during working hours. In order to minimize interference with business, the same standardized contents were offered at four different occasions on three separate days. Each participant was assigned to attend one of the four occasions. About 40 employees were assigned to each of the four intervention groups. All participants received the brochure, titled “Training book for skilled coping” (Shimazu 2003) by way of a textbook. After the program, participants were asked to read the brochure and to complete the exercises that were described in it. The detailed content of the program is described in the next section.

Contents of the program

The program consisted of the following four parts.

(1) A lecture on psychological stress (20 min). The aim of this part was to provide participants with basic knowledge about stress, and to emphasize the importance of coping with stress for one’s own well-being. First, a fictitious case about two employees was illustrated; they were confronted with the same stressful situation but coped in different ways, which led to different consequences, such as personal growth (favorable) and depression (adverse). Furthermore, an explanation was given of the nature of stressors, coping, and stress responses, and the relationship among them was presented according to the stress and coping model (Lazarus 1966; Lazarus and Folkman 1984). It was also explained that appropriate coping may not only improve one’s health, but may also enhance personal growth and strengthen personal resources (Greenglass 2002).

(2) Small-group discussion (45 min). Participants were divided into five groups (7–9 participants per group). They discussed the following six topics, each of which was compatible with each stages of problem solving (D’Zurilla and Nezu 1999): (a) describing and defining stressors, (b) deciding which stressor has priority, (c) working out as many strategies as possible to deal with the stressor, (d) discussing the pros and cons of each strategy and the expectations that a certain strategy will lead to certain outcomes, (e) estimating which strategy can be successfully applied and deciding three strategies to apply to the “real” workplace, (f) drafting a detailed action plan (e.g., who, when, what, how).

(3) Group presentation (45 min). Each group presented (a) stressors they worked out, including the one, which had highest priority, (b) coping strategies they worked out, and (c) the detailed action plan they had discussed.

(4) General discussion (10 min). All participants reviewed the action plans presented by each group and discussed how to cope more effectively.

Please note that although the program was conducted in a group, our focus was *not* on developing group strategies to improve participants’ working conditions but on improving individual coping skills in order to deal better with perceived individual stressors. We did not expect employees to solve their stressors during the training, rather to learn coping skills that they can apply outside the training session (in the workplace). At the end of the program we asked participants to read the brochure and to make lists of their own stressors and action plans in order to put the acquired skills into practice and hence to solve their own stressors.

Measures for intervention effects

All data were measured by questionnaires. Details of the scales or questions used in the study are described below.

Knowledge was assessed using five items on the following issues; (1) concept of stress, (2) effects of stress on health, (3) effects of stress on performance, (4) concepts of coping, and (5) procedure of dealing with stressors. Participants were asked to choose the most suitable one out of four alternatives. A score of 1 was given if they gave a right answer. High scores indicate a high level of knowledge.

Coping skills was assessed using the corresponding subscale of the Brief Scales for Coping Profile (BSCP; Kageyama et al. 2004). This questionnaire was developed to assess individual coping behaviors using as few items as possible. It includes 18 items and six subscales (i.e., active solution; seeking help for solution; changing mood; emotional expression involving others; avoidance and suppression; changing a point of view). In the current study only the “active solution” subscale was used (three items, e.g., “I try to analyze the causes and solve the problem”). Respondents were asked to indicate the extent to which they often used the strategy described by the particular item, ranging from “1 = almost never” to “4 = very often”, for the stressful situation in the workplace ($\alpha=0.86$ and 0.86 for T1 and T2, respectively). High scores indicate a high level of coping skills.

Psychological distress was assessed using the corresponding subscales of the Brief Job Stress Questionnaire (BJSQ; Shimomitsu et al. 1998). The questionnaire was developed with support from the Japanese Ministry of Labor. The primary purpose of its development was to help occupational health staff assess employees’ job stress using as few items as possible. Psychological distress was measured by means of 18 items, mainly reflecting fatigue, anxiety, and depression. For instance, “I am tired completely”, “I feel ill at ease”, and “I feel depressed”. Each item was scored on a four-point Likert scale ranging from “1 = strongly disagree” to “4 = strongly agree” ($\alpha=0.91$ and 0.92 for T1 and T2, respectively). High scores indicate a high level of psychological distress.

Physical complaints was also assessed using the corresponding subscales of BJSQ (Shimomitsu et al. 1998) consisting of 11 items, like “I have a pain in the back”. Each item was scored on a four-point Likert scale ranging from “1 = strongly disagree” to “4 = strongly agree” ($\alpha=0.85$ and 0.85 for T1 and T2, respectively). High scores indicate a high level of physical complaints.

Job control was assessed using the corresponding subscale of BJSQ (Shimomitsu et al. 1998) consisting of three items, like “I have the freedom to decide the way and order of my work”. These items were scored on a four-point Likert scale, ranging from “1 = disagree” to “4 = agree” ($\alpha=0.65$ and 0.69 for T1 and T2, respectively). High scores indicate a high level of job control.

Statistical procedure

To investigate the intervention effect, change scores in outcome variables were calculated by subtracting the

scores at T1 from those at T2. Then, the difference in the scores between groups was examined using analyses of covariance (ANCOVA) with T1 scores as covariate according to the recommendation of Murphy (1996). In addition, the effect sizes (Cohen’s d) were calculated as a standardized measure of change (Cohen 1992). Furthermore, analyses were conducted for subgroups that differed in levels of job control at T1 to examine whether or not job control moderates the intervention effect. Each subgroup was defined according to the median at the T1. Intervention efficacy was analyzed on an intention-to-treat basis; that is, data from all assigned participants were included in the analyses if they had a baseline observation. Missing values due to participants lost to follow-up were replaced, assuming a zero event rate over the follow-up period, in accordance with the “last observation carried forward” principle.

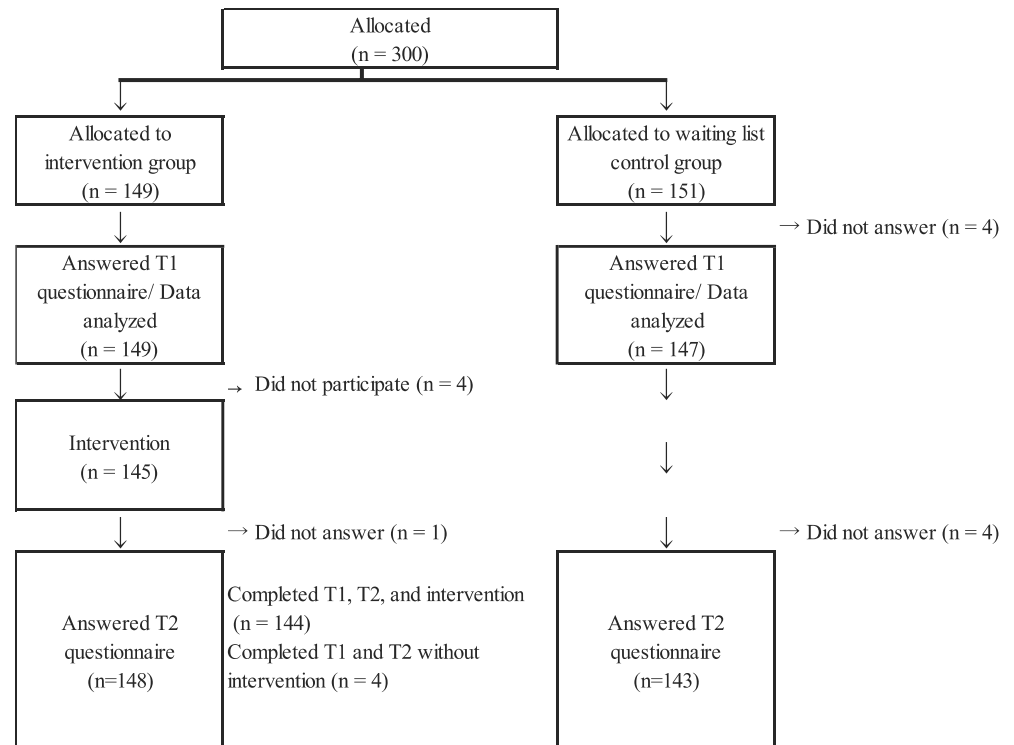
Results

Participants

Figure 1 summarizes the flow of participants through the trial. Four employees from the waiting list control group dropped out just before commencing the study because they changed their workplace. At baseline survey (T1), 296 participants (149 from the intervention group and 147 from the waiting list control group) completed the questionnaire. Among 149 employees in the intervention group 4 employees did *not* receive the education. At post-intervention survey (T2), 291 participants (148 from the intervention group and 143 from the waiting list control group) completed the questionnaire, which means that one employee from the intervention group and four employees from the waiting list control group completed only the T1 survey. The overall retention rate was 97.0% (99.3% for the intervention group and 94.7% for the waiting list control group). At T2, the number of participants who completed the intervention (i.e., received the education and answered both T1 and T2 questionnaires) was 144 in the intervention group. Data from those who answered the T1 survey were analyzed to investigate the intervention effect on an intention-to-treat basis (149 for the intervention group and 147 for the waiting list control groups).

Baseline characteristics

Table 1 shows the characteristics of the participants who completed the baseline survey (T1). Those in the intervention group had significantly higher scores on knowledge and physical complaints than those in the waiting list control group ($t(294) = 3.26$, $P=0.001$; $t(293) = 2.84$, $P=0.005$). In addition, the proportion of male employees in the intervention group was significantly lower than those in the waiting list control group

Fig. 1 The flow of participants through the trial**Table 1** Means (and SDs) or numbers (and percentages) of demographic and variables at T1

Variables	Intervention group				Control group				Statistical test	P value
	n ^a	Mean	SD	%	n	Mean	SD	%		
Sex										
Men	118			79.2	131			89.1	$\chi^2(1) = 5.45$	0.020
Women	31			20.8	16			10.9		
Job position										
Non-manager	131			87.9	129			87.8	$\chi^2(1) = 0.00$	0.965
Manager	18			12.1	18			12.2		
Age	148	35.7	10.78		147	37.3	10.86		$t(293) = -1.30$	0.195
Job control	148	8.0	1.59		146	8.0	1.88		$t(292) = -0.17$	0.868
Knowledge	149	3.3	1.10		147	2.8	1.25		$t(294) = 3.26$	0.001
Coping skills	149	8.0	2.22		146	8.0	2.42		$t(293) = 0.05$	0.962
Psychological distress	149	39.7	8.95		146	37.9	8.66		$t(293) = 1.76$	0.080
Physical complaints	149	19.7	5.14		146	18.0	5.62		$t(293) = 2.84$	0.005

^aThe numbers did not add up to the total number of the participants because of occasional missing data

($\chi^2(1) = 5.45$, $P = 0.020$). However, *no* significant differences were found between the groups in any of the other variables ($P > 0.05$).

Drop-outs

Using the baseline data from the intervention group, we compared baseline characteristics for “completers”, who received the program and answered both the T1 and T2 questionnaires, with those for “drop-outs”, who only answered the T1 questionnaire (Table 2). Drop-outs had significantly higher scores on knowledge than completers ($t(5.9) = -4.44$, $P = 0.005$). However, we detected *no*

differences between the groups in any other variables at baseline ($P > 0.05$).

Inter-correlations

Table 3 presents the inter-correlations between the study variables. Test-retest reliabilities of knowledge and coping skills were 0.43 and 0.53 for intervention group and 0.51 and 0.62 for waiting-list control group, respectively. Those of psychological distress and physical complaints were 0.73 and 0.71 for intervention group and 0.76 and 0.74 for waiting-list control group, respectively. Next, we examined whether or not the in-

Table 2 Comparison of means (and SDs) or numbers (and percentages) of demographic and variables between completers and drop-outs in intervention group at T1

Variables	Completers				Drop-outs				Statistical test	P value
	<i>n</i> ^a	Mean	SD	%	<i>n</i>	Mean	SD	%		
Sex										
Men	114			79.2	4			80.0	$\chi^2(1) = 0.00$	0.964
Women	30			20.8	1			20.0		
Job position										
Non-manager	128			88.9	3			60.0	$\chi^2(1) = 3.80$	0.051
Manager	16			11.0	2			40.0		
Age	143	35.7	10.83		5	34.2	10.18		$t(146) = 0.31$	0.758
Job control	143	8.0	1.58		5	8.2	1.92		$t(146) = -0.34$	0.731
Knowledge	144	3.2	1.11		5	4.2	0.45		$t(5.9) = -4.44^b$	0.005
Coping skills	144	8.0	2.22		5	9.8	1.30		$t(147) = -1.82$	0.070
Psychological distress	144	39.6	8.98		5	41.8	8.93		$t(147) = -0.53$	0.599
Physical complaints	144	19.7	5.19		5	19.8	3.49		$t(147) = -0.03$	0.978

^aThe numbers did not add up to the total number of the participants because of occasional missing data

^bWelch's *t*-test

Table 3 Pearson inter-correlations of the study variables

Variables	1	2	3	4	5	6	7	8
Knowledge (T1)		0.14	-0.07	-0.05	0.51***	0.09	-0.02	0.03
Coping skills (T1)	0.12		0.02	0.00	0.31***	0.62***	0.00	-0.05
Psychological distress (T1)	-0.06	-0.18*		0.51***	0.02	0.13	0.76***	0.55***
Physical complaints (T1)	-0.07	-0.10	0.47***		-0.04	0.10	0.42***	0.74***
Knowledge (T2)	0.43***	0.01	-0.01	-0.17*		0.27***	0.09	-0.04
Coping skills (T2)	0.18*	0.53***	-0.04	0.01	0.13		0.09	0.11
Psychological distress (T2)	-0.04	-0.07	0.73***	0.40***	-0.09	0.01		0.59***
Physical complaints (T2)	0.00	-0.07	0.41***	0.71***	-0.18*	0.06	0.54***	

Intervention group below diagonal ($n = 149$) and waiting-list control group above diagonal ($n = 145$)

* $P < 0.05$, ** $P < 0.01$, *** $P < 0.001$

ter-correlations between variables changed for T1 and T2. Correlation between coping skills and psychological distress in the intervention group changed significantly for T1 and T2 ($z = -2.10$, $P < 0.05$). However, we detected *no* significant change in any other correlations in both groups ($P > 0.05$).

Intervention effects

As to primary outcomes (Hypothesis 1: Table 4), favorable intervention effects were found on knowledge ($F(1, 293) = 26.57$, $P < 0.001$) and coping skills ($F(1, 292) = 6.36$, $P = 0.012$). As to secondary variables

(Hypothesis 2), an adverse effect was found on psychological distress ($F(1, 292) = 5.31$, $P = 0.022$), but not on physical complaints ($F(1, 292) = 3.57$, $P = 0.060$). The effect sizes (Cohen's *d*) were 0.35 for knowledge, 0.25 for coping skills, 0.21 for psychological distress, and 0.10 for physical complaints. Effect-sizes exceeding 0.20 are considered to be indicative for a "small" effect, whereas values smaller than 0.20 are considered not relevant (Cohen 1992). According to this criterion, there was a "small" effect on knowledge, coping skills and psychological distress.

When we differentiate between low and high levels of job control (Hypothesis 3), a favorable intervention effect was found on knowledge ($F(1, 171) = 17.17$,

Table 4 Comparison of the change scores (T2–T1) between groups by ANCOVA with T1 score as covariate

Variables	Intervention group			Control group			F value	P value	Cohen's <i>d</i> ^b
	<i>n</i> ^a	Mean	SD	<i>n</i>	Mean	SD			
Knowledge	149	0.7	1.23	147	0.3	1.22	$F(1, 293) = 26.57$	< 0.001	0.35
Coping skills	149	0.3	2.17	146	-0.3	2.04	$F(1, 292) = 6.36$	0.012	0.25
Psychological distress	149	0.9	7.11	146	-0.6	6.16	$F(1, 292) = 5.31$	0.022	0.21
Physical distress	149	-0.1	4.22	146	-0.5	3.93	$F(1, 292) = 3.57$	0.060	0.10

^aThe numbers did not add up to the total number of the participants because of occasional missing data

^bSmall effect 0.20–0.49, medium effect 0.50–0.79, large effect > 0.80 (Cohen 1992)

$P < 0.001$) and an adverse effect was found on psychological distress ($F(1, 171) = 8.16, P = 0.005$) among those with initially low levels of job control (Table 5). The effect sizes (Cohen's d) were 0.41 for knowledge, 0.18 for coping skills, 0.36 for psychological distress, and 0.10 for physical complaints. According to the criterion of Cohen (1992), there was a "small" effect on knowledge and psychological distress.

On the other hand, among those with initially high levels of job control (Table 6), favorable intervention effects were found not only on knowledge ($F(1, 119) = 9.13, P = 0.003$) but also on coping skills ($F(1, 119) = 5.98, P = 0.016$). We did not detect an adverse effect either on psychological distress ($F(1, 118) = 0.02, P = 0.900$) or on physical complaints ($F(1, 118) = 1.25, P = 0.266$). The effect sizes (Cohen's d) were 0.25 for knowledge, 0.37 for coping skills, -0.06 for psychological distress, and 0.09 for physical complaints. According to the criterion of Cohen (1992), there was a "small" effect on knowledge and coping skills.

Discussion

The purpose of this study was to examine the effects of a single-session small-group stress management program on employees' knowledge, coping skills, psychological distress, and physical complaints. In addition, we examined the role of job control on the intervention effect; namely whether or not job control moderates the intervention effect.

The intervention program had the following three key components; (1) an educational component, where participants got information about stress and coping; (2) skills training, where they acquired skills to deal with stressors; (3) group based program, where important sources of self-efficacy (e.g., vicarious observation, social influences) are provided by participation in the group. To our knowledge, there are few empirical studies that examined the effectiveness of single-session intervention program in the workplace and that included a control group (Takada et al. 2002).

Our main finding is, as expressed in Hypothesis 1, that favorable intervention effects were found on knowledge and coping skills. This means that after the single-session training, participants acquired better

knowledge and improved their coping skills. Thus, the explanation and illustrations provided in the program and the accompanying popular textbook may have helped the participants to understand the importance of coping and motivated them to act (Van Rhenen et al. 2005). In addition, the social interactions during the group-work may have provided participants with examples of good practice and with feedback on their own way of coping (Bandura 1989; Kristenson et al. 2004; Valentijn et al. 2005).

Although the number of sessions that should be included in the program is subject to debate (Van Rhenen et al. 2005), our results suggest that even the bare minimum of only a single session may lead to a detectable increase in knowledge and coping skills that remains for at least 8 weeks. To our knowledge, there is only one empirical study that examined the effectiveness of single-session stress management program in the workplace (Takada et al. 2002). However, this study was based on an individualized program and conducted with employees with a high, sub-clinical level of psychological distress. Therefore, our study may be the first to examine the effectiveness of single-session program in a group of "normal" employees. However, the effect sizes for knowledge ($d = 0.35$) and coping skills ($d = 0.25$) were "small" according to the Cohen's criterion (Cohen 1992) and, therefore, more elaboration is needed to yield more strong effects.

Contrary to our expectation (Hypothesis 2), an adverse intervention effect was found on psychological distress. Although we expected that acquisition of knowledge and improvement of coping skills may indirectly contribute to reducing psychological distress, the opposite seemed to be true: the program led to an increase in psychological distress. A number of factors might explain this counterintuitive effect.

First, participants might have become more sensitive to their psychological condition after the program. For instance, Schaufeli and Kompier (2001) claimed that informational campaigns to raise the awareness of job stress might sensitize employees for problems at work and thus increase perceived stress. In a similar vein, Pelletier et al. (1999) concluded that, although such adverse side-effects of educational programs may be observed in the short term, long-term benefits are to be expected.

Table 5 Comparison of the change scores (T2–T1) between groups by ANCOVA with T1 score as covariate among *low* job control group

Variables	Intervention group			Control group			F value	P value	Cohen's d^b
	n^a	Mean	SD	n	Mean	SD			
Knowledge	88	0.9	1.25	86	0.3	1.25	$F(1, 171) = 17.17$	<0.001	0.41
Coping skills	88	0.3	2.37	85	-0.1	2.04	$F(1, 170) = 1.77$	0.185	0.18
Psychological distress	88	1.4	8.09	86	-1.3	6.36	$F(1, 171) = 8.16$	0.005	0.36
Physical distress	88	0.1	4.84	86	-0.4	4.13	$F(1, 171) = 2.35$	0.128	0.10

^aThe numbers did not add up to the total number of the participants because of occasional missing data

^bSmall effect 0.20–0.49, medium effect 0.50–0.79, large effect >0.80 (Cohen 1992)

Table 6 Comparison of the change scores (T2–T1) between groups by ANCOVA with T1 score as covariate among *high* job control group

Variables	Intervention group			Control group			<i>F</i> value	<i>P</i> value	Cohen's <i>d</i> ^b
	<i>n</i> ^a	Mean	SD	<i>n</i>	Mean	SD			
Knowledge	61	0.5	1.19	61	0.2	1.18	<i>F</i> (1, 119) = 9.13	0.003	0.25
Coping skills	61	0.2	1.87	61	–0.5	2.01	<i>F</i> (1, 119) = 5.98	0.016	0.37
Psychological distress	61	0.1	5.37	60	0.4	5.76	<i>F</i> (1, 118) = 0.02	0.900	–0.06
Physical distress	61	–0.3	3.14	60	–0.6	3.65	<i>F</i> (1, 118) = 1.25	0.266	0.09

^aThe numbers did not add up to the total number of the participants because of occasional missing data

^bSmall effect 0.20–0.49, medium effect 0.50–0.79, large effect > 0.80 (Cohen 1992)

Second, employees might put more effort to apply newly acquired coping skills to the stressors in workplace, which may lead to a temporal increase in psychological strain. This view is supported by differences in inter-correlations between coping skills and psychological distress at T1 and T2 in the intervention group (Table 3, below diagonal: –0.18 for T1 and 0.01 for T2). Since coping strategies, especially those that focus on problem-solving, may take some time to implement effectively, it may initially be counterproductive before it reaps benefits (Koeske et al. 1993). In a similar vein, theory on self-control strength argues that any kind of self-regulatory activity (behavior that is not shown by default, and which requires some sort of will-action) will deplete self-regulation strength in the short run, even if it is beneficial, constructive, and adaptive in the long run (Muraven and Baumeister 2000). However, like training a muscle, self-regulation strength will increase in the long run (De Jonge and Dormann, in press). Therefore, a longer study period may be required before the effect of improved skills on health outcomes can be observed (Gardner et al. 2005).

Third, the present study was conducted during a demanding period for most participants, which may have influenced the results. For the past several years, the demands of construction machinery have been increasing because of increased competitiveness from mainland China. The company had a peak of work demands just at the beginning of the intervention, which continued during the entire follow-up period. In addition, the employees in the R&D division experienced a large expansion since the previous year (an increase of 29%). In such a situation, participating in the program and efforts to apply the acquired coping skills may have become an additional burden to those in the intervention group. However, it can be speculated that if the employees had not participated in the program, their health condition would have further deteriorated. This is because the rapid job expansion can have had adverse effects on their health through multiple changes at work (Westerlund et al. 2004).

Fourth, which is related to the third explanation, the non-randomization procedure due to organizational constraints and staff availability could have had unexpected effects. However, we could not get any information from industrial health and managerial staff about

situational changes during the follow-up which could explain the difference between the intervention and waiting-list control groups.

Fifth, the follow-up period might be too short to detect a favorable intervention effect on health outcomes. Where coping skills are included in the intervention program, short-term effects may not be sensitive indicator of program effectiveness (Kagan et al. 1995; Lindquist and Cooper 1999). For instance, Lindquist and Cooper (1999), which provided coping skills training consisting of four weekly sessions, showed that job stress measures did *not* produce short-term effects (8 weeks after the program) but these indicators were significantly improved 12 weeks later. In a similar vein, Gardner et al. (2005), which provided cognitive-behavioral training consisting of three weekly sessions, reported that a significant reduction of GHQ scores was found at the 12-week follow-up, but not immediately after intervention. Since health outcomes seem more stable than coping skills (see Table 3), more time may be required before the effect of improved skills on health outcomes can be observed (Gardner et al. 2005). As Van der Klink et al. (2001) recommended on the basis of their meta-analyses, a controlled follow-up of at least 12 weeks should be part of the design of intervention studies.

Sixth, the research population mainly consisted of men. This might have had disadvantages for women who participated in the group program. The program in this study provided skills to help participants to find by themselves appropriate strategies to deal with a wide range of stressors. The number of female workers in Japan who suffer from interpersonal problems is 1.5 times as many as males (Japanese Ministry of Health, Labor and Welfare 2002). Thus a program that mainly focuses on skills to deal with interpersonal problems might be more helpful for female participants. Further studies are needed to clarify to whom the program brings about the most benefits.

However, the adverse intervention effect on psychological distress was *not* found among those who had initially high job control, where psychological distress remained at the same level in the intervention group. This suggests that among those with high job control the program precluded the increase in psychological distress. Job control may have allowed them to give priority to

the problems that they experienced in the workplace (Shimazu et al. 2003), which helped focus their coping efforts on an appropriate aspect of the stressor. On the other hand, among those who had initially low job control, an adverse effect on psychological distress was found in addition to a lacking favorable effect on coping skills. It may be speculated that low job control prevents individuals from applying coping skills. Hence, Hypothesis 3 seems to be supported.

Before drawing a final conclusion, we have to refer to several limitations of the study. The relatively short follow-up period, the use of self-reported outcome measures, and the nature of the participants (only white-collar employees) could have had some effects on the results. In addition, the non-blinded trial and non-randomization could also have had unexpected effects. Furthermore, the effect sizes are relatively small. Since we are dealing with a minimal intervention of only single-session, one cannot expect very large effects in the first place. However, based on the (minor) favorable results of this single-session, a more elaborated program might yield more strong effects.

In summary, our empirical study provides evidence that a single-session group-based stress management program may lead to the acquisition of new knowledge and coping skills that maintained at least for 8 weeks. This study also showed that the program is more effective for those with high job control, most likely because they have the discretion to use the acquired coping skills. This means that even if the program succeeded in improving participants' coping skills, the benefit may not become obvious when levels of job control are low. Therefore, in jobs with low control, organization-focused interventions aimed at increasing control should prevail, eventually accompanied by cognitive-behavioral interventions (Van der Klink et al. 2001). On the other hand, in jobs that are characterized by high levels of job control, cognitive-behavioral interventions seem to be a proper strategy. Hence, for companies a combination of individual- and organization-focused approaches may be important for successfully reducing stress in the workplace (Kompier et al. 1998).

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References

- Bandura A (1989) Regulation of cognitive processes through perceived self-efficacy. *Dev Psychol* 25:729–735
- Barkham M, Shapiro DA (1990) Brief psychotherapeutic interventions for job-related distress: a pilot study of prescriptive and exploratory therapy. *Couns Psychol Quart* 3:133–147
- Bunce D (1997) What factors are associated with the outcome of individual-focused worksite stress management interventions? *J Occup Organ Psych* 70:1–17
- Cohen J (1992) A power primer. *Psychol Bull* 112:155–159
- Daniels K (1999) Coping and the job-demands-control-support model: an exploratory study. *Int J Stress Manage* 6:125–144
- De Jonge J, Dormann C (in press) The demand-induced strain compensation model: renewed theoretical considerations and empirical evidence. In: Sverke M, Hellgren J, Naswall K (eds) *Balancing work and well-being: the individual in the changing working life*. publisher undecided
- De Rijk AE, Le Blanc PM, Schaufeli WB, De Jonge J (1998) Active coping and need for control as moderators of the job demand-control model: effects on burn out. *J Occup Organ Psych* 71:1–18
- Dolezal-Wood S, Belar CD, Snibbe J (1998) A comparison of computer-assisted psychotherapy and cognitive-behavioral therapy in groups. *J Clin Psychol Med S* 5:103–115
- D'Zurilla TJ, Nezu AM (1999) *Problem-solving therapy: a social competence approach to clinical intervention*. 2nd edn. Springer, New York
- Eriksen ER, Ihlebaek C, Mikkelsen A, Gronningsaeter H, Sandal GM, Ursin H (2002) Improving subjective health at the work-site: a randomized controlled trial of stress management training, physical exercise and an integrated health programme. *Occup Med* 52:383–391
- Ganster DC, Murphy LR (2000) Workplace interventions to prevent stress-related illness: lessons from research and practice. In: Cooper CL, Locke EA (eds) *Industrial and organizational psychology*. Blackwell, Oxford, pp 34–51
- Gardner B, Rose J, Mason O, Tyler P, Cushway D (2005) Cognitive therapy and behavioural coping in the management of work-related stress: an intervention study. *Work Stress* 19:137–152
- Greenglass ER (2002) Proactive coping and quality of life management. In: Frydenberg E (ed) *Beyond coping: meeting goals, visions, and challenges*. Oxford University Press, New York, pp 37–62
- Gruber K, Moran PJ, Roth WT, Taylor CB (2001) Computer-assisted cognitive behavioral group therapy for social phobia. *Behav Ther* 32:155–165
- Heaney CA, Price RH, Rafferty J (1995) Increasing coping resources at work: a field experiment to increase social support, improve work team functioning, and enhance employee mental health. *J Organ Behav* 16:335–352
- Japanese Ministry of Health, Labor and Welfare (2002) Report of national survey of workers' health. Japanese Ministry of Health, Labor and Welfare, Tokyo (in Japanese)
- Kagan NI, Kagan H, Watson MG (1995) Stress reduction in the workplace: the effectiveness of psychoeducational programs. *J Couns Psychol* 42:71–78
- Kageyama T, Kobayashi T, Kawashima M, Kanamaru Y (2004) Development of the brief scales for coping profiles (BSCP) for workers: basic information about its reliability and validity (in Japanese). *San Ei Shi* 46:103–114
- Kawakami N, Haratani T, Iwata N, Imanaka Y, Murata K, Araki S (1999) Effects of mailed advice on stress reduction among employees in Japan: a randomized controlled trial. *Ind Health* 37:237–242
- Koeske GF, Kirk SA, Koeske R (1993) Coping with job stress: which strategies work best? *J Occup Organ Psych* 66:319–225
- Kompier MAJ, Geurts SAE, Grundemann RWM, Vink P, Smulders PGW (1998) Cases in stress prevention: the success of a participative and stepwise approach. *Stress Med* 14:155–168
- Kristenson M, Eriksen HR, Sluiter JK, Starke D, Ursin H (2004) Psychobiological mechanisms of socioeconomic differences in health. *Soc Sci Med* 58:1511–1522
- Lazarus RS (1966) *Psychological stress and the coping process*. McGraw-Hill, New York
- Lazarus RS, Folkman S (1984) *Stress, appraisal, and coping*. Springer, New York
- Linden W (2005) *Stress management: from basic science to better practice*. Sage, Thousand Oaks
- Lindquist TL, Cooper CL (1999) Using lifestyle and coping to reduce job stress and improve health in 'at risk' office workers. *Stress Med* 15:143–152
- McCraty R, Atkinson M, Tomasino D (2003) Impact of a workplace stress reduction program on blood pressure and emotional health in hypertensive employees. *J Altern Complem Med* 9:355–369

- McLeroy KR, Green LW, Mullen KD, Forshee V (1984) Assessing the effects of health promotion in worksites: a review of the stress program evaluations. *Health Educ Q* 11:379–401
- Meichenbaum DH (1973) Cognitive factors in behavior modification: modifying what clients say to themselves. In: Franks CM, Wilson GT (eds) *Annual review of behavior therapy practice*. Brunner/Mazel, New York
- Micie S (2002) Causes and management of stress at work. *Occup Environ Med* 59:67–72
- Muraven M, Baumeister RF (2000) Self-regulation and depletion of limited resources: does self-control resemble a muscle? *Psychol Bull* 126:247–259
- Murphy LR (1996) Stress management in work settings: a critical review of the health effects. *Am J Health Promot* 11:112–135
- Palmer S, Cooper CL, Thomas K (2001) Model of organizational stress for use within an occupational health education/promotion or wellbeing programme - a short communication. *Health Educ J* 60:378–380
- Pelletier KR (1991) A review and analysis of the health and cost-effective outcome studies of comprehensive health promotion and disease prevention programs. *Am J Health Promot* 5:311–315
- Pelletier KR, Rodenburg A, Vinther A, Chikamoto Y, King AC, Farquhar JW (1999) Managing job strain: a randomized, controlled trial of an intervention conducted by mail and telephone. *J Occup Environ Med* 41:216–223
- Rahe RH, Taylor CB, Tolles RL, Newhall LM, Veach TL, Bryson S (2002) A novel stress and coping workplace program reduces illness and healthcare utilization. *Psychosom Med* 64:278–286
- Schaufeli WB, Kompier MAJ (2001) Managing job stress in the Netherlands. *Int J Stress Manage* 8:15–34
- Schurman SJ, Israel BA (1995) Redesigning work systems to reduce stress: a participatory action research approach to creating change. In: Murphy LR, Hurrell JJR, Sauter SL, Keita DP (eds) *Job stress interventions*. American Psychological Association, Washington, DC, pp 235–261
- Shimazu A (2003) *Training book for skilled coping* (in Japanese). Houken, Tokyo
- Shimazu A, Okada Y, Sakamoto M, Miura M (2003) Effects of stress management program for teachers in Japan: a pilot study. *J Occup Health* 45:202–208
- Shimomitsu T, Yokoyama K, Ono Y, Maruta T, Tanigawa T (1998) Development of a novel brief job stress questionnaire. In: Kato S (ed) *Report of the research grant for the prevention of work-related diseases from the Ministry of Labour* (in Japanese). Japanese Ministry of Labour, Tokyo, pp 107–115
- Takada M, Taneichi K, Kosugi S (2002) The effects of JSS intake interview on psychological stress reactions (in Japanese). *Job Stress Res* 9:115–121
- Timmons PL, Oehlert ME, Timmons CW, Borgers SB (1997) Stress inoculation training for maladaptive anger: comparison of groups counseling versus computer guidance. *Comput Hum Behav* 13:51–64
- Valentijn SAM, Van Hooren SAH, Bosma H, Touw DM, Jolles J, Van Boxtel MPJ, Ponds RWHM (2005) The effect of two types of memory training on subjective and objective memory performance in healthy individuals aged 55 years and older: a randomized controlled trial. *Patient Educ Couns* 57:106–114
- Van den Heuvel ETP, De Witte LP, Nooyen-Haazen I, Sanderman R, De Jong BM (2000) Short-term effects of a group support program and an individual support program for caregivers of stroke patients. *Patient Educ Couns* 40:109–120
- Van den Heuvel ETP, De Witte LP, Stewart RE, Schure LM, Sanderman R, De Jong BM (2002) Long-term effects of a group support program and an individual support program for informal caregivers of stroke patients: which caregivers benefit the most? *Patient Educ Couns* 47:291–299
- Van der Klink JJJ, Blonk RWB, Schene AH, Van Dijk FJH (2001) The benefits of interventions for work-related stress. *Am J Public Health* 91:270–276
- Van Rhenen W, Blonk RWB, Van der Klink JJJ, Van Dijk FJH, Schaufeli WB (2005) The effect of a cognitive and a physical stress-reducing programme on psychological complaints. *Int Arch Occup Environ Health* 78:139–148
- Westerlund H, Ferrie J, Hagberg J, Jeding K, Oxenstierna G, Theorell T (2004) Workplace expansion, long-term sickness absence, and hospital admission. *Lancet* 363:1193–1197
- Wilson M, Holman P, Hammock A (1996) A comprehensive review of the effects of worksite health promotion on health-related outcomes. *Am J Health Promot* 10:429–435