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Effects of a Worksite Stress Management Training Program with Six Short-hour Sessions: A Controlled Trial among Japanese Employees

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Abstract: Effects of a Worksite Stress Management Training Program with Six Short-hour Sessions: A Controlled Trial among Japanese Employees: Rino UMANODAN, et al. Japan Society for the Promotion of Science—Objectives: The purpose of this study was to evaluate the effectiveness of a multi-component worksite stress management training (SMT) program among employees belong to Japanese steel company. **Methods:** Five workplaces were assigned to an intervention group and two workplaces to a control group. SMT with monthly 30-min sessions were provided to the intervention group for 6 mo. Intention-to-treat analyses were conducted among respondents of the intervention (n=96) and control groups (n=53). **Results:** Significant favorable intervention effects were found on knowledge ($p<0.001$) and marginally significant ones on professional efficacy ($p=0.074$) at one-month after completing the program. No significant intervention effects were observed on psychological distress, physical complaints, or job performance ($p>0.05$). However, in per-protocol analyses of those who attended all sessions, significant favorable effects were observed on psychological distress and job performance, as well as knowledge and professional efficacy ($p<0.05$). In addition, subgroup analyses revealed that those with initial low job control showed a favorable intervention effect only on knowledge ($p<0.001$), whereas those with initial high job control showed favorable intervention effects on knowledge ($p<0.001$), professional efficacy ($p=0.023$) and anxiety

($p=0.033$). **Conclusions:** The results suggest that the multi-component SMT program is effective at improving knowledge and professional efficacy, although job control appeared to moderate the effect of the program on professional efficacy. The program may also be effective at reducing psychological distress and increasing job performance, if participants complete all sessions.

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Key words: Multi-component stress management training, Occupational stress, Self-efficacy

Stress at work has been increasingly recognized as a major risk factor for chronic disease, injury, and poor quality of life among employees in contemporary society¹. The number of studies on worksite stress intervention has been increasing for the past two decades and evidence for its effectiveness has been accumulating². A recent meta-analysis has shown that occupational stress management training (SMT) that focuses on the individual (i.e., individual-focused training) is effective at reducing stress-related complaints among employees³. SMT is usually provided as a psychological education program for individual employees to teach them how to become aware of and develop effective skills to cope with stress^{4, 5}.

There have been various kinds of SMT techniques and programs used in previous studies, such as cognitive-behavioral training (CBT), personalized feedback based on systematic assessment, relaxation training, and physical fitness training^{6, 7}. Accumulated evidence on individual-focused SMTs suggests that CBT or CBT combined with relaxation training is more effective than other training programs for enhancing psychological resources and reducing psychological distress^{3, 7, 8}.

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Combination of different treatments is called multi-component SMT. Previous studies have shown that multi-component SMT provides greater benefit than single-component SMT^{6, 9-13}.

A wide range of outcome variables has been used in intervention studies examining the effectiveness of SMT programs. These include knowledge about stress, inner psychological resources (such as self-efficacy), psychological distress, sick leave, physiological indicators (such as blood pressure), and job performance^{3, 14}. It is often hypothesized that an SMT program first enhances psychological resources, which may result in better health outcomes and job performance. Thus, it is recommended that studies use both psychological resource variables and health and performance outcomes¹⁵. Among psychological resource variables, self-efficacy is one of the most important and frequently-used outcomes of SMT programs¹⁶⁻¹⁸. Self-efficacy is defined as "belief in one's own capabilities to organize and execute the courses of action required to produce certain achievements or results."¹⁶ Thus, self-efficacy seems to be a good indicator for assessing the effectiveness of an SMT program, if used in conjunction with health and performance outcome indicators.

The purpose of this study was to evaluate the effectiveness of a multi-component worksite SMT program, using a controlled trial design. The primary outcome variables of the study were knowledge about stress and self-efficacy of the participants at one month after the six-month intervention, and the secondary outcome variables were psychological distress, physical complaints, and job performance at the same time.

Subjects and Methods

Study participants and procedure

The study was conducted at steel plants located in the west of Japan. We approached seven workplaces from August to September of 2006 requesting them to participate in the SMT program. Five of seven workplaces (n=105) agreed to participate in the program as well as answer the questionnaires whereas the other two workplaces (n=77) agreed only to answer the questionnaire. Therefore, we allocated the former five workplaces to the intervention group and the latter two workplaces to the control group (12 to 65 employees at each workplace). This means that the allocation was not random. All participants were full-time employees from various areas; those in the intervention group were engaged in engineering, subcontract management, clerical work, machine maintenance, and health and safety management; and those in the control group were engaged in subcontract management, clerical work and machine maintenance.

In October 2006, a baseline survey (T1) was conducted. The SMT program for the intervention group, which

lasted six months, was then initiated. In April 2007, approximately one month after the intervention group finished the SMT program, a post-intervention survey (T2) was carried out.

Informed consent was obtained beforehand from the participants. The study procedures were approved by the Research Ethics Review Board of the Hiroshima University Graduate School of Education.

Outline of the program

In order to develop an effective and practical SMT program for employees, the training format (procedure), such as the number of sessions and the session time, is important³. While an SMT program usually consists of six sessions and sometimes more than ten¹⁹, a previous meta-analysis concluded that the optimum number of sessions is 7. There was no increase in efficacy of SMT programs with a greater number of sessions³. Session time is also important for practical implementation of an SMT program at the workplace. Multi-component SMT programs needed a longer session time, at least 50 min for one session²⁰. A longer training session may provide more information, but time constrains often limit the implementation of such training, in particular when it is provided during working hours. In line with the optimal condition and limitations described above, a multi-component SMT program (i.e., CBT and relaxation techniques) was developed for this study, which consisted of six sessions of 30 min each.

A six-session monthly multi-component SMT program was conducted at convenient times for the intervention group, such as after monthly safety and health committee meetings. An SMT team, consisting of graduate students in clinical psychology, an occupational physician, occupational health nurses and a clinical psychologist working for the company, provided on-site sessions at each workplace with an intervention group during working hours. Each session took about 30 min. All participants received self-help worksheets for homework in each session. After each session, participants were asked to complete the worksheets.

Content of the program

The contents of the program were developed based on a review of previous SMT programs, and were modified according to needs learned from interviewing general managers at intervention group workplaces. The general structure of each session consisted of four parts: (a) relaxation training (3 min) at the beginning; (b) lecture (15 min) on a selected topic for each session as described below, concerning basic knowledge on managing stress usually accompanied by a fictional case story; (c) exercise (7 min), in which participants were encouraged to apply the knowledge they had acquired to a real life situation to build their relevant skills, and (d) questions and

summary at the close (5 min).

The program was designed so that distinct components were delivered in separate sessions. The following topic was selected and prepared for each session:

Session 1—Relaxation techniques and basic knowledge about stress: (1) Participants were provided progressive muscular relaxation training (PMT)²¹ to raise awareness of anxiety and tension, and were taught to release these feelings by straining and then relaxing muscles throughout the body; (2) Participants learned the basics of Psychological Stress Theory²² to raise their understanding of their own stress and the importance of coping with stress.

Session 2—Time management: Participants were provided a lecture and exercise to improve their efficiency and control of work by planning their work schedules and effectively using their working hours.

Session 3—Goal setting skills: Participants studied the “small step approach” to setting goals to improve their confidence and motivation.

Session 4—Interpersonal communication skills: Participants were trained in better interpersonal communication skills by examining and understanding communication styles of their own.

Session 5—Causal attribution: Participants were given a lecture on psychological theories of causal attribution (the way people attribute causes of a problem which they experience) and performed an exercise to develop new views on their problems.

Session 6—Irrational-dysfunctional belief²³: Participants were provided a lecture and an exercise to recognize their maladaptive ways of thinking, such as perfectionism, exaggerated negative evaluations or distortions of reality, and to modify them.

Measures for intervention effects

All data were measured by self-report questionnaire. Details of the scales and questions used in the study are described below.

Knowledge about stress and stress management was assessed using seven questions on the following topics which were explained in each session: 1) PMT, 2) concept of stress, 3) time management skills, 4) goal setting skills, 5) causal attribution, 6) interpersonal communication skills, and 7) irrational-dysfunctional beliefs. Respondents were asked to choose the most suitable option among four presented. An item score of 1 was given for a right answer. High scale scores indicated a high level of knowledge.

Professional efficacy is an aspect of self-efficacy on the job, and was assessed using a 6-item subscale of the Japanese version of the Maslach Burnout Inventory-General Survey (MBI-GS)²⁴. The items were rated on a 7-point Likert scale, ranging from 0=“never” to 6=“every day” (T1, $\alpha=0.91$; T2, $\alpha=0.92$). An item example is “I

feel I am making an effective contribution to what this organization does.” High scale scores indicate a high level of professional efficacy.

Psychological distress was assessed using an 18-item subscale of the Brief Job Stress Questionnaire (BJSQ)²⁵, which consists of five subscales (irritability-anger, fatigue, anxiety, depression, and lack of vigor). The items were rated on a 4-point Likert scale, ranging from 1=“strongly disagree” to 4=“strongly agree” (T1, $\alpha=0.89$; T2, $\alpha=0.88$). Item examples are as follows: “I am completely tired” (fatigue), “I feel ill at ease” (anxiety), and “I feel depressed” (depression). High scale scores indicate a high level of psychological distress.

Physical complaints were assessed using an 11-item subscale of the BJSQ²⁵. The items were rated on a 4-point Likert scale, ranging from 1=“strongly disagree” to 4=“strongly agree” (T1, $\alpha=0.88$; T2, $\alpha=0.88$). For instance, “I have a pain in my back.” High scores indicate a high level of physical complaints.

Job performance was assessed using the World Health Organization (WHO) Health and Work Performance Questionnaire (HPQ)²⁶. Respondents were asked to rate their overall work performance during the past four weeks. The item was scored on an 11-point self-anchoring scale ranging from 0=“worst possible performance” to 10=“best possible performance.” High scores indicate a high level of perceived job performance.

Other variables

Quantitative demand and qualitative demand were assessed using 3-item subscales of the BJSQ²⁵. The items were rated on a 4-point Likert scale, ranging from 1=“strongly disagree” to 4=“strongly agree” (for quantitative demand, $\alpha=0.79$ at T1 and $\alpha=0.77$ at T2; for qualitative demand, $\alpha=0.71$ at T1 and $\alpha=0.71$ at T2). An item example of quantitative demand is “My job requires working hard,” and one of qualitative demand is “It is a difficult job that requires a high level of knowledge and skills.” High scale scores indicate a high level of quantitative or qualitative demand.

Job control was also assessed using a 3-item subscale of the BJSQ²⁵. The items were rated on a 4-point Likert scale, ranging from 1=“strongly disagree” to 4=“strongly agree” (T1, $\alpha=0.54$; T2, $\alpha=0.65$). Although the alpha coefficients were somewhat low, they were comparable to previous study²⁵ ($\alpha=0.65$). An item example is “I have the freedom to decide the method and order of my work.” High scale scores indicate a high level of job control.

Demographic data, such as sex, age, and job position, were also collected in the questionnaire.

Statistical procedure

All data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 14.0J. Baseline characteristics of the intervention and control groups were

compared and tested with the *t*-test for continuous data and the χ^2 test for ordinal or categorical data. To examine the intervention effect, the changed score of each outcome variable was calculated by subtracting the score at T1 from that at T2, and the difference in the change of the score between the intervention and control groups was compared and tested using analysis of covariance (ANCOVA), with T1 scores, quantitative demand, and qualitative demand as covariates. The effect size (Cohen's *d*) was also calculated as a standardized measure of change²⁷. We conducted the same analyses of each item of the professional efficacy scale and of each subscale of the psychological distress scale to evaluate the details of the intervention effects. All analyses were first conducted on an intention-to-treat (ITT) basis, and then replicated on a per-protocol basis, after removal of non-completers, i.e., the participants who attended fewer than six sessions.

A previous meta-analysis³ suggested that the effects of an SMT program are more prominent among employees with high job control. Therefore, an analysis was conducted according to level of job control at T1, in which participants were dichotomized using the median score, to examine whether job control moderates the intervention effect. Please note that the level of job control between T1 and T2 was not significantly different for intervention group (T1, Mean=7.78, SD=1.67; T2, Mean= 7.83, SD=1.70; $t=-0.402$, $df=95$, $p>0.05$) and for control group (T1, Mean=7.75, SD=1.51; T2, Mean=7.75, SD=1.66; $t=0.000$, $df=51$, $p>0.05$).

We replaced missing values among participants lost to follow-up with their baseline (T1) values, assuming a zero event rate over the follow-up period, according to the last observation carried forward principle. If less than 50% of items of a given scale had missing values at T1 for a participant, the scale score for this person was estimated using item scores of other non-missing items of the scale; otherwise the scale was regarded as missing. Thus, the numbers of subjects for the analysis varied from 94 to 96 for intervention group and from 51 to 53 for control group.

Results

Participant withdrawal

The recruitment and retention details are shown in Fig. 1. At T1, 96 employees from intervention group and 53 employees from control group completed the questionnaire (response rates, 91.4% and 68.8%, respectively). At T2, 87 employees from intervention group and 53 employees from control group completed the questionnaire (response rates, 90.6% and 100.0%, respectively). Among 96 employees in the intervention group, 44 participants (45.8%) attended all-six sessions and answered both T1 and T2 questionnaires. Fifty-two participants could not complete all-six sessions mainly due to business trips, personnel changes or machine

trouble.

Baseline characteristics

The data of 96 and 53 participants from the intervention and control groups, respectively, were used for the ITT analyses. The number of respondents varied among outcomes due to missing values (Table 1). Those in the intervention group had significantly lower scores on quantitative demand ($t=-3.1$, $df=146$, $p=0.003$), qualitative demand ($t=-2.4$, $df=147$, $p=0.018$), psychological distress ($t=-2.2$, $df=146$, $p=0.031$), and physical complaints ($t=-2.5$, $df=146$, $p=0.013$) than those in the control group. However, no significant differences were found between the groups in any of the other variables ($p>0.05$).

Using the T1 data from the intervention group, we compared baseline characteristics between "completers," who participated in all six sessions and returned both T1 and T2 questionnaires, and "non-completers" who returned the T1 questionnaire but did not attend all the sessions. The completers had significantly higher scores of psychological distress and physical complaints than the non-completers ($t=-2.760$, $df=93$, $p=0.007$; $t=-2.057$, $df=80$, $p=0.043$). However, we detected no differences between the groups in any of the other variables ($p>0.05$).

Inter-correlations

Table 2 presents the inter-correlations between the study variables. T1-T2 correlations for psychological distress, physical complaints, performance, and job control were 0.73, 0.74, 0.63 and 0.72 for the intervention group and 0.82, 0.83, 0.72, and 0.83 for the control group, respectively.

Effects of intervention

In the ITT analyses, a favorable intervention effect was found on knowledge about stress ($F=32.929$, $df=1$, 144, $p<0.001$, Cohen's $d=0.80$). In addition, a marginally significantly favorable effect was found on professional efficacy ($F=3.246$, $df=1$, 143, $p=0.074$, Cohen's $d=0.31$). Furthermore, to evaluate the details of the intervention effects, an analysis was conducted on the respective items of professional efficacy. A marginally significant favorable intervention effect was found on three of six items in the professional efficacy scale: "I can solve problems..." ($F=3.293$, $df=1$, 143, $p=0.072$), "I feel I am making an effective contribution..." ($F=3.058$, $df=1$, 143, $p=0.082$), and "I am confident at my work..." ($F=5.998$, $df=1$, 143, $p=0.086$). There were no significant intervention effects on psychological distress, physical complaints, or job performance ($p>0.05$). Among subscales of psychological distress, a marginally significantly favorable effect was found on anxiety ($F=3.146$, $df=1$, 144, $p=0.078$).

Per-protocol analyses were conducted for 44

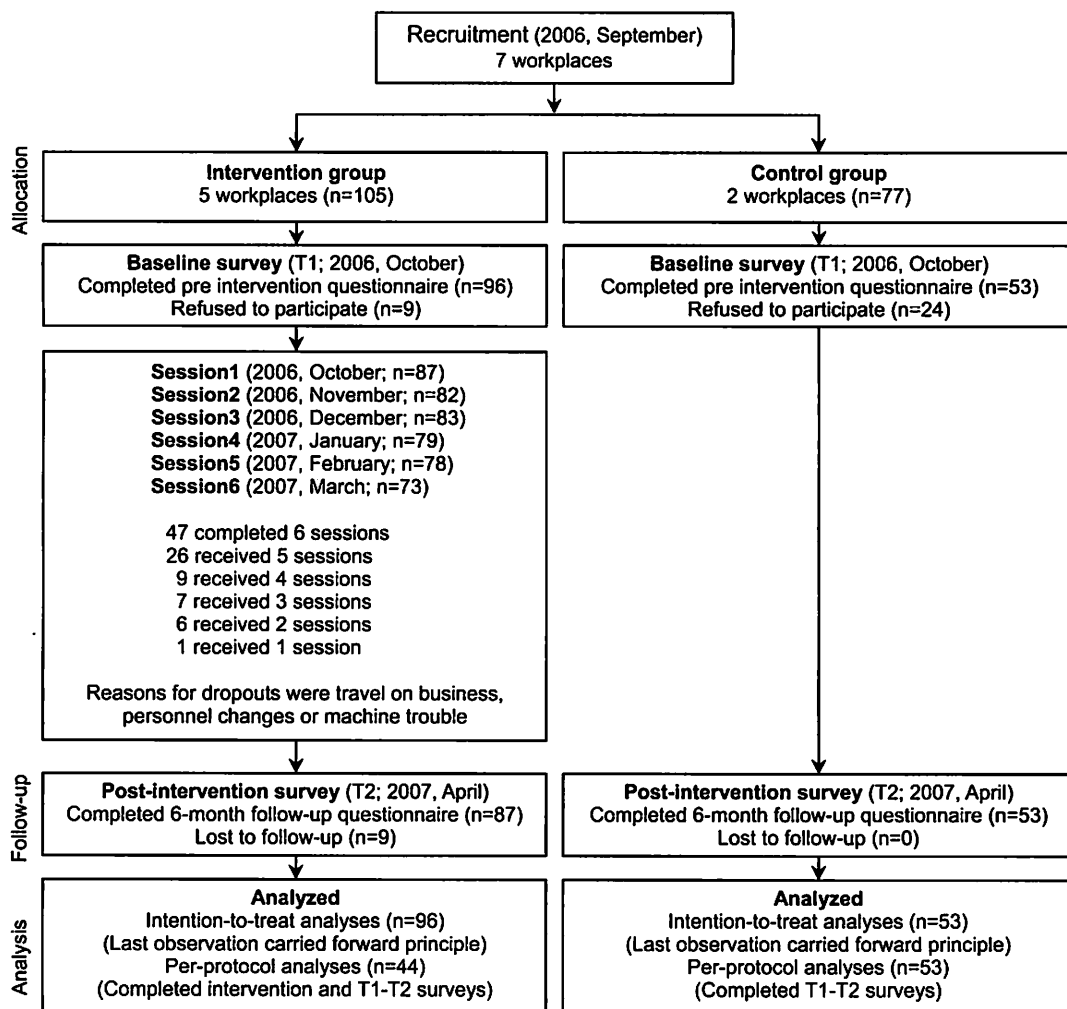


Fig. 1. Flow of participants through trial.

Table 1. Baseline characteristics of the intervention group and the control group

| Variables | Intervention group | | | Control group | | | Statistical test | p value | | |
|------------------------|--------------------|------|--------|---------------|----|------|------------------|---------|--------------------|-------|
| | n ^a | Mean | (SD) | % | n | Mean | | | (SD) | % |
| Sex | | | | | | | | | | |
| Men | 84 | | | 87.5 | 49 | | | 92.5 | $\chi^2 (1)=0.874$ | 0.350 |
| Women | 12 | | | 12.5 | 4 | | | 7.5 | | |
| Job position | | | | | | | | | $\chi^2 (1)=1.452$ | 0.228 |
| Non-manager | 90 | | | 93.8 | 52 | | | 98.1 | | |
| Manager | 6 | | | 6.3 | 1 | | | 1.9 | | |
| Age | 96 | 42.3 | (11.4) | | 53 | 38.5 | (14.0) | | $t (90) = 1.671$ | 0.098 |
| Quantitative demand | 96 | 9.0 | (2.3) | | 53 | 9.9 | (1.4) | | $t (146) = -3.073$ | 0.003 |
| Qualitative demand | 96 | 8.5 | (1.9) | | 53 | 9.2 | (1.4) | | $t (147) = -2.387$ | 0.018 |
| Job control | 96 | 7.8 | (1.7) | | 52 | 7.8 | (1.5) | | $t (146) = 0.112$ | 0.911 |
| Knowledge | 96 | 2.6 | (1.3) | | 53 | 2.3 | (1.5) | | $t (147) = 1.369$ | 0.173 |
| Professional efficacy | 96 | 15.2 | (6.5) | | 52 | 14.7 | (6.9) | | $t (146) = 0.474$ | 0.636 |
| Psychological distress | 95 | 37.2 | (9.5) | | 53 | 40.6 | (8.7) | | $t (146) = -2.180$ | 0.031 |
| Physical complaints | 95 | 16.8 | (5.3) | | 53 | 19.3 | (6.3) | | $t (146) = -2.516$ | 0.013 |
| Job performance | 96 | 6.1 | (2.0) | | 53 | 5.9 | (2.2) | | $t (147) = 0.478$ | 0.633 |

^aThe numbers of subjects varies for some variables because of missing data.

Table 2. Pearson inter-correlations of the study variables

| Variables | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 |
|--------------------------------|-------|---------|----------|----------|---------|----------|---------|---------|----------|---------|---------|---------|
| 1. Knowledge (T1) | - | 0.17 | -0.04 | 0.13 | 0.20 | -0.12 | 0.62*** | 0.18 | -0.09 | 0.10 | 0.16 | -0.09 |
| 2. Professional efficacy (T1) | 0.17 | - | -0.03 | -0.04 | 0.69*** | 0.15 | 0.00 | 0.86*** | -0.08 | -0.03 | 0.56*** | 0.22 |
| 3. Psychological Distress (T1) | 0.08 | -0.01 | - | 0.53*** | -0.08 | -0.13 | -0.10 | 0.08 | 0.82*** | 0.42** | -0.07 | -0.01 |
| 4. Physical complaints (T1) | 0.04 | -0.15 | 0.59*** | - | 0.03 | -0.09 | -0.08 | -0.07 | 0.47*** | 0.83*** | -0.08 | -0.07 |
| 5. Job performance (T1) | 0.21* | 0.57*** | -0.23* | -0.17† | - | 0.32* | -0.03 | 0.62*** | -0.19 | 0.11 | 0.72*** | 0.41** |
| 6. Job control (T1) | 0.15 | 0.24* | -0.37*** | -0.40*** | 0.38*** | - | 0.05 | 0.13 | -0.20 | -0.01 | 0.29* | 0.83*** |
| 7. Knowledge (T2) | 0.14 | -0.02 | -0.11 | -0.22* | 0.14 | 0.19† | - | 0.03 | -0.05 | 0.02 | 0.05 | -0.02 |
| 8. Professional efficacy (T2) | 0.12 | 0.80*** | 0.01 | -0.03 | 0.56*** | 0.30** | -0.02 | - | 0.00 | 0.05 | 0.71*** | 0.22 |
| 9. Psychological Distress (T2) | -0.02 | -0.16 | 0.73*** | 0.48*** | -0.32** | -0.44*** | -0.09 | -0.19† | - | 0.46*** | -0.22 | -0.17 |
| 10. Physical complaints (T2) | -0.13 | -0.06 | 0.49*** | 0.74*** | -0.16 | -0.38*** | -0.21* | -0.05 | 0.53*** | - | 0.00 | -0.02 |
| 11. Job performance (T2) | 0.20† | 0.40*** | -0.20† | -0.22* | 0.63*** | 0.39*** | 0.16 | 0.54*** | -0.35*** | -0.25* | - | 0.39** |
| 12. Job control (T2) | 0.21* | 0.26** | -0.30** | -0.23* | 0.31** | 0.72*** | 0.08 | 0.28** | -0.40*** | -0.28* | 0.35*** | - |

Intervention group below diagonal (n=96) and control group above diagonal (n=53). †p<0.10, *p<0.05, **p<0.01, ***p<0.001.

Table 3. Comparison of the change of scores (T2-T1) between groups by ANCOVA with T1 score, quantitative demand, and qualitative demand as covariates

| Variables | n ^a | Intervention group | | n | Control group | | F value | Cohen's <i>d</i> |
|------------------------------------|----------------|------------------------|------------|----|---------------|------------|-----------|------------------|
| | | T1 | T2 | | T1 | T2 | | |
| | | Mean ^b (SD) | Mean (SD) | | Mean (SD) | Mean (SD) | | |
| Intention-to-treat analyses | | | | | | | | |
| Knowledge | 96 | 2.6 (1.3) | 4.1 (1.6) | 53 | 2.3 (1.5) | 2.5 (1.3) | 32.929*** | 0.80 |
| Professional efficacy | 96 | 15.2 (6.5) | 15.6 (6.3) | 52 | 14.7 (6.9) | 13.7 (7.0) | 3.246† | 0.31 |
| Psychological distress | 95 | 37.2 (9.5) | 36.0 (8.2) | 53 | 40.6 (8.7) | 39.5 (8.7) | 1.296 | -0.02 |
| Physical complaints | 95 | 16.8 (5.3) | 16.5 (5.5) | 53 | 19.3 (6.3) | 18.5 (6.2) | 0.007 | 0.11 |
| Job performance | 96 | 6.1 (2.0) | 6.3 (2.0) | 53 | 5.9 (2.2) | 5.9 (2.2) | 0.800 | 0.37 |
| Per-protocol analyses | | | | | | | | |
| Knowledge | 44 | 2.7 (1.2) | 4.5 (1.4) | 53 | 2.3 (1.5) | 2.5 (1.3) | 49.603*** | 1.15 |
| Professional efficacy | 44 | 16.1 (7.0) | 16.5 (5.8) | 52 | 14.7 (6.9) | 13.7 (7.0) | 4.888* | 0.30 |
| Psychological distress | 44 | 40.0(10.3) | 36.8 (7.9) | 53 | 40.6 (8.7) | 39.5 (8.7) | 3.973* | -0.33 |
| Physical complaints | 44 | 18.0 (5.9) | 18.0 (6.5) | 53 | 19.3 (6.3) | 18.5 (6.2) | 0.489 | 0.16 |
| Job performance | 44 | 6.1 (2.0) | 6.6 (2.0) | 51 | 5.9 (2.2) | 5.9 (2.2) | 3.755* | 0.33 |

^aThe numbers of subjects varies for some variables because of missing data. ^bUnadjusted Mean. †Small effect 0.20-0.49, medium effect 0.50-0.79, large effect >0.80 (Cohen, 1992). †p<0.10, *p<0.05, **p<0.01, ***p<0.001.

completers from the intervention group who participated in the all six sessions and responded to both T1 and T2 surveys, and 53 participants from the control group who responded to both the T1 and T2 surveys. In the per-protocol analyses, favorable intervention effects were observed on psychological distress ($F=3.973$, $df=1$, 92 , $p=0.049$) and job performance ($F=3.755$, $df=1$, 90 , $p=0.047$), in addition to knowledge ($F=49.603$, $df=1$, 92 , $p<0.001$) and professional efficacy ($F=4.888$, $df=1$, 91 , $p=0.030$). No significant effect was observed on physical complaints ($p>0.05$).

Subgroup analysis

In the subgroup analysis by job control at T1, a significantly favorable intervention effect was found only on knowledge about stress ($F=16.345$, $df=1$, 59 , $p<0.001$) among those with low levels of job control at T1. On the other hand, significant favorable intervention effects were found on professional efficacy ($F=5.407$, $df=1$, 79 , $p=0.023$) and anxiety ($F=4.733$, $df=1$, 80 , $p=0.033$), as well as on knowledge about stress ($F=20.227$, $df=1$, 80 , $p<0.001$) among those with high levels of job control at T1.

Discussion

The main purpose of this study was to evaluate the effects of a multi-component worksite SMT program on knowledge about stress, self-efficacy, psychological distress, physical complaints, and job performance. In the intervention group, 89 participants (92.7%) attended more than half of the program sessions, although 52 participants could not attend all-six sessions. Since the reasons for absence were business trips, personnel changes, or machine trouble, the somewhat low retention rate may not have been due to the content /format of the program, suggesting that the program itself seems to have been well accepted by the participants.

A favorable significant intervention effect was observed on knowledge about stress and a marginally significant effect on professional efficacy was also seen as a primary outcome in the ITT analyses. A favorable effect was not observed for all items of the professional efficacy scale. However, the three items with significant intervention effects were concerned with self-efficacy in specific job situations or specific behaviors, such as self-efficacy in problem solving at work, which may be sensitive to change by SMT, whereas the non-significant items dealt with more general situations at work, which may take a long time to change. In the present SMT program, the use of self-help worksheets may have helped participants learn about stress and practice the skills they learned. A 30-min SMT program may hold promise for providing basic knowledge on stress and enhancing psychological resources (e.g., professional efficacy) among workers, because it is easy to implement in

practice.

In the ITT analyses, no significant intervention effects were found on any secondary outcomes such as psychological distress, physical complaints, or job performance, whereas a marginally significant intervention effect was observed for anxiety. The findings are in concordance with those of previous studies which reported longer time sessions in multi-component worksite SMTs (e.g., taking 50 min per session) were effective at decreasing anxiety among participants²⁰. The present study further suggests that even 30-min short-time SMT sessions decrease anxiety among participants. A significant favorable effect was observed on psychological distress and job performance, as well as knowledge about stress and professional efficacy, in the per-protocol analysis only for completers of all six sessions. Less than half of the initial participants completed the entire program in the present study. van der Klink *et al.*³ mentioned in their meta-analyses that at least six sessions were needed to achieve favorable effects on health outcomes; otherwise, favorable effects were limited to knowledge and professional efficacy. The present intervention program may be more effective when participants complete all sessions. In future studies, an additional technique (such as an initial motivational session or a reinforcement of adherence in each session) could be incorporated to keep participants in the program. However, caution is advised because in the per-protocol analyses there may be a bias due to drop-outs. It is possible that only participants who perceive a favorable effect due to the program remain in the program.

Another possible explanation for the lack of significant intervention effects on the secondary outcomes is the short follow-up period. Previous studies have shown that when coping-skill training is included in the SMT program, the program may not produce a favorable change within a short-term follow-up period^{10, 12}. For instance, Lindquist and Cooper¹² provided a coping skills training program consisting of four weekly sessions and found that the program did not produce effects on job stress at eight weeks after the program, but it did so at 12-wk follow-up. In a similar vein, Gardner, Rose, Mason, Tyler, and Cushway²⁸ provided a cognitive-behavioral training program consisting of three weekly sessions and reported a significant reduction in psychological distress at the 12-wk follow-up, but not immediately after the intervention. In addition, since health outcomes are expected to be more stable than coping skills, a longer follow-up is probably required to identify an effect on health outcomes²⁸. In a future study, the follow-up should be extended to 12 wk at least³ to show the effectiveness of the SMT program on secondary outcomes.

The additional analyses revealed that, regardless of the extent of job control, participants acquired the knowledge about stress through participating in the SMT program.

However, more favorable effects were found particularly on professional efficacy and anxiety among those with an initially high extent of job control. This finding is consistent with those of previous studies^{3, 29)}, indicating that job control had a moderating role on intervention effects of SMTs. Higher job control may allow participants to apply acquired skills more effectively in their workplace, which may lead to improved professional efficacy and decreased anxiety. On the other hand, lower job control may not provide participants with enough opportunities to apply their acquired knowledge and skills, which may inhibit the favorable intervention effects. The combination of SMTs and a work environment-oriented approach to increase job control, such as work environment improvement activities, may hold promise.

The results of this study should be interpreted with caution because of several limitations. First, the study design was neither blind nor randomized, which might have introduced bias to the outcomes reported by participants and a confounding bias due to unknown confounders. The baseline comparisons indicate that the degree of qualitative and quantitative demands, psychological distress, and physical complaints were lower in the intervention group compared to the control group. Therefore, employees in the intervention group may have had low resistance to and been more ready to participate in the program, leading to over estimation of intervention effects³⁰⁾. Second, all participants were employees working in the steel plants and consisted mainly of men. Therefore, the present findings may not be applicable to the general working population. Third, we could not get information about homework completion rates by participants in the intervention group. The extent of homework completion may have had some influence on the intervention effects. Fourth, the study relied on self-report information. Objective outcome measures such as sickness absence, observed job performance, or physiological parameters, were not available. Finally, some outcome measures may not have been sensitive to change by the SMT program. For instance, professional efficacy was measured at a more general level (i.e., we asked participants how confident they were in dealing with their daily jobs), which may be stable over time and difficult to change. A scale should be developed including items referring to specific work situations in order to detect the effect of an SMT program.

Conclusion

Despite the limitations, the present controlled trial showed that a multi-component SMT program, consisting of six sessions of 30 min each, increased knowledge on stress and enhanced professional efficacy among participants. The SMT may also be effective at reducing psychological distress and increasing job performance if

participants complete all sessions. 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 stress management skills.

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