Effects of Mailed Advice on Stress Reduction among Employees in Japan: A Randomized Controlled Trial

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Abstract: We conducted a randomized controlled trial (RCT) to examine the effects of mailed advice on reducing psychological distress, blood pressure, serum lipids, and sick leave of workers employed in a manufacturing plant in Japan. Those who indicated higher psychological distress (defined as having GHQ scores of three or greater) in the baseline questionnaire survey (n=226) were randomly assigned to an intervention group or a control group. Individualized letters were sent to the subjects of the intervention group, informing them of their stress levels and recommending an improvement in daily habits and other behaviors to reduce stress. Eighty-one and 77 subjects in the intervention and control groups, respectively, responded to the one-year follow-up survey. No significant intervention effect was observed for the GHQ scores, blood pressure, serum lipids, or sick leave (p>0.05). The intervention effect was marginally significant for changes in regular breakfasts and daily alcohol consumption (p=0.09). The intervention effect was marginally significant for the GHQ scores among those who initially did not eat breakfast regularly (p=0.06). The study suggests that only sending mailed advice is not an effective measure for worksite stress reduction. Mailed advice which focuses on a particular subgroup (e.g., those who do not eat breakfast regularly) may be more effective.

Key words: Stress reduction, Breakfast, Mental health, Health education, Intervention study

Introduction

It has been recognized that job stress has adverse effects on worker health and welfare, as well as a huge impact on medical costs and work performance1). Worksite stress reduction programs include the work-environment or organization-oriented approach, focusing on the improvement of a stressful work environment, and the individual-oriented approach, which aims to enhance the coping ability of individual employees2). In general, more worksite stress...
reduction programs have used an individual-oriented approach\(^7\). There is some evidence that an individual-oriented program is effective for reducing coronary heart disease (CHD) risk factors\(^3\), although a review of international studies\(^4\) suggests that the effect of the individual-oriented approach is often transient and rather weak.

There is accumulated evidence that improving daily habits and other behavior patterns are important for reducing psychological distress. Exercise has been associated with lower levels of depression or psychological distress in previous studies\(^5-10\); a clinical intervention trial has suggested that exercise is effective in reducing depression\(^11\). Other daily habits, such as eating breakfast regularly\(^6,9\) and getting a balanced diet\(^8\), have also been associated with lower psychological distress. Furthermore, it has been reported that those who consume alcohol every day while depressed are more likely to remain depressed\(^12\). The modification of type A behavior is also suggested as a measure of stress management since the behavior pattern has been linked to CHD and greater psychological distress\(^13\). Information dissemination and education for changing these behaviors may be useful for reducing stress and improving the mental and physical health of employees. Furthermore, the importance of being aware of stress is broadly emphasized in the literature\(^14,15\).

Individualized mailed advice based on responses to a self-reported questionnaire is one of the popular programs for worksite stress reduction, provided either commercially or by a corporate medical staff\(^16\). In this type of program, employees are informed of their stress profiles and advised to act to reduce their stress levels by changing daily habits or behavioral patterns. However, the effects of individualized mailed advice on stress reduction have not been assessed in a controlled study. In the present study, we conducted a randomized controlled trial (RCT) to examine the effects of individualized mailed advice on reducing psychological distress, blood pressure, serum lipids, and sick leave of employees in a manufacturing plant in Japan.

**Subjects and Methods**

**Subjects**

In October 1993, a baseline survey was conducted of all men and women (n=756) employed in a manufacturing plant in Japan, using a mailed questionnaire including the 12-item General Health Questionnaire (GHQ)\(^16\), a health risk appraisal (HRA) questionnaire\(^17\), and questions on other variables relevant to this study. Among the 706 who completed the GHQ, 226 (32%) were found to have psychological distress, defined as having a GHQ score of three or greater. These subjects were randomly assigned to an intervention group (n=113) or a control group (n=113). After making the assignments, we further excluded those who had missing responses on sex, age, other questionnaire scales, or health check-up data, which reduced the number of baseline subjects to 91 for the intervention and 88 for the control group. In March 1994, mailed advice for stress reduction, as well as HRA results on cardiovascular risks, were sent to each subject of the intervention group. Only the HRA results were sent to subjects in the control group. A follow-up survey was conducted of these subjects in October 1994 (one year after the baseline survey and seven months after the mailed advice) using a mailed questionnaire, including the GHQ. Respondents of the follow-up survey were 81 (66 men and 15 women) and 77 (62 men and 15 women) for the intervention and control groups, respectively. The follow-up rate was 89% and 88%, respectively, and the average age was 36 years (standard deviation, SD, 13) and 35 years old (SD 13), respectively. However, health check-up data at follow-up were available for only 48 subjects (42 men and 6 women, average age 46) in the intervention group and 45 subjects (39 men and 6 women, average age 44) in the control group. These subjects constituted 53% and 51% of the baseline subjects in the respective intervention and control groups. This was mainly because the company changed the schedule for periodic health checkups.

**Measures**

The baseline questionnaire included the following scales/questions: the 12-item GHQ, a type A behavior scale, a leisure-time physical activity scale, and questions on eating breakfast regularly, eating green vegetables, and drinking alcohol. Psychological distress was measured by the GHQ score, ranging from 0 to 12. Type A behavior was assessed using a 13-item scale which was originally used in the MONICA Psychosocial Optional Study and translated into Japanese by Uehata\(^18\). The total score was used as an indicator of type A behavioral tendencies. Frequency of leisure-time physical activity was assessed using an original scale, which first asked the subjects to name up to three exercises or sports they had participated in during the past year. The subjects were then asked to tell how many times per month they had done these activities during the year. Information on alcohol consumption was requested in terms of average frequency of drinking per month during the past...
year. Blood pressure, total serum cholesterol, and serum triglycerides were measured at the periodic health check-up, which was conducted within a month of the baseline or follow-up questionnaire survey.

**Intervention**

Mailed advice for stress reduction was sent to each subject in the intervention group, under the name of an occupational physician of the factory. It was written on A4-sized paper and consisted of individualized messages for each subject on the basis of his/her own responses to the questionnaire in the baseline survey. On the mailed advice, each subject was told a normalized score of his/her GHQ score in a whole sample at the baseline survey, showing his/her levels of psychological distress and recommending him/her to reduce it. Those who had no leisure-time physical activity (70%) were recommended to exercise or participate in sports. As an indicator of nutritional balance, we looked at the frequency of green vegetable intake. Those who did not often eat green vegetables (47%) were recommended to eat them more. Those who did not eat breakfast regularly (21%) were encouraged to do so. Those who consumed alcohol every day (25%), were advised to reduce their frequency of drinking in order to recover faster from psychological distress. For those who indicated a type A score of 21 or greater (27%), a brief description of type A behaviors and "time out" techniques to control these behaviors were introduced: (1) counting to 10 before speaking; (2) consulting someone else about what you are going to do before doing it; (3) waiting overnight to make an important decision; and (4) using a relaxation technique. A relaxation technique was briefly introduced to all subjects in the intervention group. Other than the mailed advice, we did not provide any individual follow-up counseling or group sessions for stress reduction.

**Evaluation**

The effects of the intervention were evaluated by comparing indicators of the intervention and control groups at baseline and at follow-up. The indicators included the GHQ score, systolic and diastolic blood pressures, total serum cholesterol, serum triglycerides, and sick leave in the past year. Also included were leisure-time physical activity (none/any), eating breakfast (not regularly/regularly), green vegetable intake (not often/often), and alcohol consumption (not daily/daily) as mediating variables of stress reduction. Analysis of variance (ANOVA) with repeated measurements was used to test the statistical significance of the intervention (time x group) effect on each of these indicators, except for sick leave. For sick leave, physical activity, alcohol drinking, and regular meals, the statistical significance of the intervention (group x time) effect was tested by the CATMOD procedure of the SAS release 6.11 for a PC.

**Results**

The intervention effect on the GHQ score was not significant (Table 1). While the GHQ scores significantly decreased in both the intervention and control groups at follow-up compared with baseline (p<0.001), no difference was shown in the GHQ scores between the two groups at baseline or at follow-up (p>0.05). The intervention effect was not significant for systolic or diastolic blood pressure, total serum cholesterol, or serum triglycerides (Table 1). The intervention effect was not significant for sick leave (Table 2).

The intervention effect was marginally significant for eating breakfast regularly (Table 2); the proportion of those eating breakfast regularly increased in the intervention group, while it remained unchanged in the control group. The intervention effect was also marginally significant but in an unexpected direction for alcohol consumption: the proportion of everyday drinkers was unchanged in the intervention group, while it decreased in the control group. No significant effect of the intervention was observed for leisure-time physical activity or green vegetable intake.

The intervention effect was not significant (p>0.05) on any indicator in any analysis for subgroups classified by sex, age (34 years or younger/35 years or older), type A behavior scores (0–20/21+), leisure-time physical activity (none/any), alcohol drinking (not daily/daily) or green vegetable intake (not often/often). The intervention effect on the GHQ was marginally significant (p=0.06) among those who initially did not eat breakfast regularly (n=17 and 18 for the intervention and control groups, respectively): average GHQ scores (the SDs) were 5.9 (2.6) and 2.9 (2.6) at baseline and at follow-up, respectively, for the intervention group. They were 5.1 (2.2) and 4.1 (2.3), respectively, for the control group. All the results were similar in ANOVA and CATMOD analyses even after controlling for sex and age as covariants.

**Discussion**

This study examined the effects of individualized mailed advice on stress reduction among company employees, using a randomized controlled trial (RCT) design. The study failed
to find any significant effect of the intervention (the mailed advice) on psychological distress measured using the GHQ, blood pressure, serum lipids, or sick leave. The findings suggest that individualized mailed advice is not effective for reducing psychological or physiological stress among Japanese employees who have high psychological distress.

The GHQ scores clearly decreased at follow-up in the intervention and control groups, but no difference was observed between these two groups. This is attributable to the "regression to the means"\(^{21}\), since we initially selected those who had higher psychological distress. This is also attributable to the natural course of psychological distress, as reported by previous studies which indicated that half of those who were initially depressed recovered by the one-year follow-up without any intervention or medication\(^{22, 23}\).

Table 1. Psychological distress (GHQ score), blood pressures and serum lipids in the intervention (n=81) and control (n=77) groups at baseline and one-year follow-up in a randomized control trial on effects of mailed advice on stress reduction among employees in Japan: mean with standard deviation (S.D.) in the parentheses§

<table>
<thead>
<tr>
<th>Variable</th>
<th>At baseline</th>
<th>At follow-up</th>
<th>Intervention effect*</th>
</tr>
</thead>
<tbody>
<tr>
<td>GHQ score</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>5.5 (2.4)</td>
<td>3.5 (2.9)</td>
<td>p=0.164</td>
</tr>
<tr>
<td>Reference</td>
<td>5.0 (2.2)</td>
<td>3.6 (2.5)</td>
<td></td>
</tr>
<tr>
<td>Systolic blood pressure, mmHg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>127.6 (16.0)</td>
<td>121.4 (16.4)</td>
<td>p=0.933</td>
</tr>
<tr>
<td>Reference</td>
<td>124.4 (13.6)</td>
<td>118.4 (13.0)</td>
<td></td>
</tr>
<tr>
<td>Diastolic blood pressure, mmHg</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>78.3 (10.2)</td>
<td>76.5 (11.5)</td>
<td>p=0.314</td>
</tr>
<tr>
<td>Reference</td>
<td>77.6 (10.5)</td>
<td>73.8 (12.0)</td>
<td></td>
</tr>
<tr>
<td>Total serum cholesterol, mg/dl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>205.0 (32.4)</td>
<td>204.1 (33.3)</td>
<td>p=0.234</td>
</tr>
<tr>
<td>Reference</td>
<td>195.0 (30.6)</td>
<td>199.6 (32.3)</td>
<td></td>
</tr>
<tr>
<td>Serum triglycerides, mg/dl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intervention</td>
<td>169.6 (135.5)</td>
<td>130.4 (89.8)</td>
<td>p=0.488</td>
</tr>
<tr>
<td>Reference</td>
<td>141.2 (136.4)</td>
<td>117.7 (77.8)</td>
<td></td>
</tr>
</tbody>
</table>

*Intervention (group*time) effect based on analysis of covariance with repeated measurements. §Data on blood pressure and serum lipids were available only for 44 and 41 subjects of the intervention and control groups, respectively.

Table 2. Sick absence days in the past year and selected daily health habits in the intervention (n=81) and control (n=77) groups at baseline and one-year follow-up: number with percentage in the parentheses

<table>
<thead>
<tr>
<th>Variable</th>
<th>Intervention group</th>
<th>Reference group</th>
<th>Intervention effect*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sick absence days in the past year</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>None</td>
<td>26 (32)</td>
<td>24 (31)</td>
<td>29 (38)</td>
</tr>
<tr>
<td>1-4 days</td>
<td>31 (38)</td>
<td>26 (34)</td>
<td>29 (38)</td>
</tr>
<tr>
<td>5 days+</td>
<td>24 (30)</td>
<td>27 (35)</td>
<td>19 (25)</td>
</tr>
<tr>
<td>Leisure-time physical activity (none)</td>
<td>57 (70)</td>
<td>64 (83)</td>
<td>59 (77)</td>
</tr>
<tr>
<td>Breakfast (not regularly)</td>
<td>17 (21)</td>
<td>18 (23)</td>
<td>20 (26)</td>
</tr>
<tr>
<td>Green vegetable intake (not often)</td>
<td>38 (47)</td>
<td>39 (51)</td>
<td>34 (44)</td>
</tr>
<tr>
<td>Drinking (everyday)</td>
<td>20 (25)</td>
<td>18 (23)</td>
<td>13 (17)</td>
</tr>
</tbody>
</table>

*Intervention (group*time) effect based on generalized logit analysis with repeated measurements (d.f.=2 for sick absence days; d.f.=1 for others).
EFFECTS ON STRESS REDUCTION

control groups, it was possible that some subjects in the intervention and control groups worked at the same workplaces and talked to each other about the mailed advice received by the intervention subjects. If information included in the mailed advice was shared with the control subjects, the effects of the intervention could be less clear. However, we only informed a subject in the intervention group that he/she had a higher level of psychological distress, encouraging him/her to make an effort to reduce stress. This was an essential part of the intervention and the findings still seem to indicate that this approach had no clear effect. This type of problem may be minimized in a future study if subjects are recruited from a broader sample in different workplaces.

The intervention effects on blood pressure, serum lipids, or sick days were not significant. However, several methodological problems existed in the assessment of these indicators. Blood pressure, total serum total cholesterol, and serum triglycerides were measured only for half of the baseline subjects at follow-up. A possible attrition bias and a smaller number of subjects might result in a less clear effect of the intervention. Sick days “in the past year” were assessed in this study, which means that sick days assessed at follow-up possibly included sick leave occurring before the mailed advice was sent. This may reduce the ability to detect the intervention effects on sick leave. Thus, we should be careful to conclude no clear effects of the mailed advice on reducing these physiological indicators and sick leave.

However, although they are only marginally significant, the results suggest that the intervention is at least effective in increasing the proportion of those who eat breakfast regularly. Among those who did not eat breakfast regularly at baseline, the GHQ scores decreased in the intervention group. Eating breakfast regularly to reduce stress may be acceptable, feasible advice for employees, by which in turn psychological distress may be reduced. This is consistent with previous findings on the association between regular breakfast and lower psychological distress in observational studies\(^7,8\), although the underlying mechanism is still unclear. On the other hand, the proportion of everyday drinkers slightly increased in the intervention group. Despite our advice, increased awareness of stress may have caused the subjects to drink more in order to cope with their knowledge. No intervention effect was observed on leisure-time physical activity or vegetable consumption. This suggests that the mailed advice failed to motivate the subjects to change their leisure-time physical activity or green vegetable intake. Our findings do not necessarily imply that physical activity or green vegetable intake is not associated with lower psychological distress.

Our study suggests that only sending individualized mailed advice to employees is not an effective measure for worksite stress reduction. An approach focusing on a particular subgroup, e.g., those who do not eat breakfast regularly, may be more effective. Previous experiences in health education have suggested that a combination of individual counseling and group education with individualized written advice is most effective\(^24,25\). Follow-up individual counseling or group education may improve the efficacy of the mailed advice to change daily habits and thus reduce stress. Further study is needed to examine the effects of such an intensive stress reduction program.

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