Short Communication

Effects of a Structured Stress Management Program on Psychological and Physiological Indicators among Marine Hazard Rescues

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Key words: Mental health, Stress, Relaxation training, Rescue, NK cell activity

Acute stress disorder, post-traumatic stress disorder, depression and anxiety disorder are well-documented consequences of disasters and accidents^{1–3}. Moreover, rescuers have various stresses in daily work including those associated with training⁴. We have investigated the physical and mental states of marine hazards rescue services in Japan for 6 yr. Their daily responsibilities, including dispatch and training, were physically and mentally burdensome. There might be a risk of health impairment, but this cannot be avoided because of the demanding work needed to conduct rescues.

It is possible to change the ability to cope with stress by education and training^{5,6}. Two stress management programs, a “Structured stress management Program” composed of psycho-education, group discussion and relaxation training, and a “psycho-education program only”, were devised as strategies for promoting more efficient work considering safety and for upgrading competence to carry out rescues. The effects of these programs were evaluated.

Received Jan 13, 2004; Accepted Sep 17, 2004

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Subjects and Methods

Subjects

The subjects were marine hazard rescue service personnel (28 men), all persons belonging to a public agency (not civilian). Their main responsibility was to handle various marine disasters and accidents, such as saving people from hulls and overturned ships by coming down from a helicopter, and handling fires and explosions on ships loading dangerous objects, searching for victims, and so on. They have been divided into 5 groups. Each group consisted of 5–6 persons.

The assessments and intervention programs (Fig. 1.)

Before the intervention, we told to all subjects that the stress management program would be carried out. Consent was obtained after the research purpose and the research procedure were explained. 5 work groups were randomly divided into 2 intervention groups. The “Structured Stress Management Program”^{7,8} was applied to three groups, 17 persons (Group A). It involved psycho-education focusing on themes related to stress, group discussion on these themes, relaxation training, autogenic training with recorded BGM and narration describing progressive muscle relaxation for 13 min. Only psycho-education focusing on stress was provided to the other 2 groups (Group B). The programs involved a series of five weekly 90-min sessions. We used three psychological inventories, i. e., Profile of Mood States (POMS), General Health Questionnaire–30 (GHQ), and the Hospital Anxiety and Depression Scale (HAD). POMS measures the state of temporary feelings. GHQ is a screening test for neurosis. HAD assesses anxiety and depression conditions other than physical symptoms. The reliability and validity of the Japanese edition of these tests have already been confirmed^{9–11}. These tests were administered at the beginning of the first session (baseline), in a week after the last session (post-intervention), and again 3 months after intervention (from 10 a.m. to noon). Blood samples for Natural Killer (NK) cell activity were also collected at these times. NK cell activity was determined by ⁵¹Cr release assay, as the means of E/T ratios at 10:1 and 20:1. The investigation

Structured Stress Management Program

Psycho-education and group discussion (77 min)	Relaxation training (13 min)
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Psycho-education Program

Psycho-education (90 min)

Fig. 1. Composition of 2 stress management programs.

Table 1. Characteristics of the subjects

	Group A	Group B
Number	15	11
Age (yr)	29.6 ± 3.4	30.1 ± 3.3
Duration of service (yr)	10.1 ± 2.6	11.8 ± 2.8
Duration of rescue (yr)	4.5 ± 2.1	4.7 ± 1.8
Marriage	married=12 single=3	married=11 single=0

period was from May to October of 2000.

Statistical analysis

We used SPSS for statistical analysis. The differences between subscale scores at baseline, post-intervention, and 3 months after were analyzed by repeated ANOVA.

The characteristics of the subjects (Table 1)

All subjects completed 5 sessions. Two persons (who were in Group A) dropped out of this study because of hospitalization or overseas dispatch. A feature was that in the single persons anxiety scales in POMS and HAD were higher than in the married persons. There were no significant differences between the 2 groups in background characteristics or any index in inventories.

Results

Changes in mental health with intervention (Table 2)

Compared with the baseline and post-intervention, in comparing the 2 groups, the D scale in HAD improved significantly in Group A ($p<0.05$) and NK cell activity at an E/T ratio of 10:1 decreased in Group B ($p<0.05$). In comparing the post-intervention value with those at 3

months later, there was no significant change between the 2 groups in any scale. In comparing the baseline and 3 months later values, NK cell activity in Group A increased more than in Group B ($p<0.01$).

Discussion

HAD scores were high. In particular, more than half of the subjects exceeded the A scale in the HAD cut-off point for major depression. Rescuers understand that catastrophic situations can result from even small errors, and it has already been reported that rescuers sense extreme anxiety¹²⁾, and the subjects might have the same sense.

Compared with the baseline and post-intervention data, the D scale fluctuation in HAD was better in Group A than in Group B. In Group B, NK cell activity dropped. About the time of the fifth session, the Miyakejima Island earthquake began and dispatch standby was requested. The Okinawa summit was also scheduled for immediately thereafter. These were rare cases, so that physical and mental loads were heavy at that time, but subjective health was improved in Group A. Many reports state that NK cell activity is related to mental health. In Group B only, NK cell activity as an objective index diminished. We speculate that the lowering of NK cell activity was suppressed in Group A. In brief, the short-term effect of the program of Group A improved, especially the depression, and effectively maintained NK cell activity. In comparing data at the baseline and after 3 months, NK cell activity in both groups had a tendency to improve. And as compared with Group B, it increased greater in Group A. According to the questionnaire, 11 out of 15 persons in Group A carried out acquired relaxation training after the intervention. Thus, NK cell activity gradually improved and showed a long-term effect. Progressive muscle relaxation and autogenic training, as

Table 2. Changes in mental health with intervention

	Group A baseline	post-intervention	3 months after	Group B baseline	post-intervention	3 months after
HAD						
Depression (D)	5.7 ± 4.3	4.9 ± 3.7	4.9 ± 4.0	5.2 ± 2.9	7.2 ± 4.4*	5.8 ± 3.6
Anxiety (A)	8.3 ± 3.2	7.0 ± 3.8	6.5 ± 2.4	7.2 ± 3.1	6.8 ± 2.9	7.7 ± 2.8
Total (A+D)	13.9 ± 6.9	11.9 ± 6.7	11.4 ± 5.9	12.4 ± 5.6	14.0 ± 6.9	13.5 ± 5.5
NK cell activity (%)						
10:1	17.2 ± 9.3	16.9 ± 11.1	25.4 ± 14.1	18.8 ± 8.5	12.3 ± 7.4*	16.7 ± 9.9##
20:1	28.8 ± 14.1	26.9 ± 15.8	41.1 ± 19.8	31.1 ± 13.3	23.0 ± 13.0	28.1 ± 14.9#

mean ± S.D.

Compared Group A with Group B, *Compared baseline and post-intervention or post-intervention and 3 month later, $p<0.05$, ** $p<0.01$, #Compared baseline and 3 months later, # $p<0.05$, ## $p<0.01$

part of the relaxation training, are effective not only for relaxation of mind and body but also for improving the autotherapy force, self normalization function of the brain and recovery of autonomic nerve balance, as well as being useful for recovery from physical fatigue¹³⁾. NK cell activity also increased for this reason.

Education has been believed to be effective for reducing the burden of depressive symptoms^{5, 6)} but this view was contested in this study. Although the power to resist the loads might be slightly increased, stress that cannot be eliminated would accumulate without reduction. Thus, it is insufficient for these individuals and they need practical methods for reducing stress.

In short, this method made it possible to improve the health care abilities and the stress coping abilities of Group A individuals. This improvement is useful for making preparations to carry out their work under heavy physical and mental loads, utilizing maximal personal abilities, and for promoting efficient work, considering safety. Nevertheless, actual effectiveness could not be demonstrated in this study, since there was no complete control group, i.e., with no intervention. And there were only 28 persons who could be the subjects of this study in Japan. So we cannot statistically analyze with a sufficient number. We think this is a limitation of this study. In the future, therefore, a comparison must be made with an appropriate control group receiving no intervention. This would allow much more precise evaluation of the effects. An intervention method accounting for the characteristics and level of the subjects, more accurately, also needs to be developed. It will be possible to identify a strategy for improving mind and body functions so as to enhance the competence of rescue workers.

Conclusions

We investigated the mental health of rescue workers in Japan, and evaluated two intervention programs. There was significant improvement and maintenance of the improvement in HAD and NK cell activity when subjects were assessed at baseline, post-intervention and 3 months after completion of the program in Group A. These results indicate that the "Structured stress management Program" is effective in managing the stress of rescuers and

improving their competence in rescue work.

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