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Abstract

This study examined the effects of relaxation training on salivary IgA (s-IgA) and mood state in Japanese female medical workers. Participants were enrolled and assigned to relaxation or control groups. The relaxation group Japanese female medical workers (n = 38, mean age = 33.5 years, SD = 9.6) participated in a lecture on stress for 1 h and had 10 min of relaxation training. The control group (n = 41, mean age = 35.0 years, SD = 8.6) participated in only the lecture. S-IgA was measured, and a self-report mood questionnaire administered before the lecture and then again after the relaxation training for the relaxation group. The control group was measured before and after the lecture. The results showed that s-IgA levels significantly increased after relaxation training in the relaxation group compared with the control group (p = 0.03). A marginally significant intervention effect was observed for mood state (p = 0.06) ; indicating that the relaxation group was more likely to reduce any fatigue and confusion than was the control group. These findings suggest that short-time relaxation training is effective in relaxing mood and causes changes in immunological function.

KEYWORDS: relaxation training, immediate eff ects, female medical co-workers, salivary immunoglobulin A

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Original Article

The Immediate Effects of 10-minute Relaxation Training on Salivary Immunoglobulin A (s-IgA) and Mood State for Japanese Female Medical Co-workers

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This study examined the effects of relaxation training on salivary IgA (s-IgA) and mood state in Japanese female medical workers. Participants were enrolled and assigned to relaxation or control groups. The relaxation group Japanese female medical workers (n = 38, mean age = 33.5 years, SD = 9.6) participated in a lecture on stress for 1 h and had 10 min of relaxation training. The control group (n = 41, mean age = 35.0 years, SD = 8.6) participated in only the lecture. S-IgA was measured, and a self-report mood questionnaire administered before the lecture and then again after the relaxation training for the relaxation group. The control group was measured before and after the lecture. The results showed that s-IgA levels significantly increased after relaxation training in the relaxation group compared with the control group ($p = 0.03$). A marginally significant intervention effect was observed for mood state ($p = 0.06$); indicating that the relaxation group was more likely to reduce any fatigue and confusion than was the control group. These findings suggest that short-time relaxation training is effective in relaxing mood and causes changes in immunological function.

Key words: relaxation training, immediate effects, female medical co-workers, salivary immunoglobulin A

Co-medical staff are highly stressed. Working as medical secretaries, registered nurses and assistant nurses, pharmacists, physiotherapists, occupational therapists, and dietitians is generally physically heavy work. Burnout and occupational stress factors among co-medical staff have been explored in many studies [1–3]. There is a discrepancy in Japan between physical capacity, occupational precision demands, role conflicts, ergonomic shortcomings, and relationships with patients [4]. Collaboration with colleagues may become a state of stress. Psychological distress among co-medical staff may have negative effects on the well-being of the professionals and on the quality of care they provide to patients [1, 3]. Considering these needs of health care professionals, it is desirable to implement stress-reduction methods in a health education system for medical co-workers.

However, administrators in hospitals seldom provide any formal stress management programs for

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nurses and other co-medical staff to enhance their mental health status through learning coping mechanisms. As discussed by Yung *et al.* [5], one reason for this lack of programming is the belief that such intervention programs usually require manpower and resources that could be better spent on patient care than on staff care. Another reason is that senior management presumes that formal stress management programs are time-consuming and that health workers in hospital settings cannot spare the time to practice these skills. However, given the high stress levels reported among nurses in many countries, including Japan, these reasons are not sufficient to ignore the well-being of health professionals [4]. Therefore, a fast and low-cost stress-reduction method is needed for health professionals.

Relaxation training is often implemented in a stress management program at work and results in reducing anxiety and stress symptoms, improving insomnia as well as mild and moderate depression, and increasing job satisfaction [6–8]. Much research has been carried out on the effects of various forms of relaxation training and distraction procedures (*e.g.* progressive muscle relaxation, deep breathing, and mental imagery).

Measuring immune outcomes such as leukocytes (white blood cells, granulocytes, monocytes, lymphocytes, T-helper lymphocytes, and natural killer cells), total immunoglobulin levels, and cellular functions (natural killer cell cytotoxicity and proliferation to concanavalin A) are often used for relaxation effects [9]. Among the indices of immune functioning, immunoglobulin A in saliva (s-IgA) is often measured to assess the effects of relaxation training [9–12]. Various types of relaxation techniques have proved to be effective in increasing s-IgA levels [13–16]. Effects of relaxation training on s-IgA levels are clearer for immediate assessment after training than for a long period after training [12].

A limited number of studies have examined the effects of relaxation training among medical workers in a hospital setting [5, 8, 17, 18]. These previous reports have indicated that relaxation training such as meditation and progressive muscle relaxation is effective in reducing anxiety and burnout and improves the quality of work among nurses and other medical staff [5, 8, 17, 18]. These studies have utilized multi-session training with longer session hours (30–90 min) with homework. No study has tested the effects of a shorter (*e.g.,* 10 min), easy-to-implement relaxation technique that could be used in practice. Additionally, studies have thus far relied on self-reporting for the assessment of outcome indicators. No study has examined the effects of relaxation training on immune outcomes.

The purpose of the present study was to examine the immediate effects of relaxation training on s-IgA levels and mood state for Japanese female medical co-workers. We hypothesized that s-IgA levels for the relaxation group would increase significantly after relaxation training compared to the control group. Second, we hypothesized that the relaxation training group would improve their mood status, including that related to fatigue and confusion, after the relaxation training compared to controls.

Materials and Methods

Participants were recruited through the administrator of 2 hospitals in a local area to be volunteers to participate in a study concerning mental health education in August and September, 2005. Each education session had a seating capacity of approximately 50. A hospital manager determined the number of participants almost equally in each department, and nominated and assigned participants to the intervention group (the session in August) or the control group (the session in September). Both sessions were held where the room temperature was adjusted to an appropriate level for participant comfort. The hospital manager also considered work schedules and workload, but did not know whether individual sessions were an intervention or a control. The assignment was not based on the preference of the participants. Participants were asked to register for one of the 2 sessions according to their schedule. In total, 92 co-medical staff members, excluding medical doctors, were registered in one of the 2 sessions. Finally, 86 staff members (7 males and 79 female co-medical staff) agreed to participate in the study.

The males were omitted from the analysis because the sample was too small (8%). A total of 79 Japanese female co-medical staff members were included as participants. Of these, 38 females who participated in August were assigned to the relaxation group (the first session), and 41 females who

participated in September (the second session) were assigned to the control group.

Table 1 presents distributions of age and occupation of the participants (n = 79). The majority of the co-medical staff were nurses.

This study was conducted after obtaining approval from the Ethics Committee of Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences and also the Ethics Committee of the Hospital of the participants. The instructor explained the outline of the study to each participant, and all participants signed informed content forms prior to participating.

The procedure is shown in Fig. 1. First, a saliva sample was collected. Next, we collected a psychological measure of a self-report before the lecture. An instructor (TT) lectured on mental health using a textbook containing 'what is stress?' stressors, stress symptoms and stress coping by Lazarus's stress transactional model [19]. The lecture lasted approximately 60 min. The relaxation group consisted of a lecture on stress and relaxation training, and the control group participated only in the lecture. Saliva and psychological measures for the relaxation group were obtained after the relaxation training. Those for the control group were obtained after the lecture. In addition, the control group participated in relaxation training after all procedures were finished.

The relaxation training was guided by the integrated training of Solin [20]. The procedure for relaxation training was as follows. Before starting the training, the instructor explained and demonstrated an abdominal respiratory technique.

The course of the 10-min training largely consisted of 4 parts: (a) progressive muscle relaxation, including tensing and relaxing the muscles of the legs and arms, shoulders, face, and whole body; (b) abdominal respiration; (c) meditation, including imagining a special place where one can have a relaxing time; and (d) stretching arms and getting up. The instructor read to the participants from a text on relaxation training. Participants sat on chairs during the training.

Saliva samples were collected using saliva collection test tubes (Sceti. Co., Ltd, Tokyo, Japan). Participants were instructed to place a piece of cotton on their tongue to collect saliva. Participants were asked to hold the cotton as still as possible for 2 min and were timed precisely by the lecturer using a watch. After 2 min, participants removed the cotton and returned it to the salivette tubes. All samples were assayed using an EIA s-IgA test (Medical & Biological Laboratories Co., Ltd, Nagoya, Japan) following the manufacturer's instructions. Given the

Table 1 Summary statistics of the participants

	Relaxation group	Control group	*p*
	n = 38	n = 41	
Age, mean (SD)[a]	33.5 (9.6)	35.0 (8.6)	0.73[b]
(Age range)	(23–55)	(27–59)	
medical co-worker (%)			0.72[c]
registered nurse	21 (55.3)	23 (56.1)	
medical secretaries	3 (7.9)	3 (7.3)	
physiotherapist	4 (10.5)	4 (9.8)	
occupational therapist	2 (5.3)		
speech therapist		1 (2.4)	
assistant nurse	3 (7.9)	6 (14.6)	
dietitian	3 (7.9)	2 (4.9)	
medical technologist	1 (2.6)		
radiologist	1 (2.6)	1 (2.4)	
pharmacist		1 (2.4)	

[a], As for the age, relaxation groups are 19 females, control group are 22 females only who got an answer; [b], *p* value by t-test was shown; [c], *p* value by chi-square test was shown.

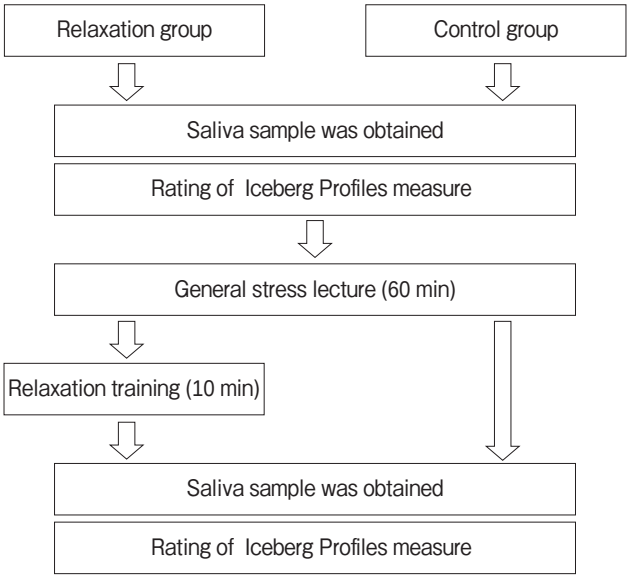

Fig. 1 Procedure of relaxation group and control group.

distribution of s-IgA secretion rate values in the samples, natural log transformation was applied prior to statistical analyses.

We evaluated the mood state for psychological responses. The Japanese version of the Iceberg profile (IP) [21] was used to assess mood states such as nervousness and uneasiness. The IP has 6 items, which are based on subscales of Profile of Mood States and were used to assess mood states for athletes by Morgan [22]. Each item is rated on a scale from 0 (low) to 6 (high). The validity and reliability of the Japanese version of IP has been examined and previously reported [21]. Cronbach's internal consistency of the total score was 0.87 for the present study.

Two-way analysis of variance (ANOVA) with repeated measurements was used to test the intervention effects of relaxation training on s-IgA levels and IP scores as an interaction effect of group (relaxation or control group) and time (before or after the training). Analysis was preformed using SPSS version 11. A p-value < 0.05 was considered statistically significant.

Results

The level at baseline (pre) s-IgA showed an insignificant difference between the groups ($t = 1.3$ $p = 0.18$). Table 2 shows the mean and SD concentrations of s-IgA by groups. The group and time interaction was statistically significant, indicating that s-IgA levels of the relaxation group increased after relaxation training compared to the control group ($F\ (1,\ 71) = 4.93,\ p = 0.03$). However, the interaction effect on s-IgA showed a marginal significance after adjustment for age ($F\ (1,\ 34) = 2.88$, $p = 0.09$).

Table 3 presents the mean scores of the subscales from the IP by groups. The IP total score and the subscale scores of fatigue and confusion of the relaxation group tended to be reduced more than in the control group ($F\ (1,\ 75) = 3.59,\ p = 0.06$; $F\ (1,\ 71) = 2.81,\ p = 0.09$; $F\ (1,\ 71) = 2.89,\ p = 0.09$, respectively). No significant relaxation training effects were found in the subscale of tension, depression, anger, or vigor, except for a result of confusion, showing a significant interaction between group and time after adjustment for age ($F\ (2,\ 35) = 4.77$, $p = 0.04$).

Table 2 Mean value and standard deviation of Log S-IgA

	Relaxation Group		Control Group		p-value[b]
	Mean	SD	Mean	SD	
pre					
log s-IgA	5.35	1.03	5.15	0.71	0.03
post					0.09[a]
log s-IgA	5.82	0.80	5.32	0.76	

SD = standard deviation
[a], adjusted for age; [b], P value for time × group interaction esimated by repeated ANOVA.

Discussion

The present results show that a short relaxation training for 10 min increased s-IgA levels and improved mood (confusion, fatigue, and the total IP score) to some extent immediately after training among hospital medical workers in Japan. This study supports previous findings that relaxation training is effective in improving psychological distress among medical workers. In addition, (1) even a short training could be effective in improving psychological distress, and (2) relaxation training may also be effective in enhancing immune function among medical workers.

Previous studies among medical workers [5, 8, 17, 18] have found that a multi-session training with longer session hours and sometimes with homework effectively improve a psychological distress measured from 1 day up to several weeks after the training. This study shows that a shorter, easy-to-implement technique of relaxation training is also effective, to some extent. This finding is very important because medical workers tend to be busy, and longer trainings would be less likely to be used. However, it should be noted that our study did not consider compliance or continuation of the present training. Further research must be carried out to explore how the subjects could continue the training for weeks or months.

There is some evidence that stress-reducing interventions such as relaxation using a humorous videotape, abbreviated progressive relaxation training,

and classical music affects immune function, including s-IgA [13, 15, 16, 23, 24]. It has been hypothesized that the parasympathetic nervous system is activated during relaxation and that s-IgA is then increased [11]. S-IgA has been recognized to play an important role in immune functioning, including the defense against mucosal infections [25]. A short relaxation training session may enhance immune functioning, even if it might be temporal. Levels of s-IgA have been reported to decrease under chronic stress [26]. However, acute stress is also often associated with temporal elevation of immune functions such as s-IgA [26] through an activation of sympathetic nervous system to provide synergism with innate defense mechanisms [11, 12]. It is not likely that the relaxation training provided to the participants was a stressful experience because, at least, there was no deterioration in psychological mood states after the relaxation training. However we should keep in mind such a mixed behavior of s-IgA in the interpretation.

The participants in this study reported that the relaxation training improved their psychological mood state, even though the effects of the relaxation training on mood state did not reach statistical significance. In free descriptive reports after the relaxation training, 53% participants wrote that they felt refreshed (33% of participants wrote that they wanted to know more about this relaxation training, and others made other types of comments about the program). Recent findings showed that the relaxation training produces a reduced negative emotional affect and improves mental activity [17, 18]. Therefore, the short period of relaxation training utilized in this study may have an effect on activating immune function and reducing stress. However, further research is needed to clarify the function of s-IgA.

Several limitations of this study should be noted. In the relaxation training in the present study, the instructor trained the participants only once. A training of approximately 10 min may have been too short, and thus the participants may not have been accustomed to the relaxation training. It is necessary

Table 3 Mean value and standard error of Iceberg Profiles measure of all participants

	Relaxation group		Control group		Significance	Adjustment for age
	Mean	SD	Mean	SD		
Tension-Anxiety						
Pre	2.96	1.57	2.66	1.44	F = 2.44	F = 0.14
Post	2.15	1.58	2.17	1.28	$p = 0.122$	$p = 0.870$
Depression-Dejection						
Pre	2.28	1.56	2.33	1.39	F = 1.57	F = 2.04
Post	1.62	1.51	1.96	1.36	$p = 0.213$	$p = 0.161$
Anger-Hostility						
Pre	1.34	1.26	1.40	1.30	F = 1.19	F = 0.01
Post	1.18	1.15	1.37	1.26	$p = 0.278$	$p = 0.937$
Vigor-Activity (*)						
Pre	3.84	0.92	3.62	1.05	F = 0.641	F = 0.20
Post	3.96	1.12	3.60	1.04	$p = 0.425$	$p = 0.657$
Fatigue-Inertia						
Pre	3.39	1.57	3.25	1.16	F = 2.81	F = 1.61
Post	2.78	1.61	3.02	1.09	$p = 0.098$	$p = 0.212$
Confusion-Bewilderment						
Pre	1.76	1.34	1.58	1.41	F = 2.89	F = 4.77
Post	1.34	1.25	1.42	1.27	$p = 0.093$	$p = 0.036$
Total score						
Pre	15.6	5.30	14.8	4.41	F = 3.58	F = 2.94
Post	13.1	5.63	13.5	4.54	$p = 0.062$	$p = 0.095$

SD = standard deviation; (*) Revised item.
Pre, before the session; Post, after the session.

to guide the participants to practice more by themselves. In addition, other limitations of this study should be considered in any interpretation of the findings. There is a possibility of a selection bias, that is, the participants in the study were not randomly assigned to the relaxation and control groups. More male medical co-workers should be included in a future study. Furthermore, confounding factors such as smoking, exercise, stress levels, and relaxation history were not measured. In this study, because s-IgA levels were measured before the lecture and after the relaxation training, the findings related to the relatively short-term effects of relaxation. While many previous studies have assumed that a temporal elevation of s-IgA following relaxation training would have a beneficial effect on health through enhanced immune functions [14], it should be noted that such a temporal elevation may not be associated with a beneficial effect on health in future since long-term effects on IgA have not yet been clarified [11, 12]. The present study could not provide data on how long the effects remain after relaxation, or on any cumulative effects of relaxation training through the repeated training. Sampling timing of saliva was also different between the relaxation training and the control session: it was 10 min earlier in the control session. This difference in timing may also have affected the results, although we cannot say how.

Reducing stress for Japanese medical co-workers by mental health education is an important issue. The present study was conducted to implement relaxation training in health education for medical co-workers. There are many limitations, to this study, however, as mentioned above. It is hoed that the study design can be improve to prove the effects of short periods of relaxation training in a future study. Relaxation training utilized as a brief stress reduction intervention can be applied to enhance immune system activity and to reduce stress levels for Japanese medical co-workers. Improving their psychological stress may facilitate health professionals to provide high-quality service in a hospital setting.

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