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# Evaluation of a Yoga-based stress management training for teachers: Effects on Immunoglobuline A secretion and subjective relaxation

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## Summary

A ten-week Yoga-based stress management training program was developed and carried out with teachers. The aim of this intervention program is to enable teachers to better cope with the daily pressures of their work and to learn methods of self-regulation. In an accompanying process-evaluation study, we measured Immunoglobuline (IgA in saliva) and the subjective feeling of relaxation before and after ten training sessions for 11 participants. A significant increase in IgA occurred after 6 of the 10 training sessions. The effects on subjective relaxation could be shown to be significant in 8 out of 10 sessions.

*Keywords: Immunoglobuline A, stress management, Yoga, training evaluation, relaxation*

## Introduction

The need for studying stress management in schools arises from the continually increasing, multiple demands on teachers in the various educational systems. Psychological consequences (e.g., depression, burnout), as well as somatic and psychosomatic effects on the immunological and cardio-vascular systems, emerge and manifest themselves in diseases or in various chronic conditions. The effects of stress can be verified in alarming numbers in the German scientific literature. For example, only 1.8% of all retired teachers in the German state of North-Rhine Westphalia are in a good health. All other teachers terminate employment earlier because they are suffering from psychosomatic and psychological diseases caused by the energy-consuming life of a teacher (Sieland & Tacke, 2000). In this context, it is necessary to develop and evaluate structured and preventive methods of intervention to protect the health of teachers. The stress-prevention training program presented here, which was designed specifically for teachers, was developed in the context of the Integrative Stress Management Concept (ISiS-Concept) developed by Stück (1998, 2000, 2004 a, b, c; Stück et al., 2001; Stück, Rigotti & Mohr, 2004; Stück & Glöckner, 2004). Stück's systemic concept involves 3 stages. In stages 1 and 2, the students as well as the teachers undergo a training program to improve stress management. In the 3rd stage, teachers are offered seminars aimed at helping them improve classroom climates by using specific pedagogical-psychological techniques.

Stress management trainings take effect on both psychological and biological levels. There are different biological systems that respond to stressors, for instance, the Hypothalamic Pituitary Adrenocortical axis (HPA-axis), which predominantly activates cortisol release (Kirschbaum & Hellhammer, 1994), the autonomic nervous system (ANS), which can influence blood pressure and heart rate (Blaskovich & Katin, 1995), and the sympathetic adrenal medullary system (SAM), which is involved in varying catecholamine levels. Furthermore, some parameters of the immune system (e.g. Immunoglobuline/Ig A, M, D, E) are considered to be stress-sensitive (e.g. Sapolsky, Romero & Munck, 2000). Immunoglobuline A (IgA) is an antibody of specific humoral immune response. An increase in IgA in the saliva can be taken as a sign of improved specific immunological defence. There is evidence that IgA acts as a first line of defence against complaints such as upper-respiratory tract infections (Roitt et al., 1991).

IgA is particularly suited for immunological field studies, because it can be measured noninvasively in the saliva (Mandel & Wotman, 1976). It is, due to the dense innervation of the salivary glands and the connection with neuropsychological regulation mechanisms, closely related to aspects of emotional experience (Sabadini & Berczi, 1995). Previous studies have shown significant interrelations among psychological relaxation and an increase in IgA in the saliva (Kugler, 1991). Because of this, the subjective feeling of relaxation is an important accompanying variable for investigations of Immunoglobuline A and stress reduction trainings. There are virtually no publications concerning psycho-neuro-immunological training evaluations or research

with adults which show the effects of the training process on IgA in more than two measuring points. The existing studies with adults refer to examinations of a single relaxation session or to results in which the IgA was measured immediately before and after a single course. These two-point measurements cannot guarantee an exclusion of accidental effects.

Hewson-Bower, and Drummond (2001) and Reid, Mackinnon, and Drummond (2001) assessed IgA before and after an intervention at multiple sample points with children and adolescents. Hewson-Bower, and Drummond (2001) determined whether IgA increased during relaxation training in children aged 8-12 years. The concentration was found to increase during conditions of relaxation. Higher levels of IgA correlate with resistance to upper respiratory tract infections, suggesting that enhancing IgA concentrations by means of relaxation techniques can serve as a preventative measure for children with recurrent infection problems (Hewson-Bower & Drummond, 2001).

As teachers are at risk for stress-related illnesses and, in virtue of their job, are more exposed to antigens that lead to minor health problems, IgA seems to be an appropriate immunological outcome for the evaluation of a stress management training for teachers.

In the following process evaluation study, we asked whether an increase or decrease in the concentration of secretory Immunoglobuline A and the subjective experience of relaxation measured before and after the training sessions could be found in the process of undergoing 10 training sessions.

## Method

### *Sample procedure*

An experimental group of 11 participants took part in the stress management training for 10 weeks (September-December 2000). It was a group intervention, so all participants took part in the training at the same time. The experimental group was chosen by request. All participants were female high school (Gymnasium) teachers with a mean age of 41.6 years. All participants were non-smokers who reported no current illnesses or medication use.

### *Saliva collection and analysis*

IgA in the saliva was measured before and after each session. The saliva samples were taken by means of sample tubes with an integrated cotton sponge (Salivette, Greiner, Frickenhausen, Germany). The saliva was collected passively (without chewing) within a time period of 2 minutes. In this way, we were to consider the IgA secretion flow rate and the volume of saliva. The saliva samples were kept frozen at -80 °C until analysis. The saliva was separated from the cotton sponge by a centrifuge and gathered in the lower part of the Salivette. Five  $\mu$ l of each undiluted saliva sample were placed on radial immuno-diffusion plates for testing secretory IgA (The Binding Site, Birmingham, UK.). The diameter of the resulting precipitate ring was measured after 96 hours.

### *Materials for measurement of subjective feeling of relaxation*

Before and after the sessions, participants rated the subjective feeling of relaxation on an 17-point scale (17 levels: not relaxed = 1; very much relaxed = 17). This scale was developed by Binz and Wendt (1986).

### *Intervention*

The yoga-based stress prevention training for teachers was designed and carried out as a type of mountain-climbing expedition called: "Getting up is easy. But how do I come down? Expedition to Stress Mountain." (Stück, 2004 a, b; Stück, Rigotti & Mohr, 2004). A mountain-climbing expedition can indeed be compared to the experiences of being a teacher, as in both cases, the degeneration of resources which occurs after successful stress management can lead to serious states of exhaustion involving weakened immune responses, vegetative and/or psychological instability, as well as more specific psychosomatic reactions (Stück, Hecht, Schroeder & Rieck, 2001).

The training was made up of 10 sessions, one session per week. One training session lasts for two hours. The structure of the sessions is based on the most recent results of psychotherapeutic research and on previous personal experiences with the development of training sessions (Stück, 1998; 2000);

In the first part of the session (60 minutes), psychoeducational concepts about stress-related problems are taught and different short- and long-term stress management techniques are practised (external coping strategies). In the second part of the session (60 minutes), the self-regulation method of yoga, as well as meditation, are practised in order to develop the ability to relax and to perceive one's body (internal coping strategies). The regular and extended practising of self-regulation techniques is an important characteristic that differentiates this program from other similar programs and was, in fact, something requested by teachers in preliminary assessments (Stück, Hörnig & Hecht, 2001). This seems to fit the insights put forward by Schaarschmidt and Fischer (1998), who show that insufficient opportunities for relaxation becomes a prominent issue for teachers in particularly high risk situations. Table 1 outlines the essential elements of the training program.

The program allows teachers to make use of the following two coping strategies (Stück, 1998):

1. Successful management of external demands in everyday life with the help of stress-relevant strategies for teacher-student interactions, time management, and effective communication behaviour (external coping).
2. Successful attainment of internal regulation stability in or after stressful situations - a state considered a prerequisite for successful external acting - by means of various methods of relaxation (yoga, breathing, and walking meditation), and other methods (autoregulation, internal coping). Scientific research has shown yoga and meditation procedures to be very efficient techniques with positive psychotherapeutic effects (Grawe, Donati & Bernauer, 1994).

Table 1: Steps involved in the yoga-based stress prevention training program: "Getting up is easy. But how do I get down? Expedition to Stress Mountain." (Stück, 2004)

<i>Session</i>	<i>Psycho-educative aspects (60-75 minutes)</i>	<i>Autoregulation (45-60 minutes)</i>
	<i>Information and exercises relevant to various topics concerning stress</i>	Discovering a slow pace: "If you want to climb a high mountain, you have to go slowly."
1	The desire to go on an expedition awakens! Introduction, cognitive preparations Motivation for stress prevention training, stress definition	Yoga, Meditation (Introduction)
2	Information concerning Stress Mountain S O R K - Schema 1 Stressors, Stress reactions	Yoga, Meditation (Breathing)
3	Fitness test for the climb. S O R K - Schema 2 Analysis of attitudes towards stress and long-term consequences of stress	Yoga, Meditation (Walking)
4	Checking equipment and acclimatisation Foundations of stress management 1 Stress management - resources, Psycho-education of relaxation techniques	AT, Yoga, Meditation (Breathing)
5	Stress training at the basecamp Foundations of stress management 2 Short-term stress management techniques	AT, Yoga, Meditation (Walking)

<i>Session</i>	<i>Psycho-educative aspects (60-75 minutes)</i>  <i>Information and exercises relevant to various topics concerning stress</i>	<i>Autoregulation (45-60 minutes)</i>  Discovering a slow pace: "If you want to climb a high mountain, you have to go slowly."
6 + 7	The ascent with equipment for high-camps 1 and 2. Teacher-specific stress management 1 and 2 (Analysis of needs, choice of topics for teachers: conflict management, communication, relaxation in the classroom)	AT, Yoga, Meditation (Breathing, Walking)
8	Ascent to the summit, experiencing a sense of satisfaction Foundations of stress management 3 Discovering new horizons beyond stress and hectic, Social contacts and Enjoyment	AT, Yoga, Meditation (Breathing) Independent application of the relaxation program
9	Getting down from Stress Mountain safely Foundations of stress management 4 Managing time, discovering your desires and goals (Part 1)	AT, Yoga, Meditation (Walking) Independent application of the relaxation program
10	Farewell shot from the ground Foundations of stress management 5 Discovering your desires and goals (Part 2) Farewells	AT, Yoga, Meditation (Breathing) Independent application of the relaxation program

In the first column, the psycho-educative aspects of the program are presented. Modules 1-3 involve information and exercises based on stress theory and stress diagnostics. Short and long-term stress management techniques are presented and practised in modules 4 and 5. Instruments for diagnosing stress and methods of stress management are geared towards the particulars of the teaching professions. In Modules 6 and 7, teacher-specific behaviours in the teacher-student interaction are discussed and new teacher behaviours are practised (conflict management, communication behaviours, relaxation techniques for use in the classroom). Module 8 involves the activation of resources (enjoyment, social support) and Modules 9 and 10 support the reflection upon personal desires and future goals. The second column presents the content of the self-regulatory aspects of the training, which involves a structured yoga and meditation program. Autogenous Training is performed and practised at the beginning of every session.

### **Statistical analysis**

For the comparison of the pre- and post-measurements, a t-test for the grouped samples and effect-sizes were calculated.

We operated under the assumption that the yoga-based stress prevention training sessions for teachers would increase both the secretion of IgA and subjective relaxation.

### **Results**

The concentration of secretory Immunoglobuline A before and after each session differed in 6 out of 10 sessions significantly (Table 2).

In three sessions (second, sixth and tenth session), the differences were highly significant ( $p < 0.01$ ). In the 1<sup>st</sup>, 5<sup>th</sup> and 8<sup>th</sup> sessions, we found no significant differences between pre and post measures. The effect sizes point to a substantial increase.

The psychological measurements of the subjective experience of relaxation due to the training sessions, which were taken at the time of saliva sampling before and after each session, showed 8 significant pre-post changes ( $p < 0.05$ ) (Table 3).

In three sessions (second, third and tenth session), the differences were highly significant ( $p < 0.01$ ). In the 1<sup>st</sup>, and the 10<sup>th</sup> session, no significant difference was reported, but effect sizes point to a not negligible difference. Across the 10 training sessions, an increase in the pre-measure of the subjective experience of relaxation was observed.

The measures of relaxation and IgA showed a substantial moderate correlation of  $r = .31$  ( $p < .001$ )

Table 2: Means, Standard deviations, and t-test for grouped samples for pre-post "IgA"

session	1	2	3	4	5	6	7	8	9	10
pre $\bar{X}$	65.47	30.80	76.09	29.15	46.71	36.91	49.84	26.44	42.12	22.33
sd	46.18	15.71	50.98	23.97	25.62	21.81	32.22	14.23	22.35	14.10
post $\bar{X}$	100.43	116.41	114.91	96.67	85.60	61.57	94.49	27.06	79.39	93.16
sd	46.66	53.36	83.10	63.92	71.17	27.32	58.99	21.91	43.37	42.16
p	.13	.00	.07	.04	.11	.00	.04	.94	.02	.00
d'	0.92	2.18	1.06	1.56	0.97	1.46	1.03	0.03	1.11	2.80
p < .10 (remarkable change)										
p < .05 (significant change)										
p < .01 (highly significant change)										

Effect size for t-tests (dependent samples):  $d' = \frac{\mu_1 - \mu_2}{\sigma_D} \sqrt{2}$

Table 3: Means, standard deviations, and t-test for grouped samples for pre-post "Relaxation"

session	1	2	3	4	5	6	7	8	9	10
pre $\bar{X}$	8.80	8.22	8.63	8.67	9.50	10.18	9.60	10.75	10.55	12.63
sd	2.95	2.94	3.85	3.01	3.39	2.44	2.91	2.49	3.21	2.62
post $\bar{X}$	13.80	13.67	13.63	13.33	13.83	13.73	12.30	14.63	13.45	13.50
sd	3.49	2.24	1.41	1.03	1.47	1.95	3.68	1.06	1.97	1.20
p	.10	.00	.00	.01	.04	.00	.02	.01	.01	.29
d'	1.32	2.23	1.72	2.07	1.53	1.61	0.81	2.03	1.09	.043
p < .10 (remarkable change)										
p < .05 (significant change)										
p < .01 (highly significant change)										

Effect size for t-tests (dependent samples):  $d' = \frac{\mu_1 - \mu_2}{\sigma_D} \sqrt{2}$

## Discussion

With this pilot study, we aimed to find the effects of a stress management training on the secretion of Immunoglobuline A and on the subjective feeling of relaxation. We found that the teacher training sessions for stress management had positive effects on the participants' subjective feeling of relaxation and on their immunological defence. In eight out of ten sessions, significant differences between pre and post measures of relaxation could be found. The training could therefore be seen as substantially influencing the subjective feeling of relaxation. The results of the IgA measure showed a significant post-session increase in 6 out of

10 sessions. In one session we found a statistical trend at the 10% level of significance. The pre-post differences show that the effects of the sessions are not negligible.

Though it would have been interesting, we did not intend to look at the long-term effect of the training on Immunoglobuline A production in this study. For this purpose, we would have needed a larger sample with a control group, as IgA-levels are subject to circadian influences over the seasons of a year, which can hardly be controlled. Thus, long-term effects should be a subject for further research.

We hold, in particular, the stress management elements of the training (relaxation, yoga, meditation) responsible for the effects we found. The effects of the training sessions on IgA, which were confirmed by the use of inferential statistics, can also be seen in the comparison of individual results of the participants taken before and after the sessions. In 83% of all cases, positive pre-post changes occurred, whereas 17% showed negative changes. Thus, the results of former studies with adults, in which stress management trainings influence the segregation of IgA, could be confirmed (Green & Green, 1987; Green, Green & Santoro, 1988; Jasnowski & Kugler, 1987). These studies were all based on two points of measurement. In this study, we performed ten pre and post measures and reduced the likelihood of accidental effects.

Based on the results of this teacher training study, we were able to answer the initial questions as follows: The stress management training sessions were able to achieve a lasting, significant effect with regard to the improvement of the IgA level in the saliva. This fact speaks for immuno-enhancing effects that should reduce the susceptibility to minor infection in a high risk group. With respect to the subjective experience of relaxation, the training has a particularly quick and positive effect. We suggest the following for future research in the field of immunological and psychological evaluations of training programmes:

Further research should address the issue of gender specific differences in the effects of relaxation training programmes on immunological parameters (Bekker, Nijssen & Hens, 2001). In order to be able to assess circadian influences on the human organism and thus be able to properly interpret our evaluation results, further evaluation studies related to this topic should be carried out.

Furthermore, it would be interesting to explore which changes of emotional well-being correlate with changes in IgA concentration, and whether a correlation between personality factors and secretory Immunoglobuline A exists.

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