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ORIGINAL ARTICLE

Short-term effects of a randomized controlled worksite relaxation intervention in Greece

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Abstract

Objective. To evaluate the short-term benefits of simple relaxation techniques in white-collar employees.

Materials and methods. The study was a two-arm parallel group randomized controlled trial. 152 employees were randomly assigned to receive the 8-week programme (N=80) (relaxation breathing and progressive muscle relaxation, twice a day) or not (wait-list group N=72). Self-reported validated measures were used to evaluate perceived stress, health locus of control, job and lifestyle related variables. Saliva cortisol were also sampled and measured. Adjusted mean changes on outcomes were estimated by linear mixed model analysis. 127 employees were finally analyzed (68 in the intervention and 59 in the control group).

Results. Specific stress-related symptoms, psychological job demands and cortisol levels were found to be significantly decreased after 8-weeks in the intervention group. The result was probably affected by the general socio-economic condition during the study period. Cortisol levels were also significantly related with age, family situation, gender and sampling time.

Conclusions. Simple relaxation training (diaphragmatic breathing and progressive muscle relaxation) could benefit employees and it is strongly proposed that these and other similar techniques should be tested in various labour settings

Key words

stress, stress management, progressive muscle relaxation, occupational health, health promotion, Greece, saliva cortisol

* These authors contributed equally

INTRODUCTION

The employees exposed to chronic stress exhibit reduced performance at work, interpersonal conflicts and higher odds for stress-related diseases (CVD, hypertension, sleep problems, dysregulation in immune functioning, headaches) [1, 2, 3, 4, 5, 6]. The multiple effects of stress include a number of physical ailments and mental health problems such as depression and an increased suicide rate. [7]. Furthermore, increased job demands have a negative impact on family life. The long working hours, excessive workload and job insecurity are all factors which may adversely affect an individual's personal/family life. On the other hand, problems or conflicts within the family environment cause further stress which is then transferred back to the workplace. Essentially this acts as a vicious circle where stress (regardless of where it comes from) is transferred back and forth in one's life (private or professional), making it harder to deal with [8].

The programs focused on stress management at work and also on the empowerment of individual's personal skills appear to significantly reduce the risk of developing a disease [9]. Stress management and relative coping strategies in the workplace have been developed since the '70s. Intervention programs oriented to work-related stress aim to eliminate the stressors and strengthen the individual in order to be able to cope with stress [10]. The interventions in question could be categorized into primary prevention actions towards job-related sources (e.g. restructuring of the workplace, reducing workload, improving communication); in secondary prevention interventions aimed at reducing the severity of stress symptoms before leading to serious health problems, educating subjects how to manage stress effectively, such as cognitive-behavioral therapy, relaxation, diaphragmatic breathing, meditation, exercise, time management, targeting, techniques of emotional discharge (writing journal), anger management; and tertiary prevention actions targeted at reducing the impact of stress-induced diseases through the management and treatment of symptoms that have already appeared by mental health professionals. Rehabilitation and return-to-work programs as well as advisory ones are included in this category [11, 12, 13].

The effectiveness of stress management programs has been assessed at organizational level (absenteeism, productivity) or/and at individual-level with the measurement of either the psychological factors (stress, anxiety, depression, aggression, anger, satisfaction with life and work) or physiological (blood pressure, weight, cortisol, cholesterol) [11, 14]. The cognitive-behavioral interventions are considered as more effective among others while relaxation techniques are applied more frequently [11, 14]. However, the evaluation of the benefits of these techniques is based primarily on the measurement of psychological rather than physiological factors [11, 14]. Both cortisol and blood pressure have circadian rhythms and stress has been shown to disrupt normal diurnal variation. Cortisol levels peak in the early morning and drop to the lowest concentration at night [15, 16]. Disruptions in normal patterns of cortisol and blood pressure have been both linked to negative health outcomes [17].

In this randomized controlled study, a short-term stress relaxation program was applied and evaluated in healthy adults in the workplace. Specifically, it was assumed that the implementation of the techniques (muscle relaxation

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combined with diaphragmatic breathing) will lead to stress reduction and improved daily life parameters. Specifically, we assume that the participants who will implement the relaxation techniques (intervention group) will demonstrate a decrease in perceived stress, a decrease in salivary cortisol, the biological indicator for measuring stress, an improvement in their day-to-day lifestyle as well as an increase of internal health locus of control in comparison with the employees who will not be performing the relaxation techniques (wait list or control group).

MATERIALS AND METHOD

Design of the study. This was a pilot non-blind randomized controlled trial, comparing an intervention group which will be educated in certain relaxation techniques within a stress management and healthy lifestyle program for 8 weeks, with a control group which will receive recommendations on improving nutrition and integrating exercise in daily life. The study was conducted in Athens, from October 2010 to March 2011.

Sample. Employees (office workers) in various workplaces were invited to participate in the program. The only exclusion criteria were the psychotropic drug use (e.g. antidepressants, benzodiazepines, antipsychotic) and practice of other relaxation techniques (e.g. yoga or mindfulness). Of the 189 employees who were initially willing to participate in the research, 152 accepted or were eligible to be randomized and gave their writing informed consent. Finally 127 completed the stress management program (Figure 1). The loss of participants was due to either their increased work load that included professional trips abroad or due to the fact that they had difficulties in complying with the program (we were not able to reach them).

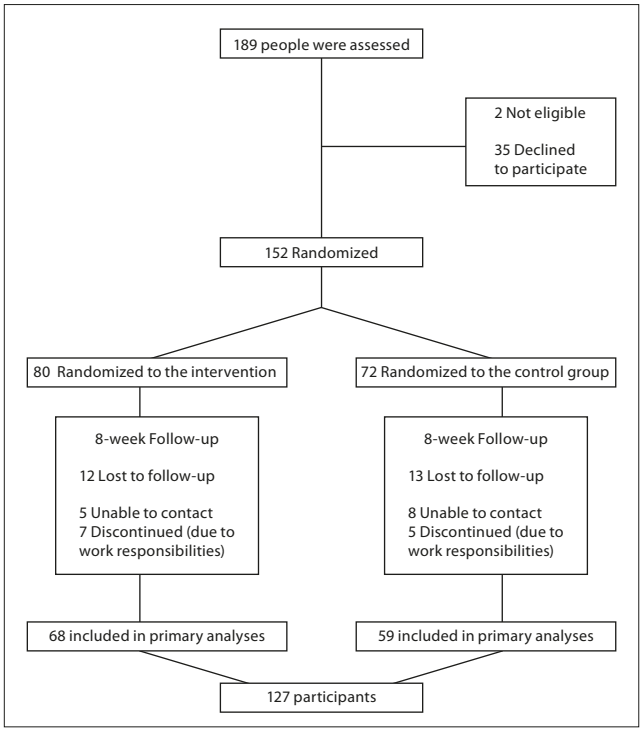

Figure 1. Flow diagram

Procedure. The study was approved by the Medical School Scientific and Ethics Committee (UoAMedPR-4716-180211-09/16).The employees deemed eligible at baseline assessment were randomly assigned to either the intervention or the control group, using random numbers generated by an online generator (found in www.random.org). Randomization, baseline and final measurements were not blinded. After being randomized, participants both in the intervention group who would apply the relaxation techniques and control group (wait list group) received education and recommendations on healthy lifestyle such as the improvement of their nutritional habits and the increase of their physical activity levels. Firstly, both groups attended an informative session on stress in order to understand stress physiology and pathophysiology, its clinical manifestations and the mechanisms to cope with it. They were also given recommendations (by seminar and brochures) on the benefits of healthy daily routine (regularity of sleep, diet and exercise). The recommendations on diet included the essentials of the Mediterranean diet (i.e. regular small meals with emphasis on breakfast, variety, frequency) [18]. The recommendations on exercise brochure emphasized its benefits on mental, physical health (e.g. body weight, cholesterol, CVDs) and wellbeing by proposing as minimum systematic walking for at least 30 minutes four times a week. The importance of adapting a healthy lifestyle through the daily routine and proper time management was also emphasized i.e. the importance of keeping a program in everyday life and organizing time, since relaxation seems to positively affect routine and vice versa.

Both groups were given self-rating questionnaires at the beginning and at the end of the program and salivettes to collect salivary cortisol samples before the intervention, every fifteen days, and at the end of it (i.e. five times; see below).

The intervention arm was further instructed on implementing the specific relaxation techniques (diaphragmatic breathing combined with muscle relaxation exercises) twice a day for 20 minutes at a time, for 8 weeks, with the help of a CD containing educational material on stress reduction exercises. The relaxation techniques focus on conscious and controlled release of the muscular tension. More specifically, diaphragmatic breathing focuses on increasing the oxygen during breathing and releasing carbon dioxide. This combination of relaxation techniques is considered effective in reducing stress in comparison to the implementation of a single technique [11,14]. In addition, they were given a diary to note how often they practice the relaxation techniques.

During the intervention program, the research group was in regular contact (once a week) with the participants in order to clarify any questions concerning the relaxation techniques and possible side effects, while meetings have taken place every two weeks throughout the program so that the subjects' adherence could be checked.

Baseline and outcome measures. Stress levels were measured by using psychometric and biological indicators. The questionnaires were administrated at the beginning (before implementing the relaxation techniques) and at the end of the Stress Management Program to both groups (intervention and control group). Participants were asked to fill in the questionnaires during 1 week. The screening tools were the following:

Perceived Stress Scale (PSS). The PSS is a self-report 14-item measure of the degree to which situations in an individual's life are appraised as stressful [19]. For this purpose, respondents rate the frequency of feelings and thoughts over the previous month in a five point Likert scale (from 0=never to 4=very often). There are seven positive and seven negative items and total score is calculated by summing up each score after reversing all the positive items (min. total score=0, max. total score=56). Higher scores indicate higher perceived stress of the individual during the last month. PSS measurement took place at baseline and at the end of the 8 weeks. Good psychometric properties of this measure in the Greek population have been recorded [20]. Internal consistency reliability for this 14-item scale in our study was also good for both initial and final measurements (Cronbach's alpha 0.86 and 0.88, respectively).

Job Content Questionnaire (JCQ). is designed to evaluate the content of tasks at work of the interviewee. It is a tool for measuring mental and physical demands, social support and job insecurity [21]. In this research 4 scales were used; decision latitude (9 items), psychological demands (Framingham version; 9 items), coworker support (4 items), and supervisor support (4 items).

Health Locus of Control scale (HLC). Health locus of control was measured using the 18-item Health Locus of Control Scale (HLC) developed by Wallston and colleagues [22]. Respondents express their level of agreement to 18 statements in a 6-point Likert type scale (from 1=strongly disagree to 6=strongly agree). The scale is built upon three 6-item subscales, namely: "internal health locus of control" (HLC1), "external health locus of control" (HLC2) and "chance" (HLC3). Internal health locus of control (HLC1) measures the degree that the individual believes that he/she is responsible for his/her health status. External health locus of control (HLC2) and chance (HLC3) represent the extent that other people (such as medical doctors) or chance, respectively, are perceived by individuals as the main health determinants. After summing up answers for each subscale, higher scores indicate higher strength of each type of health belief (total score range 6–36 for each subscale). HLC measurements took place at baseline and at the end of the 8 weeks. The instrument is standardized in Greek populations [23]. Internal consistency reliability for each subscale was found satisfactory for both initial and final measurements (Cronbach's alphas ranged between 0.63 and 0.79.

A 'Lifestyle and Health' questionnaire. which contains sociodemographic and disease-related variables: age, gender, marital status, educational status, income (low <1000, average 1000–1500, high >1500 euros), smoking status and questions relating to the sleep quality, eating habits, medical history, general health status and exercise. In this questionnaire, we have used a list of various possibly stress, anxiety or somatoform-related symptoms or behavioral characteristics such as irritability, fatigue, hostility, feeling of tension, inability to concentrate, sleep disturbances, tachycardia, palpitations, chest discomfort, dizziness, impatience, difficulty in decision making, lack of humor, suppressed anger, failure to focus, memory disorders, exaggerated imagination, lack of creativity, failure to accomplish an activity, failure to respond, lack of interest and fatigue. Participants were asked about the frequency of experiencing these symptoms and each symptom was binary categorized as frequent or not [24]. This checklist is not intended as a psychometric tool. It consists of nonspecific symptoms described as related to stress. Some of these symptoms may not well be expressed as binary variables and suffered low specificity but our interest was to evaluate the possible change of these stress-related symptoms during intervention.

Biomarkers. *Measurement of salivary cortisol.* Salivary cortisol reflects the free (bio-active) fraction of serum cortisol and follows the 24-hour daily rhythm of cortisol produced in response to real-life stress [25]. Five samples of salivary cortisol were collected by using salivettes. Samples were taken in the beginning, intermittently every fifteen days and at the end of the program in both groups. Clear written and oral instructions were provided for proper use of the salivette (the cotton is placed inside the mouth for two minutes, or chewed for one minute, then placed back in the plastic tube and stored in a cooler). Samples were collected three times per day at the following intervals: when getting up in the morning, 30 to 45 minutes after getting up and just before bedtime, (samples were collected on a specific day of the week for each group and each workplace). Afterwards, the samples which were gathered one day after their collection by the assigned researchers, were stored and transported (using a mobile cooler or an isothermal bag with ice packs) to the lab for further analysis.

Statistical analysis. Statistical comparisons of the various qualitative and quantitative with study group were performed using the Pearson's chi-squared test and the non-parametric Mann-Whitney test respectively. The corresponding comparisons, within each study group, with the intervention (before vs. after intervention) were based on Stuart-Maxwell test and Wilcoxon test for matched pairs of observations. Trends in cortisol levels were modelled using linear mixed-effects models with random intercept. These models account for the correlation between observations within individuals. The analysis of longitudinal cortisol levels was performed using linear mixed-effects models, to account for the correlation between measurements of the same subject. The effect of study group in final levels of PSS, HLC1, HLC2 and HLC3 was estimated using linear regression with adjustment for the corresponding baseline levels.

RESULTS

127 white collar employees (office personnel) from seven small to medium size companies participated in this study. The majority of the employees were women (61.4%) while the median age was 40 years (rang: 33–46). Descriptive characteristics of employees are presented in Table 1 according to group at the beginning of the study.

None of the study variables were significantly different between groups at entry into the study.

Table 2 shows comparisons within groups of the main study of variables. More participants in the control group reported restful sleep at the end of the follow- up than in the intervention group. Also, it was noted that both HLC2 and HLC3 scores were significantly higher at the end of the trial.

Table 1. Descriptive characteristics of the 127 participants in the study

	Intervention Group N=68	Control Group N=59	Total	
	N (%)	N (%)	N (%)	p-value
Gender				0.651
Male	25 (36.8)	24 (40.7)	49 (38.6)	
Female	43 (63.2)	35 (59.3)	78 (61.4)	
Residential status				0.241
Living alone	20 (29.4)	20 (33.9)	40 (31.5)	
Living with others	48 (70.68)	39 (66.1)	87 (68.5)	
Education				0.77
12–15 years	27 (39.8)	22 (37.2)	49 (38.6)	
> 15 years	41 (60.2)	37 (62.8)	78 (61.4)	

Table 2. Self-reported study measures within the group at the beginning and end of the study

	Beginning	End	
	N (%)	N (%)	p-value
CONTROL (WAIT LIST GROUP)			
Smoking			0.157
Yes	23 (39.0)	25 (42.4)	
No	36 (61.0)	34 (57.6)	
JCQ subscales	**Median (IQR)**	**Median (IQR)**	**p-value**
Decision latitude	70.0 (64.0, 76.0)	68.0 (64.0, 78.0)	0.947
Co-worker support	12.0 (11.0, 12.0)	12.0 (12.0, 13.0)	0.176
Supervisor support	16.0 (14.0, 17.0)	16.0 (14.0, 17.0)	0.225
Psyc.Job Dem. (FR)	10.0 (7.0, 13.0)	9.0 (7.0, 12.0)	0.077
PSS-14 score	23.0 (19.0, 30.0)	24.0 (15.0, 30.0)	0.582
HLC1 score	28.0 (24.0, 29.0)	27.0 (25.0, 29.0)	0.382
HLC2 score	18.0 (14.0, 22.0)	23.0 (14.0, 27.0)	0.002
HLC3 score	14.0 (12.0, 18.0)	18.0 (13.0, 22.0)	0.037
INTERVENTION GROUP			
Smoking (n, %)			0.564
Yes	30 (44.1)	29 (42.6)	
No	38 (55.9)	39 (57.4)	
JCQ subscales	**Median (IQR)**	**Median (IQR)**	**p-value**
Decision latitude	69.0 (64.0, 74.0)	70.0 (64.0, 74.0)	0.528
Co-worker support	12.0 (11.0, 13.0)	12.0 (11.0, 13.0)	0.711
Supervisor support	16.0 (14.0, 16.0)	16.0 (14.0, 16.0)	0.237
Psyc.Job Dem. (FR)	10.0 (8.0, 12.0)	9.5 (7.0, 12.5)	0.028
PSS-14 score	27.5 (23.0, 31.0)	25.0 (21.0, 30.5)	0.145
HLC1 score	27.0 (24.5, 30.0)	27.0 (24.5, 30.5)	0.614
HLC2 score	19.5 (17.0, 23.5)	21.0 (19.0, 25.0)	0.36
HLC3 score	14.0 (13.0, 18.0)	16.5 (12.5, 22.0)	0.185

The percentage of employees in the intervention group who reported experiencing stress was lower at the end of the trial (80.3%) compared with the beginning of the study (87.9%) (p-value=0.025). Various possibly stress-related symptoms were reported as reduced in the intervention group, including dyspepsia (–10.1%, p-value = 0.027), palpitations (–10%, p-value = 0.030), dyspepsia and swelling (–11,3%, p-value = 0.037) and chest pain (–10%, p-value = 0.030). Most importantly, psychological job demands score was also reported to be significantly lower at the end of the study (p-value = 0.028).

Between groups comparisons did not differentiated significantly at the end of the study for the main study variables in unadjusted comparisons (Tab. 3).

Table 3. Mean changes in scores (end – beginning of study) according to group

	Control Group	Intervention group	
	mean (SE)	mean (SE)	p-value*
ΔPSS-14 score	–0.65 (1.41)	–1.59 (1.06)	0.824
ΔHLC1 score	–0.57 (0.61)	–0.36 (0.70)	0.741
ΔHLC2 score	3.13 (0.85)	1.00 (0.91)	0.176
ΔHLC3 score	1.96 (0.81)	1.54 (0.86)	0.74

* Level of significance by linear regression models with a dependent variable at the final levels and independent to the initial levels and the group.

Table 4 presents analysis of diachronic cortisol levels in a fully-adjusted linear mixed effects model. It was observed that the 2nd measurement of cortisol was higher than the morning measurement by 0.07, on average, on the square

Table 4. Factors affecting diachronic cortisol levels during the two-month trial (results from linear mixed effects model)

	Estimated difference*	95% C.I.	p-value
Initial Levels			
Reference Category	0.636	(0.590, 0.682)	<0.001
Measurement			
A (awake)	0	-	-
B (after 45 minutes)	0.07	(0.047, 0.093)	<0.001
C (8-830 p.m.)	-0.338	(-0.361, -0.315)	<0.001
Group			
Control	0	-	-
Intervention	0.033	(-0.010, 0.075)	0.129
Age (years)			
<40	0	-	-
40+	0.043	(0.001, 0.086)	0.047
Gender			
Male	0	-	-
Female	0.063	(0.028, 0.097)	<0.001
Married			
No	0	-	-
Yes	0.049	(0.003, 0.094)	0.037
Children			
No	0	-	-
Yes	-0.058	(-0.104, -0.012)	0.013
Rate of change (per 15 days)			
Reference Category	0.019	(0.008, 0.029)	<0.001
Group			
Control	0	-	-
Intervention	-0.013	(-0.025, -0.001)	0.039
Age (years)			
<40	0	-	-
40+	-0.014	(-0.026, -0.002)	0.025

*Square Root scale

root scale (p-value<0.001), and the 3rd (evening) was lower than the morning measurement by 0.338, on average, on the square root scale (p-value<0.001), taking into consideration the remaining factors of the model. No statistically significant difference was observed between control and intervention group, in initial levels of cortisol (p-value = 0.129), taking into consideration the remaining factors of the model. It was observed that individuals in the intervention group had a lower rate in cortisol levels by 0.013 units per 15 days, on average, on the square root scale, compared with the control group (p-value = 0.039), taking into account the remaining factors of the model.

Furthermore, employees aged over 40 presented higher initial cortisol levels by 0.043 units (p-value = 0.047) and a lower rate by 0.014 units (p-value = 0.025) on the square root scale, in comparison with younger employees; and women presented higher levels of cortisol by 0.063 units on the square root scale (p-value<0.001), taking into consideration the factors of the model. Moreover, married individuals had higher average levels of cortisol by 0.049 units on the square root scale (p-value = 0.037), and employees with children had lower levels of cortisol by 0.058 units on the square root scale (p-value = 0.013), taking into consideration the remaining factors of the model.

DISCUSSION

The purpose of the presented randomized controlled trial was to assess the feasibility and effectiveness of a stress management and health promotion programme (progressive muscle relaxation and relaxation breathing, recommendations on adapting a healthy lifestyle), in a group of healthy office workers. The study coincided with a particularly stressful period because of the escalated economic crisis which affected working life, income and security in Greece; consequently, the presented results have to be evaluated within this context. Significant differences were found in favour of the intervention concerning some stress related symptoms, e.g. dyspepsia, psychological job demands, and more importantly, on cortisol levels. Specific workplace programmes that have applied muscle relaxation techniques (singly or in combination with other relaxation techniques, such as diaphragmatic breathing, meditation) have shown similar results to this study, such as reduction of stress [26, 27] and stress-related symptoms like neck and shoulder pain [28]. Other findings include improvements in mental health, blood pressure, general health, and an increase in the response capacity of employee [29, 30, 31, 32].

In the control group, a significant increase was observed in the scores of external health locus of control (HLC2) and chance (HLC3), which shows that more people in control group perceived as the main health determinants 'others' (such as medical doctors) or 'chance', partly reflecting the effect of the difficult socio-economic period.

The salivary cortisol measurements confirmed the well-known diurnal variations [33]. The difference found in favour of the intervention group has never been reported before in a such short-term intervention in apparently healthy people. In addition, the adjusted results confirmed important prognostic factors, such as age, family situation and gender [34, 35, 36].

It has to be acknowledged that the presented study has a number of limitations. Firstly, the possibility of reporting bias since most of the outcomes and the diary on implementation of the techniques were based on self-reports. However, this was not the case in the laboratory assessments of salivary cortisol. Generalizations of the study results are limited mostly to highly educated office workers who were affected to an unknown extent by the progressive socio-economic situation in labour market in Greece.

In conclusion, simple relaxation training (diaphragmatic breathing and progressive muscle relaxation) could benefit employees, and these and other similar techniques should be tested in various labour settings. Future studies should extend these preliminary findings by examining other similar techniques and performing reassessments in order to investigate possible long-term effects.

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