Research article

Effect of exercise, relaxation, and ergonomics on physiological stress indicators - An experimental study on teachers

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(Received: December 2021 Revised: November 2022 Accepted: November 2022)

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ABSTRACT

Introduction and Aim: Stress is a reaction of the body to substantial or unusual demands. It, a complex reaction of the neurologic and endocrinologic system which can initiate the 'Fight or Flight' response. This may lead to headache, tense muscles, insomnia. Stress can alter the memory function, immune function, metabolism, and susceptibility to the disease. The effect of stress and relationship in making teachers quite inefficient in their profession is a growing concern. The present study objective is to investigate the effective significance of exercise, relaxation, and ergonomics on physiological stress in teachers.

Materials and Methods: A total of 30 teachers, both male and female were randomly selected. They supported the inclusion and exclusion criteria and were between 30 to 60 years, separated into 2 groups. They were asked to fill necessary information in the stress profile for teachers. The subjects with moderate to high stress were taken for the study and were divided into two groups. Group 'A' were given aerobic stepper exercise and relaxation techniques. Group 'B' were given aerobic stepper exercise and suggestions given on ergonomic correction for an intervention period of about 8 weeks, 5 days per week 45 minutes per session. Pre- and post-test values were taken on blood pressure and blood glucose level using sphygmomanometer and glucometer.

Results: The pre- and post-test between group A and group B show a highly significant difference. However, group A showed higher significance than group B.

Conclusion: According to the findings, aerobic stepper exercise with relaxation techniques shows highly significant difference and aerobic stepper exercise with ergonomic correction shows significance but aerobic exercise with relaxation technique is highly effective in reducing stress and maintaining blood pressure and glucose level in teachers.

Keywords: Ergonomics; physiological stress indicators; relaxation technique.

INTRODUCTION

A physical demand, a mental demand, or both can be regarded as stress, which is defined as "an excess of demand made upon the adaptive powers of the mind and body." Working as a teacher is really a difficult job (1). In order to characterize the phenomena of strain experienced by an organism due to external influences, Hans Seyle coined the term "stress." As indicated by him it is "the body's vague reaction to any request" or the standard result of openness to anything. Previous studies suggest that the concept of "stress" is helpful in interpreting the connections between psychological and environmental events and the physiological, behavioral, and emotional consequences to an individual. A general opinion regarding one's employment in terms of certain aspects of emotional relationship known as "job satisfaction" the work (salary, advancement, job in general. According to Robins, occupational stress is a dynamic circumstance in which a person is presented with a chance, restriction, or demand that is related to what they want and for which they want an outcome that is both unpredictable and significant. Environmental effects, organizational factors, and personal variables can all contribute to stress. The sensation of unpleasant negative emotions by a teacher, such as wrath, impatience, worry, melancholy, and anxiousness, is known as teacher stress. "A pleasant or positive emotional state coming from the evaluation of one's job or job experiences" is the definition of job satisfaction (2).

Task performance, contextual performance, and adaptive performance were the three main divisions of teacher performance. The five personality types of teachers include neuroticism, extraversion, openness, and conscientiousness. The personality of the teacher has a big impact on whether students succeed or fail. Less morale, job dissatisfaction, absenteeism, adverse health effects, poorer productivity, job turnover, etc. are all effects of teachers' stress. If teachers have positive personality attributes that promote learning in pupils, communicate knowledge in a variety of methods, and foster an atmosphere of cooperation (3). Between 25 and 50 percent of teachers quit their jobs

during the first five years of their careers, and high stress levels have been linked to this.

Typically, special education teachers engage in activities that necessitate prolonged periods of kneeling, stooping, squatting, bending, and constant trunk flexion. Pain in a specific body part, like the lower back, has been the focus of research into work-related musculoskeletal disorders among special education schoolteachers. This pain is linked to a posture of prolonged static trunk flexion (4). The poorly designed work environments have a direct impact on the productivity of the teacher resulting in their poor health and quality of teaching (5). An important tool for effectively controlling and preventing musculoskeletal injury is ergonomic training(6).

Teachers work under a great deal of stress, which is linked to an increase in physical complaints and mental health issues including burnout, which are the most common causes of early retirement. Long-term negative stress in teachers, which is a sign of an unbalanced psychophysiological system, can cause heart disease, depression, anxiety, and gastrointestinal problems. Long-term negative stress causes abnormalities in the endocrine and autonomic nerve systems and ongoing psychological strain results in the emergence of health problems. Poor job satisfaction, little job autonomy, and high job demands are all linked to an increased risk of cardiovascular disease. A vicious cycle may form if the person is repeatedly exposed to harmful work stress while recovering. When performing mentally taxing tasks, blood pressure may rise. Heart rate frequently rises in instances of intense muscle strain and falls in repetitive, low-arousal tasks. The quick return to hormonal normalcy is an indication of positive mood and situational adjustment. Catecholamine excretion that is consistently increased is a sign of poor adjustment, which is connected to stressful situations. Long-term stress causes an increase in catecholamine excretion that is chronic (7).

A person's ability to cope with stress appears to be improved by aerobic fitness, which also seems to influence the autonomic nervous system's reactions to intellectually demanding work in the actual world (8). Techniques for relaxing the body and mind are included (9). The study of ergonomics focuses on how to tailor a worker's physical task requirements to reduce occupational disease and damage. The goal of the ergonomic interventions was to prevent or lessen the impacts of overexertion, repetitive motion, and poor alignment or posture that are experienced when doing job responsibilities. Interventions are intended to lessen work-related stress (10). The subject-oriented design of the workplace, suitable learning aids and resources and a teacher-friendly learning environment are the guiding principles of ergonomic design for the teacher's workplace.

MATERIALS AND METHODS

Ethical considerations

The manuscript is approved by the Institutional Review board of the faculty of physiotherapy (IRB REF NO: BPT IV D/PHYSIO/ IRB/2019-2020). All the procedures were performed in accordance with the ethical standards of the responsible ethics committee both (Institutional and national) on human experimentation and the Helsinki Declaration of 1964 (as revised in 2008).

The outpatient physiotherapy department at ACS Medical College and Hospital was the setting for this study. The random sampling method was used to select 30 subjects for this study based on the inclusion and exclusion criteria. The selected subjects were divided into two groups: 15 were placed in Group A, where they were treated with the aerobic stepper exercise and relaxation technique, and 15 were placed in Group B and treated using aerobic stepper exercise. Suggestions have been given on ergonomic correction. Pre-tests were collected on the first day of the study and post-test done on the end of the study course using testing blood pressure and blood glucose using a sphygmomanometer and glucometer as outcome measure. Treatment was given for a period of 8 weeks 5 days in a week, 45 minutes per day.

Intervention

Group A (aerobic stepper exercises and relaxation technique)

Relaxation training (Jacobson relaxation training)

Position of the subject was in a comfortable relaxed half lying position. For 5 minutes the subject is asked to achieve mental relaxation. Then diaphragmatic breathing is applied to gain physical relaxation. The subjects were instructed to flex their fingers and hold them in this position for eight to ten seconds. They were then asked to relax and feel as though there was no tension. This was done for each movement(Flexion, extension, abduction and adduction for all the joints).

Diaphragmatic breathing exercise

Subjects were positioned in half lying with two pillows supported over back. Subject hand was instructed to be over the anterior margin of the rectus abdominis. The breathing focus includes the expansion of the rib cage during inhalation. The relaxation training procedure was done for 15 minutes.

Group B (aerobic stepper exercises and ergonomic corrective measures)

Ergonomic intervention

The desk positioning, seat height and locations for the keyboard, mouse, and monitor were changed in

accordance with the ergonomic guidelines.

To improve the workstation

In the workplace, computer workers should keep their posture straight. Keep your head tucked in. Sit straight in a chair with shoulders relaxed, your feet flat on the ground, and back supported.

A desk or work surface

Work desk with sufficient height that allows enough space for your knees and thigh to comfortably fit under the desk was recommended.

Neck supportive chair

The person can adjust the chair's height so that their feet are flat on the floor. It lowers the likelihood of neck issues. Long periods of sitting without neck support can cause stiffness. Ergonomic seat with head rest that supports head and neck was recommended.

Aerobic stepper exercise (Training given to both groups)

Aerobic stepper exercise is a form of physical exercise which is helpful in managing blood pressure. Subjects were asked to begin a step aerobics workout with series of basic moves such as stepping up and stepping down, and following are the aerobic stepper exercise, A step move, V Stepper, Inverted V stepper, Side stepper

A step move

The subjects were instructed to stand with their backs to the stepper. Then, using the right foot, step up to the center and bring the left foot up to meet the right. Then, using the right foot, step back to the opposite side and bring the left foot up to meet the right.

V stepper

V step is another basic move to start with, which is the same as the basic step up move except when patient feet are on the step, they are at a wider V stance.

Inverted V stepper

The patient was asked to alternate the V step by tapping a toe and changing the lead foot. As a rule, 10 to 20 repetitions of each were generally sufficient.

Side stepper

The patient was asked to stand next to the stepper and put the right leg on the stepper followed by the left foot. Then step down their right foot and then left foot. The aerobic stepper exercise is given for 30 minutes, 5 days in a week.

Data analysis

Collected data were aggregated and analyzed using both descriptive and inferential statistics. All parameters were evaluated during the Social Science Statistics Package (SPSS)version24.An independent t-test (Student's t test) was used to identify statistical differences between the groups and a paired t-test was used to identify statistical differences between groups.

RESULTS

Tables 1 and 2 show that both groups had significantly lower mean blood pressure values after testing, with group A aerobic exercise and relaxation techniques having a mean of 123/81 mmHg, which is lower and more effective than group B's mean of 138/85 mmHg for ergonomic correction, P≤0.001. Hence, the null hypothesis is rejected.

Table 1: Comparison of systolic blood pressure range between group A and group B in pre- and post-test

SBP	Group A		Group B		t- test	df	P-value
	Mean	S.D.	Mean	S.D.			
Pre-test	142.33	5.39	142.26	5.13	.035	28	.973*
Post- test	123.66	3.99	138.53	5.01	-8.98	28	.000***

*Significant

Table 2: Comparison of diastolic blood pressure range between group A and group B in pre- and post-test

DBP	Group A		Group B		t Test	df	P-value
	Mean	S.D.	Mean	S.D.			
Pre-test	87.26	2.98	87.60	3.18	-.296	28	.770*
Post- test	81.00	2.07	85.73	3.08	-4.93	28	.000***

*Significant

Tables 3 and 4 show that post-test mean values for group A (aerobic stepper exercise and relaxation technique) and group B (mean blood glucose levels) have decreased significantly. This indicates a P ≤ 0.001 effective mean value of 107.2mg/dL (group B - ergonomic correction and aerobic stepper training). The empty hypothesis is therefore rejected. The mean values of blood pressure and glucose levels were significantly different between the pre-test and post-test within groups A and B(P≤0.001) (Table 5).

Table3: Comparison of blood glucose level between group A and group B in pre- and post-test

BGL (mg/dl)	Group A		Group B		t Test	df	P-value
	Mean	S.D.	Mean	S.D.			
Pre-test	109.60	6.40	110.73	8.72	-.405	28	.688*
Post- test	98.33	4.80	107.26	8.84	-3.43	28	.000***

*Significant

Table 4: Comparison of dependent variables within group A between pre and post-test values

Variables	Pre-test		Post-test		t – Test	P-value
	Mean	S.D.	Mean	S.D.		
Systolic BP	142.33	5.39	123.66	3.99	20.31	.000***
Diastolic BP	87.26	2.98	81.00	2.07	8.95	.000***
Blood glucose level	109.60	6.40	98.33	4.80	8.79	.000***

*Significant

Table 5: Comparison of dependent variables within group B between pre-and post-test values

Variables	Pre-test		Post-test		t Test	P-value
	Mean	S.D.	Mean	S.D.		
Systolic BP	142.26	5.13	138.53	5.01	15.04	.000***
Diastolic BP	87.60	3.18	85.73	3.08	4.29	.000***
Blood glucose level	110.73	8.72	107.26	8.84	13.55	.000***

*Significant

DISCUSSION

Stressisdefinedasovertaxingtheadaptivecapacityofthemindandbodyandcanbeseenintheformofphysicalandormentaldemands. Teachers are essential in influencing how children in our country conduct their life. In addition to facilitating learning, teachers have an impact on a child's social and emotional growth.

The stress can be experienced by environmental effects, organizational factors, and individual variables. Teacher stress can be defined as the experience by a teacher of unpleasant negative motions such as anger, frustration, anxiety, depression, and nervousness. The teaching profession is widely perceived as a stressful occupation and is characterized by several different challenges such as administrative burden, long working hours, classroom management difficulties and lack of autonomy, to name a few. It's important to note that not all stress is bad. Everyone faces some level of stress daily that is unavoidable. Stress, when experienced too much, becomes a problem and negatively impacts behavior, relationships, and health. The term "eustress" refers to positive stress associated with increased performance and productivity. 'Distress' is negative stress associated with poor performance or adverse health effects. The teacher spends most of her day away from her colleagues and spends less than 5% of her working time collaborating with them. Stress is a major public health problem associated with many physical and mental health problems. It is estimated that 75% to 90% of his GP visits are due to stress-related illnesses. Cardio- vascular disease, obesity, diabetes, depression, anxiety, immune system suppression, headaches, back and neck pain, and sleep disturbances are some of the stress-related health problems (26). Human and animal studies show that physical activity improves how the body handles stress through changes in hormonal responses, and exercise affects neurotransmitters in the brain, such as dopamine and serotonin, which influence mood and behavior. The musculoskeletal system can be affected by poor posture, extreme temperatures, or repetitive movements during work stress. Despite the extremely significant differences between group A's aerobic stepper exercise and relaxation technique, blood pressure and blood glucose levels differ significantly between pre-test and post-test within groups A and B. Therefore, it is very important that each person engages in exercises and uses relaxation techniques to manage physiological stress indicators.

CONCLUSION

According to the findings, aerobic stepper exercise with relaxation techniques shows a highly significant difference and aerobic stepper exercise with ergonomic correction shows significance but aerobic exercise with relaxation technique is highly effective in reducing stress and maintaining blood pressure and glucose level in teachers.

CONFLICT OF INTEREST

Authors declare that there is no conflict of interest.

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