The Effect of Aerobic Training with and without Screen Time Control on Stroke Volume to Bruce Protocol among Collegian with Poor Sleep Quality.

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ABSTRACT

The purpose of this study was to find out the effect of aerobic training with and without screen time control on stroke volume to bruce protocol among collegian with poor sleep quality. To achieve the purpose, forty (N=40) men hostel students in Annamalai University, Tamil nadu, were selected as subjects. The age ranged between 18 – 23 years. The subjects were selected through PSQI questionnaire to assess the quality of sleep and was randomly assigned into two equal groups of twenty (n=20) subjects each such as aerobic training with screen time control group and aerobic training alone group. The experimental group underwent their respective experimental treatment for twelve weeks and a session in each day. The Stroke Volume was taken as criterion variable for the present study and it was measured by milliliter per beat. All the subjects of two groups were tested on the stroke volume at prior to and after the training programme. The analysis of variance (ANOVA) was used to analyze the significant difference,if any between the groups. Level of confidence was fixed at 0.05 to find out the level of significance which was considered as an appropriate. The result revealed that there was a significant changes on stroke volume due to aerobic training with screen time control and also aerobic training alone. The result of the study also shows that the improvement of stroke volume was significant for aerobic training with screen time control group than aerobic training alone group.

KEY WORDS: Physical training, Screen time control, Physiological response, Stroke Volume.

INTRODUCTION

Numerous studies center on college students, who are typically thought to be in relatively good health at this time of significant shift and socio-developmental transition. Nevertheless, there is growing evidence that these students may be experiencing a range of physiological, psychological, and social health issues. Conventional physical health describes a person's condition as being free from illness and having normal physiological scores in all physical domains. In the psychological sphere, one can demonstrate the ability to manage psychological stress, recover from it, and avoid post-traumatic stress disorders. Both healthy people and a good social environment, which includes resources, support, and social adjustment are necessary for social health.

Lack of sleep is shown to have detrimental effects on physiological and psychological performance (Leeder et al., 2012**)**. The most prevalent effects of sleep loss are psychological, with the primary effect being associated with altered mood states, decision-making skills, and cognitive impairment (Davenne, 2009**)**. Decision-making skills are frequently incorporated into the sport, and when sleep duration and sleep quality are not constantly prioritized, the cognitive processes involved in decision-making during sport are impaired, thus decreasing performance outcomes (Reilly & Edwards, 2007). Physiological effects of sleep loss are not so prevalent but are linked to reduced immune function (via reductions in natural killer T cells) (Reilly & Edwards, 2007), decreased sub-maximal sustained performance (Leeder et al., 2012), and even reduced glucose metabolism (Spiegel et al., 1999) which may result in increased fatigue (Davenne, 2009).

Physical inactivity and screen-based sedentary behaviors are serious public health concerns faced by young adults in many countries. The benefits of high PA and low ST on physical health are well studied and documented, such as lower blood cholesterol, lower blood pressure, reduced obesity, higher bone density, vision, and eye health. Some studies have investigated the relationships between physical activity (PA), screen time (ST), and sleep quality, and how they relate to psychological health; however, findings have been inconsistent. Two studies, conducted in the United States and England, failed to find an association between PA and psychological health, while studies from China reported that high ST and low PA have adverse effects on sleep quality and psychological health among college students. Some studies in China also showed that high ST and low PA can interact to cause psychological problems. Furthermore, a literature review suggested that independent associations of PA and ST with social health have received very little investigation, and less is known as to whether PA and ST interact and have an additive or compensatory effect on social health (Ma et al., 2020).

MATERIALS AND METHODS

Selection of subjects and variables

The aim of this study was to find out the effect of aerobic training with and without screen time control on stroke volume to bruce protocol among collegian with poor sleep quality To achieve this purpose forty untrained students studying in Annamalai University, Tamil nadu during the academic year 2022- 2023 were selected as subject using PSQI questionnaire. The age of the subjects was ranged from 18 – 23 years. The data on stroke volume was collected by using Doppler ultrasound (in ml/beat).

Training Plan

The selected subjects were divided in to two equal groups of twenty subjects each at random. Group-I performed aerobic training (such as walking, jogging and continuous running) with screen time control (restricted to use screened devices on bed time with help of particular applications. Minimum 7-8 hours of sleep should be recommended) and Group-II performed aerobic training alone (such as walking, jogging and continuous running). The experimental period was of twelve weeks. The requirements of the experimental procedures, testing aswell as exercise schedules were explained to them so as to avoid any ambiguity of the effort required on their part and prior to the administration of the study. The investigator got the individual consent from each subject. The subjects underwent their respective training programme under the strict supervision of the Researcher.

The Bruce protocol is a standard test in cardiology and consists of several exercise phases of three minutes each. In each phase, the incline and speed of the treadmill are increased to increase the work output, called METS. Stage 1 of the Bruce protocol is performed at 1.7 miles per hour with a 10% incline. Stage 2 is at 2.5 miles per hour and 12%, while Stage 3 is at 3.4 miles per hour and 14%.The Federal Aviation Administration (FAA) expects tests to reach 100% of the maximum predicted respiratory rate (220 minus our age) and to last nine minutes unless medically contraindicated or prevented by symptoms such as fatigue, leg cramps, shortness of breath, or chest discomfort. The FAA accepts a minimum of 85% of the maximum predicted rate, but stays on the treadmill as long as possible, up to nine minutes, to demonstrate maximum effort. "The FAA allows applicants older than 70 to exercise for at least six minutes, but they still must reach 85% of the predicted maximum respiratory rate.

COLLECTION OF DATA

Pre test data was collected before and after Bruce protocol exercise stress and post test was collected from the two experimental group (PTSTCG & PTG) after 12 weeks of training, before and immediately after Bruce protocol exercise stress.

STATISTICAL PROCEDURE

The collected data from the physical training with screen time control and physical training alone group during pre and post-test on stroke volume was used for statistical treatment to find out the significance mean difference by computing the three way factorial ANOVA (2X2X2). The 0.05 level of confidence was fixed to test the significance which was considered to be appropriate measures.

RESULTS

Descriptive analysis of the data on stroke volume at rest and after exercise condition during pre and post test are presented in table - I

Table I: Mean and Standard Deviation on Stroke Volume at Rest and After Exercise during Pre and Post Tests of Experimental Groups

Groups		Pre Test		Post Test	
		At rest	After exercise	At rest	After exercise
Aerobic training with screen time control group	Mean	71.1000	101.0500	84.7500	120.1000
	SD	5.91964	5.64265	7.61491	8.69301
Aerobic training group	Mean	70.4500	100.2500	78.4500	108.5500
	SD	5.95134	5.36926	7.14861	7.33754

Table – II: Three Way Factorial ANOVA on Stroke Volume of Experimental Groups at Two

Source of Variance	Sum of Squares	df	Mean Squares	"F" ratio
Groups	931.225	1	931.225	20.155*
Test	6002.500	1	6002.500	129.915*
Before and After Exercise	39187.600	1	39187.600	848.156*
Groups and Test	672.400	1	672.400	14.553*
Groups, Before and After Exercise	72.900	1	72.900	1.578
Test, Before and After Exercise	81.225	1	81.225	1.758
Groups, Test, Before and After Exercise	65.025	1	65.025	1.407
Error	7022.900	152	46.203	

**Significant at .05 level of confidence*

(Table values required for significance at .05 level with df 1 & 152 is 3.90.)

It is observed that the obtained 'F' ratio for groups irrespective of test and exercise conditions is 20.155, which is greater than the table value of 3.90 with df 1 and 152 required for significance at .05 level of confidence. It indicates that significant differences exist between groups [PTSTC &PTG] irrespective of test and exercise conditions. From table-II, the obtained 'F' ratio value for tests (pre & post) irrespective of groups and exercise conditions is 129.915, which is greater than the table value of 3.90 with df 1 and 152 required for significance at .05 level of confidence. The result of the study shows that significant difference exists between tests (pre & post) irrespective of groups and exercise conditions. The obtained 'F' ratio for exercise conditions irrespective of groups and tests is 848.156, which is greater than the table value of 3.90 with df 1 and 152 required for significance at .05 level of confidence. It indicates that significant differences exist between resting and exercise conditions (before and after exercise) irrespective of groups at pre and post tests on stroke volume.

The obtained 'F' ratio for the interaction of groups and test irrespective of exercise conditions is 14.553, which is greater than the table value of 3.90 with df 1 and 152 required for significance at .05 level of confidence. It shows that significant difference exists for the Interaction of groups at pre and post tests irrespective of exercise conditions on stroke volume.

The results of the study also shows that the obtained 'F' ratio value for the interaction of group and exercise conditions irrespective of tests is 1.578, which is lesser than the table value of 3.90 with df 1 and 152 required for significance at .05 level of confidence. It reveals no significant difference that exists for the interaction of groups at resting and after exercise conditions irrespective of pre and post tests on Stroke Volume.

It is observed that the obtained 'F' ratio value for the interaction of test and exercise condition irrespective of groups is 1.758, which is lesser than the table value of 3.90 with df 1 and 152 required for significance at .05 level of confidence. It confers the existence of no significant difference for the interaction of tests at rest and after exercise condition irrespective of groups on stroke volume.

The obtained 'F' ratio for the interaction of groups test and exercise conditions is 1.407, which is lesser than the table value of 3.90 with df 1 and 152 required for significance at .05 level of confidence. It shows that no significant difference exists for the Interaction of groups at rest and after exercise conditions irrespective of pre and post tests on stroke volume.

Table – III: The Simple Effect Scores of Groups at Four Different Stages of Tests on Stroke

Source of Variance	Sum of Squares	df	Mean Squares	"F" ratio
Groups at rest during pre test	4.225	1	4.225	0.09
Groups after exercise during pre test	6.400	1	6.400	0.138
Groups at rest during post test	396.900	1	396.900	8.59*
Groups after exercise during post test	1334.025	1	1334.025	28.873*
Tests at rest and group I	1863.225	1	1863.225	40.326*
Tests at rest and group II	640.000	1	640.000	13.851*
Tests after exercise and group I	3629.025	1	3629.025	78.545*
Tests after exercise and group II	688.900	1	688.900	14.910*
Tests during pre test and group I	8970.025	1	8970.025	194.143*
Tests during pre test and group II	8880.400	1	8880.400	192.20*
Tests during post test and group I	12496.225	1	12496.225	270.463*
Tests during post test and group II	9060.100	1	9060.100	196.093*
Error	7022.900	152	46.203	

Significant at .05 level of confidence

(Table values required for significance at .05 level with df 1 & 152 is 3.90 respectively.)

Table-III exhibits that the obtained 'F' ratio values for groups at rest and after exercise during pretest are 0.09 and 0.138 respectively, which are lesser than the table value of 3.90 with df 1 required for significance at .05 level of confidence. However, the obtained 'F' ratio values for groups at rest and after exercise during posttest are 8.59 and 28.873 respectively, which are greater than the table value of 3.90 with df 1 required for significance The result of the study indicates that stroke volume did not vary significantly between groups during pre test period at rest and after exercise conditions, while, significant difference exists on stroke volume between groups at rest and after exercise conditions during post test period.

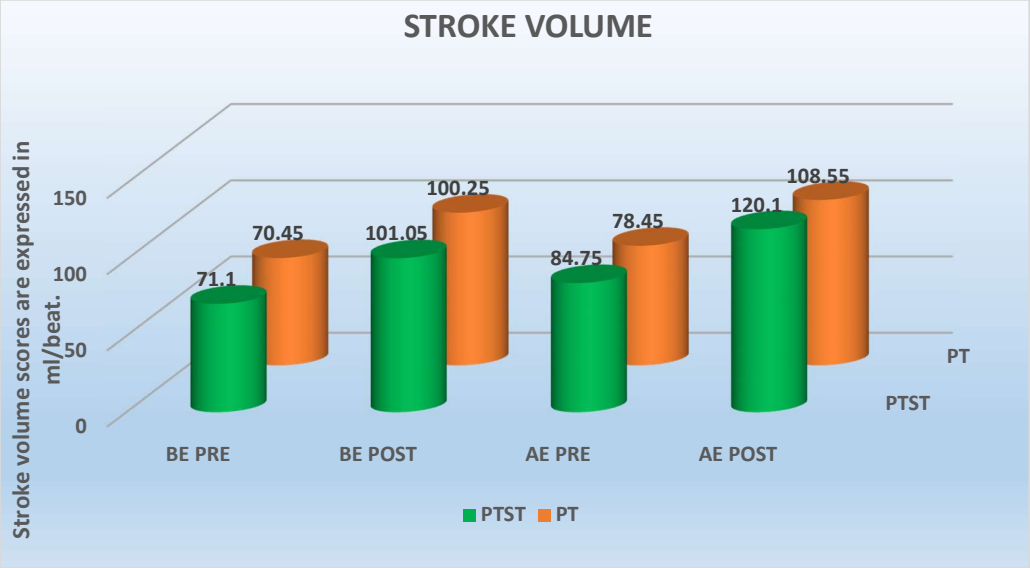
Table-III also demonstrates that 'F' ratio values obtained for tests at resting condition of group-I and group-II are 40.326 and 13.851 respectively, which are higher than the table value of 3.90 with df 1 required for significance at .05 level of confidence. It indicates that stoke volume of aerobic training with screen time control and aerobic training alone groups altered significantly for better as a result of training.

The observed 'F' ratio values on stroke volume for tests after exercise condition of group-I and group-II are 78.545 and 14.910 respectively, which are higher than the table value of 3.90 with df 1 required for significance at .05 level of confidence. Findings indicates that stroke volume in response to exercise of aerobic training with screen time and aerobic training alone groups altered significantly for better as a result of respective training.

The 'F' ratio values obtained for tests during pretest of group-I and group-II are 194.143 and 192.20 respectively, which are higher than the table value of 3.90 with df 1 required for significance at

.05 level of confidence. The result of the study indicates that stroke volume of two groups elevated significantly in response to exercise during pre test period.

The result of the study also shows that 'F' ratio values obtained for tests during posttest of group-I and group-II are 270.463 and 196.093 respectively, which are higher than the table value of 3.90 with df 1 required for significance at .05 level of confidence. It indicates that stroke volume of two groups elevated significantly in response to exercise during posttest period.



DISCUSSION

The result of the present study points out that stroke volume of the subject significantly altered due to aerobic training with screen time control and aerobic training alone. The findings are also in agreement with the findings of (Scruggs *et al*., 1991; Gledhill, Cox & Jamnik, 1994) stroke volume in highly trained persons can continue to increase up to near maximal rates of work. Further, several factors contribute to the increase in stroke volume from an endurance training. Endurance training increases plasma volume by approximately the same percentage that it increases stroke volume (Green, Jones & Painter, 1990). Besides, Swoap et al., (1994) result indicated that the effect of 26 weeks high and moderate intensity aerobic training improves in physiological parameters among older adults.

Regular participation in physical activity is imperative for good physical and mental health (Committee PAGA, 2018).Several studies indicate opposite findings that screen time and physical activity might alter health dimensions independently (García-Hermoso et al., 2017), but also interact between them (Rosenberger et al., 2019). Another study in to 14,880 Iranian children and adolescents reported that although the amount of screen time is a factor with negative impact on LS, the impact can be overshadowed by more intense and effective physical activity (Matin et al., 2017). It is known that the practice of physical exercise improves some risk factors, such as the rate of body fat, insulin resistance and high blood pressure, which are associated with increased stiffening of arteries (Stehouwer & Ferreira, 2006). Moreover, it has been shown that physical exercise has an impact on inflammation, in sympathetic activities and improved endothelial function by increasing blood flow, which leads to increased shear stress, stimulating the release of oxide; it is also known that these factors are involved in arterial stiffening (Tanaka & Safar, 2005).

CONCLUSION

Stroke volume of both groups (ATWST & AT) did not differ significantly at rest as well as exercise condition during pre test period. However, stroke volume of aerobic training with screen time control (ATWST) was higher than aerobic training alone group at resting as well as after exercise

condition during post test (i.e. after 12 weeks of training). Stroke volume at resting condition during post test (i.e. after 12 weeks of training) of ATWST group was significantly higher than stroke volume of resting condition during pretest. Similarly Stroke volume at resting condition during post test (i.e. after 12 weeks of training) of AT group was significantly higher than stroke volume of resting condition during pretest. Stroke volume after exercise condition during post test (i.e. after 12 weeks of training) of ATWST group was significantly higher than stroke volume of resting condition during pretest. Similarly Stroke volume after exercise condition during post test (i.e. after 12 weeks of training) of AT group was significantly higher than stroke volume of resting condition during pretest. The stroke volume of ATWST group after exercise condition during pre test was significantly better than stroke volume of resting condition during pre test. Similarly stroke volume of AT group after exercise condition during pre test was significantly better than stroke volume of resting condition during pre test. The stroke volume of ATWST group after exercise condition during post test was significantly better than stroke volume of resting condition during post test. Similarly stroke volume of AT group after exercise condition during post test was significantly better than stroke volume of resting condition during post test.

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