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Low intensity running as an exercise intervention for students with study related fatigue

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Abstract
Background: School students nowadays often face study stress resulting from high study demands and concern about academic grades resulting in fatigue which interferes with their daily lives.
Objective: Aim of the study was to investigate to what extent exercise intervention [low intensity running] is effective in reducing study related fatigue in school students.
Methodology: The present study was conducted as a comparative study where 30 subjects were selected on the basis of selection criteria and assessed with outcome measures which included Fatigue Severity Scale and Balke Run Test. The intervention took place for 4 weeks where the participants were divided into 1:1 ratio; exercise group and control group. The exercise group underwent the study with each running session comprised for 60 minutes. Progression was assessed after every 2 weeks.
Result and Conclusion: There were not much considerable improvement in VO2 MAX in both exercise and control group but fatigue was seen to be reduced compared to the initial score in exercise group in FSS score.

Keywords: Study related fatigue, fatigue severity scale, Balke run test, low intensity running

Introduction
Fatigue is a nonspecific symptom because it can be indicative of many causes or conditions including physiological states such as sleep deprivation or excessive muscular activity; medical conditions such as chronic inflammatory conditions, bacterial or viral infections, or autoimmune illnesses; and psychiatric disorders such as major depression, anxiety disorders, and somatoform disorders [1].

Fatigue has also been described in terms of level of severity, level of impairment, physiological and psychological characteristics (physical vs. mental), and duration [2].

School students nowadays are often faced with study stress, resulting from high study demands, and concern about academic grades. When this study stress is prolonged and exceeds student's adaptive resources, it can result in high levels of study-related fatigue or in burnout (a more severe expression of study-related fatigue) [3].

A substantial number of school students experience study-related fatigue. A foundational challenge for those who study or treat fatigue is the lack of an empirically derived definition of study-related fatigue. Since, fatigue is such a universal phenomenon, even in the general population (where it is a common complaint for about 10% of the populace and increases with age or morbidities), it is important to characterize study-related fatigue and its interference with daily life of students. The prevalence of study-related fatigue, and its negative impact on health and academic performance, call for prevention and reduction of these complaints [4].

Fatigue is physical and or mental exhaustion that can be triggered by stress, medication, overwork, or mental and physical illness or disease. Everyone experiences fatigue occasionally. It is the body's way of signaling its need for rest and sleep. But when fatigue becomes a persistent feeling of tiredness or exhaustion that goes beyond normal sleepiness, it is usually a sign that something more serious is amiss [5]. Physically, fatigue is characterized by a profound lack of energy, feelings of muscle weakness, and slowed movements or central nervous system reactions. Fatigue can also trigger serious mental exhaustion. Persistent fatigue can cause a lack of mental clarity (or feeling of mental "fuzziness"), difficulty concentrating, and in some cases, memory loss [6]. People can tire out from monotony or from repetition of routine, especially if it is below their mental capacity.

This is seen in school children who have a capacity beyond their grade, but are held back in order to fit into the routine of school life. School fatigue may not necessarily be due to an excess of lessons but may result from a continuous activity of the body and mind [7]. Irritability among students is a very frequent complaint. This manifests itself in such manners as impatience, quarrelsomeness, and inability to cooperate in group activities. Restlessness is also commonly seen. This is revealed mentally in a short attention span and physically difficult to remain quiet for a normal length of time. In marked cases temper tantrums may be severe. Verbal and physical responses are slower than normal. Students complain of inability to do certain activities because they are too hard for them, but simple for a normal student, which is seen as a feeling of inadequacy. Headaches may be complained of, sleep becomes restless and insomnia occurs. Many endocrine disturbances also play a role or even the important part in the fatigue syndrome. It is well known that emotions produce circulatory and endocrine disturbances. Chronic anxiety is said to induce adrenal insufficiency [8]. The temperament of the individual plays a role in the expression of fatigue; a nervous temperament favors quick fatigue, and repeated fatigue makes a vicious circle by increasing nervous instability [9]. Anxiety may be a protracted but legitimate form of worry, in that it is a search for a way out of a difficulty. There is, however, a less productive and quite as chronic form of anxiety which is expressed by abundance of activity, commonly called "fussing". "Fussing" is one of the most fatiguing forms of activity, because of lack of direction in the expenditure of energy [6]. Evidence is emerging that regular exercise may be an accessible and inexpensive way to prevent or reduce (study-related) fatigue. Both psychological and physiological working mechanisms may underlie potential positive effects of exercise on study-related fatigue [8]. With respect to the former article, exercise might, for instance, help students to distract from (negative) thoughts about study demands (‘psychological detachment). Detachment by means of exercise may enable students to return to a relaxed psychophysiological state that enhances the feeling of being refreshed by the start of a new (study) day [10].

Regarding the latter it is, for instance, hypothesized that individuals who exercise regularly—compared to those who do not exercise—show faster physiological (e.g., blood pressure) recovery from a stressor once the stressor is no longer present, which decreases the likelihood that persistent fatigue occurs. The few available intervention studies concerning (study-related) fatigue show favorable effects of exercise, but research in this area can be advanced, as these studies did not include a control group or focused on general fatigue instead of study-related fatigue [11].

To our knowledge, well designed randomized controlled trials to examine the efficacy of exercise for reducing study-related fatigue have as yet not been conducted.

The purpose behind the current study was to investigate to what extent an exercise intervention (i.e., low intensity running, three times a week) is effective in reducing study related fatigue.

There were careful selection of students with high levels of study-related fatigue and randomly assigned those to either an exercise intervention or wait list in order to establish to what extent the exercise intervention can reduce fatigue (primary outcome) as compared to the natural course of time.

Methodology

Design and study population

A total number of 30 subjects who fulfill the inclusion criteria were selected for the study. The inclusion criteria contains of only male subjects under 16 years of age who are studying at Amrita Vidyalayam, who scores above validated cut-off points on measures of study-related fatigue i.e., ≥22 on fatigue severity scale (FSS). Subjects those who are involved in sports activities or on any exercise activities, undergoing any treatment or taking any sort of medication for fatigue, any other medical reason related to fatigue were not included in this study. The present study was conducted at Amrita Vidyalayam School, Kannur, Kerala, India for a duration over 1 month. An experimental study design was used for the study. A purposing sampling was performed. After all the procedures were explained and a written consent from the school and the participants were taken. The ethical clearance was taken from the college ethical committee of Institute of paramedical sciences. The study was conducted from a period of 2 months from January to march 2018.

Procedure

Participants were selected on the basis of selection criteria and informed consent were taken from all participants and the students were asked to fill out the FSS questionnaire and assessed for Balke Run Test. Data was then analyzed. All participants were divided into 2 groups in 1:1 ratio; one was the exercise group and the other was the control group. The intervention took place for 4 weeks in each running session comprised 60 minutes: a warming up of about 15 minutes (running on a low intensity alternated with walking), a core program consisting of running alternated with walking of about 30 minutes, and a cooling down of about 15 minutes.

During the four weeks, the periods of running in each running session were extended, and the walking periods shortened, so that after four weeks the participants were able to run 20 minutes uninterrupted on a low intensity.

Intervention

Balke run test

This 15 minute run test, designed by Bruno Balke, is one of many field tests designed to measure aerobic fitness. This test has formula to predict VO_2max from the run distance.

Aim: a running test to measure aerobic fitness (the ability of the body to utilize oxygen to power it while running).

Equipment required: flat oval or running track, marking cones, recording sheets, stop watch.

Procedure: Place markers at set intervals around the track to aid in measuring the completed distance. Participants run for 15 minutes, and the distance covered is recorded. Walking is allowed, though the participants must be encouraged to push themselves as hard as they can. The original formula by Balke: VO2 = 6.5 + 12.5 x kilometers covered. The reliability of this test would depend on practice, pacing strategies and motivation level of the participants.

Data collection

The intervention took place in a school, even the physical education teacher was trained for the intervention in order to collect data or examine them. Training session and the assessment was taken by the therapist who is conducting the study.

Progression was assessed after every two weeks after each session by means of fatigue severity scale (FSS) and Balke Run Test. The Balke Run Test needed a running track, a stop watch and an assistant and as for procedure, the participants were asked to run as far as possible for 15 minutes and the assistant notes the total distance achieved in the 15 minutes [11]. once data was collected, a Statistical analyses were performed using SPSS 13.0 (SPSS, Chicago, IL, USA).

Results

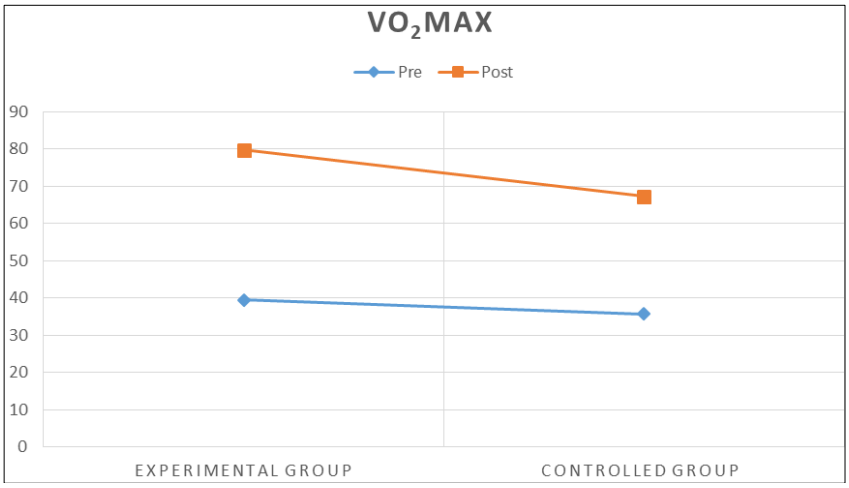
A total number of 30 subjects who fulfill the inclusion criteria were selected for the study. The table shows two variables (VO_2 Max & Fatigue) measurement, pre and post-test variables.

Table 1: Exercise group vo2 max and fatigue

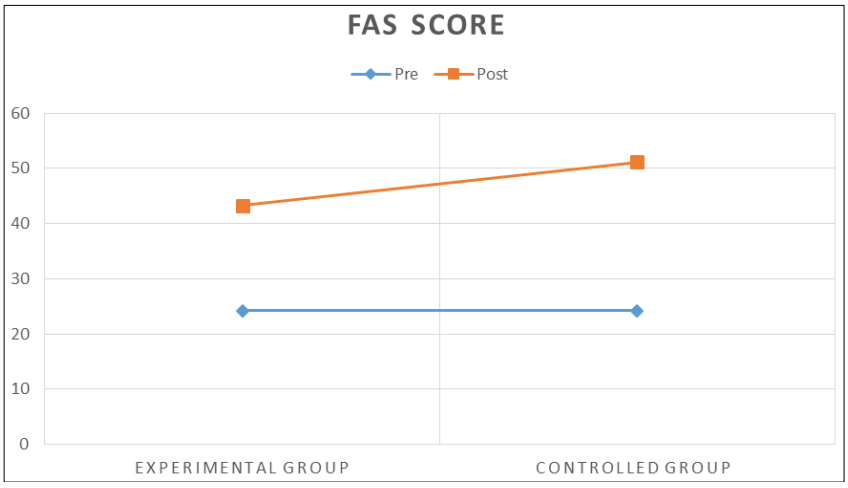
Variables	Vo2 Max		Fatigue	
	Pre	Post	Pre	Post
Mean	39.5	40.20	24.2	19.06

Table 3: Control group v02 max and fatigue

Variables	VO_2Max		Fatigue	
	Pre	Post	Pre	Post
Mean	35.66	31.5	24.26	26.86



Graphical representation of vo2max pre and post exercise in both group



Graphical representation of FAS Score (Fatigue) pre and post exercise in both group

In the exercise group there was not much improvement of average VO2 max of 40.20 from an average VO2 max of 39.5 and an average FAS score of 19.06 from an average FAS score of 24.2 in the post exercise.

In the control group there weren't any considerable improvement in VO2 max which declined from an average of 35.66 to 31.5 and FAS score which increased from an average of 24.26 to 26.86.

Discussion

A substantial number of school students experience study-related fatigue. Fatigue is physical and/or mental exhaustion that can be triggered by stress, medication, overwork, or mental and physical illness or disease [16].

The aim of the present study was to investigate to what extent an exercise intervention was effective in reducing study-related fatigue (primary outcome) among university students. The study subjects were male subjects under 16 years of age who are studying at Amrita Vidyalayam. All participants were divided into 2 groups in 1:1 ratio; one was the exercise group and the other was the control group. The intervention took place for 4 weeks in each running session comprised 60 minutes.

Progression was assessed after every two weeks after each session by means of fatigue severity scale (FSS) and Balke Run Test, which showed considerable decline in overall fatigue (on the basis of FAS scoring) in the case of exercise group but, there were no expected improvement in VO_2max

than in control group where there were no changes at all. In an another study of [10], in their study of using exercise as an intervention for study-related fatigue among university students used low intensity running 3 to 4 times a week which resulted in decrease in study-related fatigue but did not find any considerable improvement in their fitness which were assessed on the basis of FSS scale and fitness test, respectively.

Another study suggest that [17], in their study protocol of a two-arm randomized controlled trial showed the evaluation of the efficacy of an exercise intervention for employees to reduce work-related fatigue and the exercise intervention consisted of three one-hour low-intensity outdoor running sessions a week. Each week, two sessions take place in a group under supervision of a trainer, and one session is completed individually. The running sessions will be carried out during leisure time. The primary outcome is work-related fatigue which declined when assessed post intervention.

Limitations and recommendations

For further study, the authors recommends that More subjective assessment should be included, Climate were to be considered and time of day, any Chance of injury and Students taking any sort medications were excluded. Furthermore some more extension can be made to the study and Respective changes can be made to outcome measures. These study can also be used for as baseline measurement for checking the Quality of Life (QOL) among school students.

Conclusion

A substantial number of school students experience study-related fatigue which can be defined as physical and/or mental exhaustion that can be triggered by stress, medication, overwork, or mental and physical illness or disease. This study has some of the limitations, more subjective assessment were required, weather were to be considered and time of day, any chance of injury, moreover Students taking any sort medications were excluded. So these factors can be considered for further studies.

In this study we looked into how exercise intervention can reduce study-related fatigue by assessing fatigue and Vo2 max in 2 groups: exercise and control group on the basis of FAS and Balke Run Test which did not show any considerable increase of VO2 max but did find decrease in overall fatigue in the exercise group than in control group. After conducting this study some recommendations from the authors are, detail subjective assessment should be performed, some more extension can be made to the study. Respective changes can be made to outcome measures and also Consideration for those on medication and other condition.

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