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Effects of Calisthenics Training on Mood and Sleep Quality amongst Students Attending Online Mode of Education

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Abstract

Background: The word calisthenics discussed is about a set of person's own body weight exercises. Calisthenics is theoretically called "free exercises" as they are practice of rhythmic exercises without instruments. Calisthenics contributes to aerobic and muscular conditioning and improves psychomotor skills for instance coordination, agility and balance. Several studies specify that HIIT (High Intensity Interval Training) increases oxygen absorption in healthy young adults through endurance training. Other benefits of practice contain decreasing resting blood pressure and cholesterol, improvement insulin sensitivity and a decrease in intra-abdominal fat. Current evidence suggests that short period of exercise is adequate enough to change the mood. **Objective:** To evaluate the effects of calisthenics training on mood and sleep amongst students who are attending online mode of education. **Methodology:** An experimental single-group study was conducted on 60 subjects between age group of 18-25 years based on inclusion criteria. College students included in study were from South Bangalore. Mood and sleep was assessed both pre and post calisthenics training. Eight weeks of calisthenics training was given to all subjects for enhancement in mood and sleep was evaluated using POMS, PSQI and SAA, respectively. The collected data was analyzed in SPSS software by using paired t-test. **Results:** The results were statistically significant as inferred from the data analysis for POMS, PSQI and SAA, except the vigor from POMS and deep sleep duration from SAA of subjects attending online mode of education undergoing calisthenics training. **Conclusion:** Study concluded that calisthenics training improves mood and sleep quality.

Keywords: Calisthenics Training, High Intensity Interval Training, Pittsburgh Sleep Quality Index, Profile of Mood State, Sleep as Android

1. Introduction

The term calisthenics discussed in United States is about set of body weight training to increase overall health level in students. The phrase with Greek roots originates from word "Kàlos" which means beauty and "Sthénos" which means strength. Currently, term calisthenics is used to describe a specific physical exercise which resembles gymnastics but primarily done outdoor in parks, using parallel bars, high bars and rings[1].

Calisthenic exercises with High-Intensity Interval Training (HIIT) and calling it as new calisthenics, HITT Bodywork (HBW) or calisthenics HIIT[2]. The calisthenics exercises contributes to aerobic and muscular conditioning, improves psychomotor skills for example coordination, agility and balance[3]. Several studies specify that HIIT increases oxygen absorption in healthy young adults through endurance training. Other benefits of practice contain decreasing resting blood pressure and cholesterol, improvement insulin sensitivity, and a decrease in intra-abdominal fat[4].

Prior research has recommended that a change of mood in a single bout exercise is adequate enough. For example, a short period (30 minutes) of aerobic exercise could bring about a positive mood. Regular exercise not only boosts good moods but also lowers or stops emergence of bad moods. Persistent exercisers are resilient to stress. Engaging in exercise is cost free and exercise offers cost-efficient behavior treatment to improve mood[5].

Sleep is a crucial regulator of blood sugar levels, hormone release and cardiovascular function and it proves that variations in sleep quantity or quality significantly affect mortality (Banks and Dinges *et al.*, 2007). Regarding sleep-wake functioning, sleep quality is an important factor. Poor sleep quality is linked to poor academic performance, poor health, higher health care costs and absenteeism from work[6].

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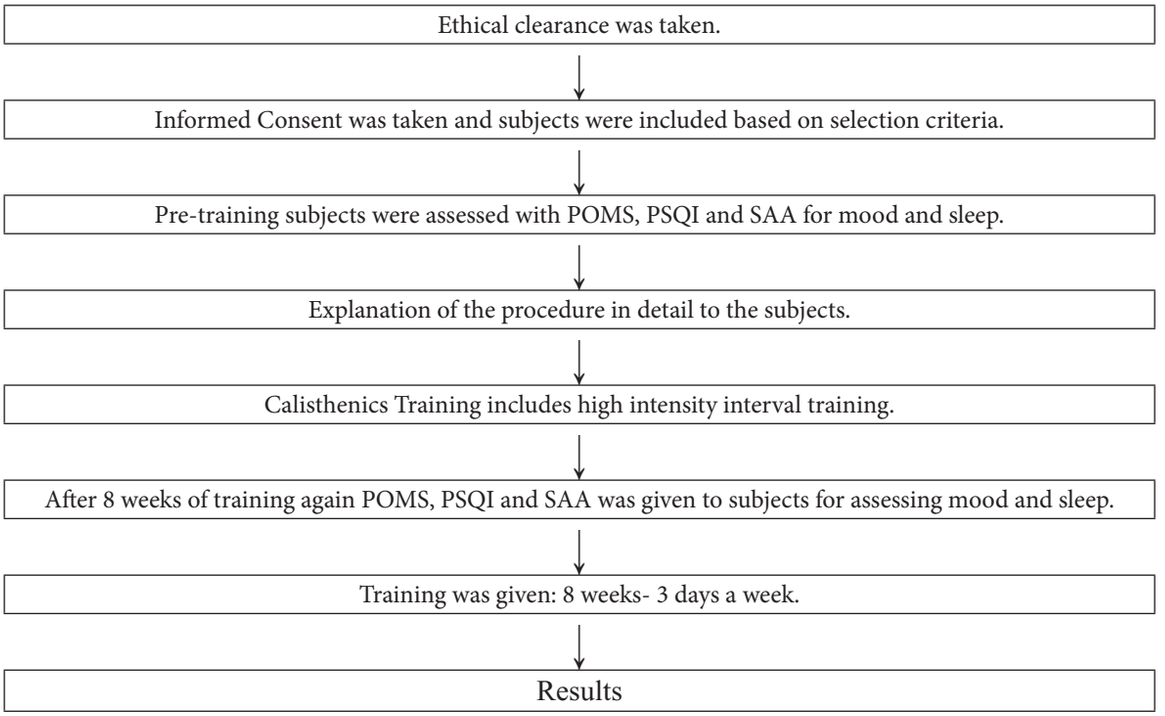
College students frequently experience sleep issues that lead to Excessive Daytime Tiredness (EDS). Deprivation results from both biological and social factors[7]. A lot of data to back up notion that sufficient quality sleep is crucial for sustaining both mental and physical health as well as optimal neurocognitive and psychomotor function[8].

Numerous college students are not involved in kind of physical activity, at a distance walking from their home to classrooms is not that far away[9]. Regular exerciser states feeling better. Some claim that this is because exercise stimulates the production of neurotransmitters, which are chemicals made in the brain. They can improve your mood and reduce stress because neurotransmitters are thought to be mediator of people's moods and emotions[10]. Aim of study is to evaluate the effects of calisthenics training on mood and sleep quality amongst students those who are attending online mode of education due to the closure of educational institutions as an impact of COVID-19 restrictions, lockdown and Government protocols.

2. Methods

"Ethical clearance was obtained from institutional ethical committee from Krupanidhi College of Physiotherapy, Bangalore, and Karnataka (Ref No: EC- MPT/PHY/011)". The study design is experimental single group study and convenient sampling technique was performed. The inclusion criteria age from 18-25 years old[11], both male and female, without health issues that rises adverse event threat while participating[12], sleep measures includes sleep quality captured by the device (i.e., not self-reported)[13], people with smart watch, those who are using android mobile devices, students spending minimum 5 hours on screen for education purpose, subjects with less than 7 hours of sleep per day, Sedentary lifestyle[14]. The exclusion criteria for Musculoskeletal disorders such as rheumatoid arthritis or specific injuries to the hand and shoulder etc[4], cardiovascular alteration confirmed by medical evaluation[4], positive clinical diagnosis of diabetes mellitus[4], those who are undergoing calisthenic training[15], diagnosed with hypersomnolence (e.g., primary insomnia or sleep apnea)[16,17], any diagnosed chronic physical or mental illness, affecting prescribed medication for the last 6 months[17], iOS mobile users. An informed consent was signed by each individual. 60 healthy subjects were recruited based on the inclusion criteria. Outcome measures were Profile of Mood state, Pittsburgh Sleep quality of index and Sleep as Android used before and after intervention for assessing the mood and sleep quality amongst students. An eight week session three days a week of HIIT based on overall body weight exercise was accomplished in time that involved 4 minutes of warming up (walking down and then up five flight of stairs) followed by 8 sets of 4 exercises were repeated twice[18,19]. The intervention included burpees, mountain climbers, squats and jumping jacks accord with work of McRae *et al.*[18]. After that subjects were engaged in slow jogging to relax and recover[20]. The duration and frequency of the training should be 30 minutes for eight weeks involving three sessions a week should be promoted[21].



3. Procedure

3.1 Statistical Analysis

Statistical analysis was done using SPSS (version 29.0) windows. The descriptive statistics was performed for the demographic variables and outcome variables. To find out significant difference among variables such as Profile of Mood State (Mood) and its components (anger, depression, confusion, tension, fatigue and vigour), Pittsburgh Sleep Quality Index (Sleep), and Sleep as Android (Sleep duration and Deep Sleep Duration) paired t-test was used. The significance level was desired at 5%. Microsoft Excel was used to generate tables and figures.

3.2 Hypothesis

Null Hypothesis

There is no significant difference in POMS, PSQI and SAA.

Alternate hypothesis

There is a significant difference in POMS, PSQI and SAA.

4. Results

Table 1. Baseline characteristics of subjects - Descriptive statistics

	Mean	Std. Deviation
Age (years)	22.00	2.139
Height (cm)	161.5180	9.58187
Weight (kgs)	60.67	13.983
BMI (kg/m^2)	23.0700	4.38794

It is inferred from Table 1 that according to baseline characteristics based on inclusion of criteria age group ranging from 18-25 years the mean value of age in years 22 ± 2.139, height in cm 161.51 ± 9.58187, weight in kgs 60.67 ± 13.983 and BMI 23.07 ± 4.38794 kg/m^2.

Table 2. Pre-test and post-test descriptive statistics

	pre-test		post-test	
	Mean	Standard Deviation	Mean	Standard Deviation
POMS	87.43	15.496	57.4	20.972
PSQI	8.267	2.5101	5.13	0.747
SAA Sleep duration	5.7012	1.03469	6.8108	0.94705
SAA Deep sleep duration	1.4798	1.88375	1.921	2.33301

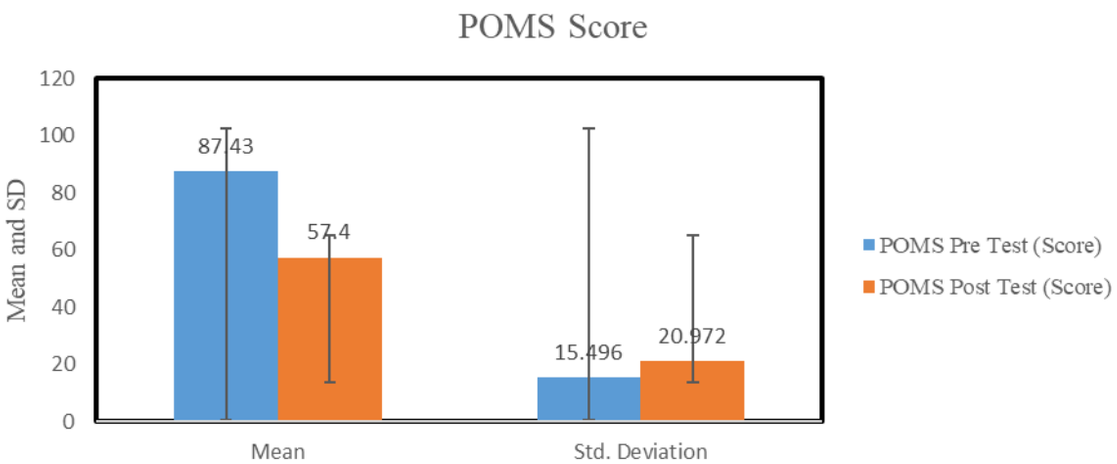


Figure 1. Mean and standard deviation of POMS.

It is inferred from Table 2 that according to outcome measure POMS, the mean difference for pre-test is 87.43 ± 15.496 and post-test is 57.4 ± 20.972 after eight weeks of the calisthenics training. There was improvement in their mood like anger, tension, fatigue, confusion, depression and vigour those who were attending online mode of education (Figure 1).

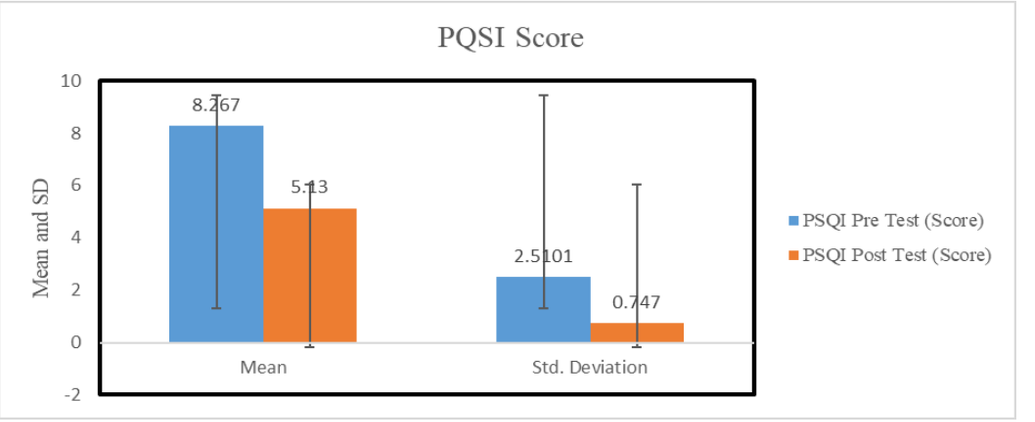


Figure 2. Mean and Standard deviation of PSQI.

It is inferred from Table 2 that according to variable PSQI there is a mean difference for the pre-test is 8.267 ± 5.13 and the post-test is 2.5101 ± 0.747. After eight weeks of calisthenics training, there was improvement on their sleep after the training of those who were attending online mode of education (Figure 2).

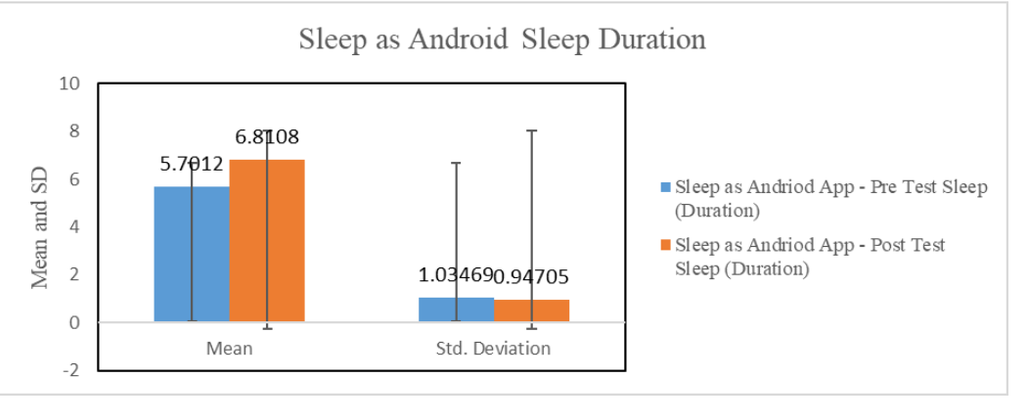


Figure 3. Mean and standard deviation of SAA sleep duration.

It is inferred from Table 2 that according to variable SAA sleep duration mean difference for the pre-test is 5.7012 ± 6.8108 and the post-test is 1.03469 ± 0.94705. After eight weeks of calisthenics training, there was improvement on their sleep after the training for those who were attending online mode of education (Figure 3).

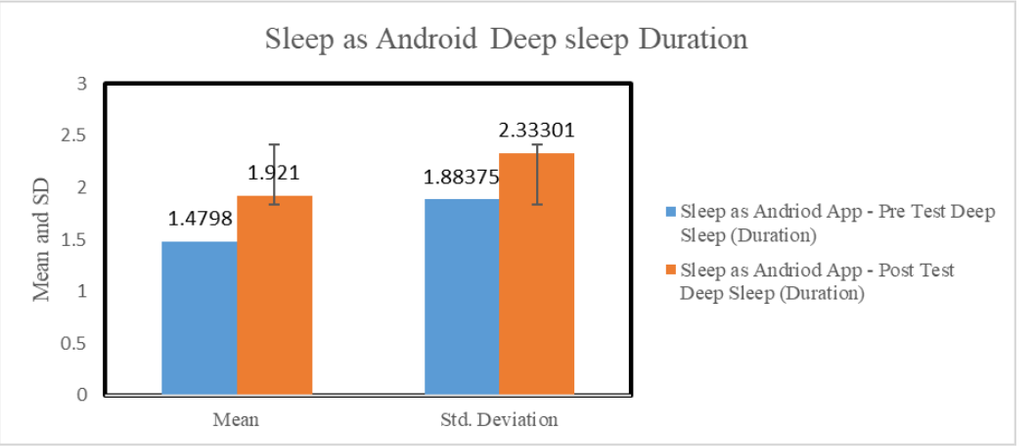


Figure 4. Mean and standard deviation of SAA deep sleep duration.

It is inferred from Table 2 that according to variable SAA deep sleep duration mean difference for the pre-test is 1.4798 ± 1.921 and the post-test is 1.88375 ± 2.33301. After eight weeks of calisthenics training, there was improvement on their deep sleep after the training those who were attending online mode of education (Figure 4).

Table 3. Outcome measures pre and post training evaluation

Test	Mean	S. D	t	p	Significant/Not Significant
POMS Pre Test (Score) - POMS Post Test (Score)	30.033	11.114	20.932	0.001	Significant
PSQI Pre Test (Score) - PSQI Post Test (Score)	3.1333	2.1899	11.083	0.001	Significant
Sleep as Android App – Pre Test Sleep (Duration)- Sleep as Android App - Post Test Sleep (Duration)	-1.10967	0.73724	-11.659	0.001	Significant
Sleep as Android App - Pre Test Deep Sleep (Duration) - Sleep as Android App - Post Test Deep Sleep (Duration)	-0.44117	2.63351	-1.298	0.199	Not Significant

No subjects were injured pre workout and post HIIT overall body training session. Table 3 represents profile of mood state, Pittsburgh sleep quality index, Sleep as android (sleep duration and deep sleep duration) pre and post HIIT overall body protocol. The p value is less than 0.05 for POMS, PSQI and SAA (sleep duration) but not for deep sleep duration value is 0.199 which is greater than 0.05. The calculated p value is below threshold chosen for statistical significance = 0.001 (<0.05), therefore null hypothesis is rejected and accepted alternative hypothesis for POMS, PSQI and SAA. The calculated p value is more than threshold chosen for statistical significance = 0.199 (0.05), therefore alternative hypothesis is rejected and accepted null hypothesis for Vigor component from POMS and Deep Sleep Duration from SAA.

5. Discussion

Calisthenics exercises with HIIT have been used by researchers[2]. HIIT consists of explosive training followed by a bout of rest and takes less than 30 minutes to perform[22]. This study evaluated effect of mood and sleep quality amongst students attending online mode of education. The mood assessed using Profile of mood state scale whereas, sleep assessed using Pittsburgh sleep quality index and Sleep as Android. In POMS scale, we analyzed the responses of six subjective transient feelings. Present study found that both mood and sleep improved significantly after 8 weeks of calisthenics training.

Evangelista AL *et al.*[4] study findings showed that extreme and compound physical exercises caused central and peripheral fatigue, which stimulates mood and it had progressive effects on subjects feelings related to mood reaction towards exercise are apparent when intensity is self-imposed. Fatigue was greater in the end of session with p = 0.03.

Rohisha I K *et al.*[23] says that in older people who were institutionalised and had poor sleep quality, calisthenics exercise had positive impact on their quality of sleep. p = 0.001 revealed an improvement in the mean sleep quality score during the calisthenics session.

Altuntas *et al.*[24] effects of calisthenics training online on physical activity, sleep, anxiety, depression and quality of life were evaluated during COVID-19. They witnessed that giving eight weeks of calisthenics training had positive effects on physical activity level, quality of life, sleep, physical activity parameters, depression and anxiety. Depression p = 0.003, Beck anxiety Questionnaire p = 0.004, Anxiety assessment p = 0.007, PSQI average sleep disturbance p= 0.014 sleep efficiency p = 0.020 and total score p = 0.002.

Chris Griffiths *et al.*[25] says that the participants from an early intervention psychosis service were interviewed and provided information on the relation between sleep, exercise and well-being. They provided their perspective about eight week intervention experience including a Fitbit, exercise advice and sleep hygiene, from the previous psychosis research stated that majority of sample experienced sleep problems. Though most participants used Fitbit and its app with the given intervention to improve level of physical activity, exercise and sleep quality.

Investigators consider high-intensity exercise might provoke muscle soreness, raised physiological provocation and counterbalance possible positive effects of exercise on sleep, meta-analysis results shows significant effect of HIIT on overall sleep efficiency and quality. The subcategory analysis of studies showed single bout of HIIT may elevate neuropsychological core temperature and stress, cause sympathetic hyperactivity or shift the circadian phase[26]. In terms of neurophysiology, both reward system and stress is altered by exercise. Exercises has

to go beyond moderation verge to activate the hypothalamus-pituitary-adrenal hormonal axis and high-intensity exercise as a result in a surge of cortisol (Arent *et al.,* 2005)[27].

The duration of 10 to 30 minutes of exercise is adequate enough for mood improvement and an extended duration has further benefits. An exercise prescription perception, the results recommend that a short duration exercise is adequate enough to improve mood. The only barrier which individuals face is lack of time for exercising. (Popham and Mitchell, 2006)[28]. There is positive impact on emotional health through short bouts of exercise to people attracted to regular exercise. Though it perceived exercise duration and mood enhancement are definitely interrelated (Evans *et al.,* 2017)[29].

6. Limitation

This study training was done for 8 weeks. A longer duration study would provide better results than small sample size. The daily activities of the subject were not monitored and could have influenced the study.

7. Future Scope of Study

Larger sample size prolongation of follow-up time is recommended to make the study more reliable. Everyday sleep can be tracked for accurate results. Further study can be conducted for muscle strength and endurance.

8. Conclusion

The study concluded that there is an improvement in Profile of mood state except vigour component, Pittsburgh sleep quality index and sleep as android but not in deep sleep duration among students in their mood and sleep quality after eight weeks of calisthenics training.

9. Conflict of Interest

There is no conflict of interest.

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