

A study on Relation of Sleep Quality with Cardiorespiratory Fitness in Adolescent Girls

S. Sangeetha¹

BPT 3rd year,

Saveetha College of Physiotherapy
Chennai, India

Dr. Sujatha Baskaran²

MPT (cardio), Assistant Professor

Saveetha College of Physiotherapy
Chennai, India

S. Priyanga³

BPT 3rd year,

Saveetha College of physiotherapy
Chennai, India

Abstract:- Aim of the study is to determine the association between the sleep quality with cardiorespiratory fitness among adolescent girls. The association between the sleep quality with cardiorespiratory fitness was predicted by using maximal multistage 3m step test according to the procedure described by the FITNESSGRAM which is a health related physical assessment. Detailed procedure will be explained in patient words and informed consent will be obtained from all participants. According to the test results the sleep quality was associated with cardiorespiratory fitness. Lower CRF indicates poor sleep quality. This study is an observational study done at Saveetha College of physiotherapy with a sample of 20 females between the age of 15-18 years. The test is assessed carefully before and after performed. The sleep quality is assessed by a questionnaire given to individuals. The results from the test conclude that the girls who were classified as fit were likely to report a better sleep quality when compared to the unfit peers. This study concludes that increased sleep quality has greater significance with cardiorespiratory fitness when compared to decreased sleep pattern.

Keywords:- 3m Step Test, Fitness Gram Sleep Quality, Cardiorespiratory Fitness.

I. INTRODUCTION

Cardiorespiratory fitness (CRF) is defined as the ability of the body's circulatory system and respiratory system to supply the required oxygen to the skeletal muscles during the increased physical activity (1). The exercise is the thing that not only improve the respiratory system of the body but it also improves the heart by increasing the amount of the oxygen that is inspired and distributed to the body tissues when required. It is the measure that how well our body is able to transport the oxygen to the muscles during prolonged sustained exercise, and also to absorb and use the oxygen after it has been delivered to generate adenosine triphosphate energy through the cellular respiration. The cellular respiration is the batch of metabolic processes and reactions which occurs in the cells of the organism to convert the biochemical energy from the nutrients in the body into adenosine triphosphate and then it excretes the waste products from the body (2). From the aerobic energy system the cardiorespiratory fitness level is measured (3).

The cardiorespiratory fitness is improved by many ways and it is also improved by making a person to perform a prolonged exercise that stimulates the persons aerobic energy system (4). The aerobic fitness is maintained by the activities that makes the heart rate to increase and maintain it for a long period and also improves the cardiorespiratory fitness level (5).

Sleep is the active process. It is the bodies rest cycle which is triggered by the group of hormones that are active and which responds to cues from the body and the environment. There are many stages of sleep, during certain stages the oxygen uptake is increased more than the normal uptake. A person is said to have a good sleep only when the person falls asleep in or before 30 mins (6). The same way a person who has a bad sleep spends most of the time in the deep sleep. The sleep quality plays a major role in the body nutrition and health. When the sleep quality is affected it in turn affects the body and causes poor nutrition and health (7).

The sleep is not only important for the health it is also important for the memory and learning of an individual (8). A person requires a quantitative and qualitative sleep for to feel rested, energized and motivated in his / her works. The optimal sleep lies in between a period of 6-9 hours which should not be less than 6 hours or exceed 9 hours (9). As already said the sleep stages forms between light sleep which include the stage 1 and 2 and the deep sleep that includes stage 3 and 4. Usually a sleep occurs in cycles, during which the person go from light sleep to deep sleep and back again. Actually we need 20 minutes for a person to go from wide awake to deep sleep (10).

The cardiorespiratory fitness has two main components, and the first main component is the ability of our body to transport oxygen to the body muscles that requires more during prolonged and sustained exercise or any physical activity, and the second most important component is the muscles ability to absorb and use those oxygen when required. These abilities mainly depend on the combined and coordinated activity of main things such as heart, arteries, veins and their lungs. This process in our body works in a step wise process and that goes as, first the air is inhaled into the body and the oxygen in the air is absorbed by the capillaries that is around the lungs and it is further transported through the pulmonary vein in the left side of the heart. And further the oxygenated blood from the lung is pumped out of the left side of the heart and then

it is delivered to the muscles when required (11). All these process requires cardiorespiratory fitness also.

There is a significant evidence that any improvement in cardiorespiratory fitness over time has a greater effect in lowering the mortality level (12). The major importance of cardiorespiratory fitness is to reduce the risk of any chronic diseases. Many health benefits are associated with increased level of cardiorespiratory fitness with is raised due to the increased physical activity. This higher CRF increases the quality of life and increases the person's life (13). The same way the reduced CRF increases the risk of premature death mostly from all causes of cardiovascular diseases. The qualitative cardiorespiratory fitness improve the energy level and will help the person to feel good and also creates body fat loss and reduces the stress level. This makes the heart muscles get strengthen and decreases the chance of heart disease.

For the person to lead a happy and prosperous life and a disease free life the sleep is very important. Both sleep and CRF improve the quality of life and provides a better health.

II. MATERIAL AND METHODS

❖ *Study Design:*

observational study design.

❖ *Study Setting:*

- Saveetha College of Physiotherapy,
- Saveetha University, Thandalam,
- Chennai- 602105.

❖ *Sampling Method:*

Random sampling method.

❖ *Sample Size:*

20 healthy subjects were selected between the age group of 15-18 years.

❖ *Inclusion Criteria:*

- Subjects age group -15 to 18 years.
- Subjects involved-only girls.
- Normotensive
- Subjects those who are willing to participate.

❖ *Exclusion Criteria:*

- Subject those who are not willing to participate.
- Students under medication.
- Psychological problems
- Orthopaedic problems.

❖ *Materials Required:*

- Sleep quality index questionnaire. (pittsburg sleep quality)
- 12-inch bench or box.
- Stop watch or clock.
- Sphygmomanometer.

❖ *Procedure:*

The total of 20 sample of adolescent girls between the age group of 18-22 years were selected according to inclusion and exclusion criteria. The safety and simplicity of the entirety of the procedure will be explained before handed. All the 20 samples were selected randomly using convenient sampling techniques. The sleep quality was assessed by giving questionnaire, and the cardiorespiratory fitness was determined by 3m step test which shows the maximum heart rate of the individual. The subjects resting heart rate is measured. The 3m step test is started first in a speed of quite slow. The subject will climb up and down in a two step stairs for 3min and then their heart rate and pulse rate was recorded. The main advantage of this test is that a larger group can perform this test easily at once for minimal costs. And also it provides a maximum effort when compare to other tests of endurance capacity.

➤ **Treatment session:** (3 minute step test)

➤ **Duration of each session:** 15 minutes.

➤ **Number of sessions:** 1 session/day.

III. RESULT

This study shows that group A who have moral sleep quality have a better cardiorespiratory fitness when compared to the group B who doesn't have a normal sleep quality which was found using the questionnaire. So, this study shows that girls who were under normal category are more likely to have a good quality of sleep. By checking this cardio respiratory fitness individuals sleep is determined separately. They help in identifying the individual with good sleep quality and improve the quality of life.

IV. DISCUSSION

The observational studies shows that physical inactivity and the decreased cardiorespiratory fitness is directly associated with the illness and death mostly caused due to the cardiovascular diseases and cancer. The most valid measure for the cardiorespiratory fitness is considered to be Vo₂ maximum (14). The vo₂ maximum is the measure of capacity of the heart, lungs and blood that transports the oxygen that is required by the working muscles and it is also the measure of the oxygen that is utilized by the muscles during activity (15).

A study shows that the poor sleep quality has reduced the CRF in young women and in that study they have correlated the sleep and BMI (16). The central America and caribbean had done some studies on persons with short sleeps and they concluded that the short sleepers have increased BMI and reduced cardiorespiratory fitness (17). In our study we found that low values of Vo₂ max indicates poor sleep quality in women of our study.

Also in certain studies done by Recinial et al., shows that there is no significant change in the Vo₂ maximum of the women with low sleep quality (18). This study that used adolescent girls examines the association between their

cardiorespiratory fitness and sleep quality and it indicates the decrease of Vo₂ max in poor sleep quality subjects (19). The most important finding of our study shows that there is an association between the CRF and sleep quality. The unfit prevalence found in our study is that our data showed that the poor percentage of the cardiorespiratory fitness of girls who were classified as unfit (20). Not only this, in addition to these information the subjects those who were classified as fit according to their sleep quality were twice the time better sleep quality when compared to the unfit samples. The lower fitness status has been related to lower level of physical activity, which in turn is related to lower availability to perform daily task and further increases in aerobic capacity levels.

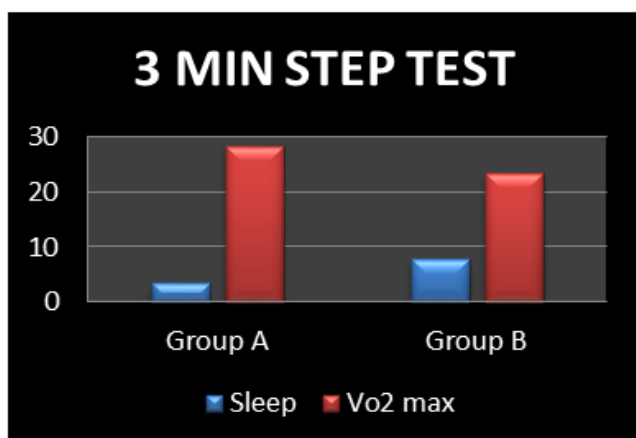


Fig 1:- Comparison of GroupA and GroupB in three minute step test

V. CONCLUSION

The conclusion of this study is that due to the increased CRF the sleep quality decreases in the adolescent subjects. The sleeping quality was also significantly associated with the CRF or vice versa. Girls who were under fit category were more likely to report better sleep quality compared to their unfit individuals. From this result , it is concluded that cardio respiratory(CRF) is effective in maintaining the muscular strength , muscular endurance and improves the flexibility and helps in improving the quality of life.

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CONFLICT OF INTEREST

All the authors of the study declared no conflict of interest.

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