Influence of exercise and physical fitness toward student sleep quality

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Abstract. Sleep is one of human physiological need which naturally happen due to changes in consciousness with characterized by decrement in consciousness and response to stimuli. Exercise is organized, and planned tone movement aimed to increase the body functional ability to achieve specific purpose. The study aim was to determine the influence of physical fitness and exercise toward the SMA Negeri 2 Barru student’s sleep quality. The study was used pre experimental using pre-test and post-test group design. The study population was all grade X students in SMA Negeri 2 Barru aged between 15 years old and 16 years old which total of 71 students. The samples were 31 samples who volunteered to involve in this study. The respondents had followed four weeks physical fitness and exercise with three times per week with 15 minutes duration. The sleep quality was measured using Pittsburgh Sleep Quality Index (PSQI) on the pre-test and post-test. The result showed mean score on pre-test was 9.55±1.710 and post-test was 5.39±1.874. Meanwhile, statistical test showed p=0.001<0.05 which meant there was decreased global score on post-test. These results proved that there was influenced of physical fitness and exercise toward the student sleep quality after the post-test.

1. Introduction
Healthy sleep has plays important role in better health maintenance and wellbeing with improve the public health [1]. Sleep is functional state which consists of complex combination of physiological and behavioural processes [2]. The sleeping is essential for improve health and sleep disorder which affect the physical and mental health [3]. Poor sleep quality is correlated with chronic diseases such as obesity, hypertension, diabetes mellitus [4]. The sleep is a sequential physiological process alternating with longer period of awake and repeated occurring over certain period and influencing the behavioural response and physiological function. Besides, sleep disorder also correlated with anxiety and mood disorder, falling down and cognitive impairment among elderly people [5].

The prevalence of sleep disorder tends to increase in every year which correlated with aging process and another causes. Sleep problems such as chronic insomnia is reflected on public health concern which insomnia symptom prevalence ranges from 25% to 48% and diagnoses from 4.4 to 9.5% [6]. Meanwhile, insomnia prevalence among adults was reported ranges from 10% to 40% in western countries and over 25% in Taiwan [7]. Approximately, women suffered sleep disorder twice than men which sleep disorder is recognized by sleep difficulty, awake or difficulty in getting enough sleep [8]. Furthermore, approximately two-thirds of teenagers which only have less than eight hours sleep compared eight to ten hours [9].
Physical activity is known for its benefit on sleep quality and reduced the risk of insomnia among older adults [10]. Exercise has may benefits to the human body such as enhancing longer and healthier living conditions, increasing pulmonary and muscle capacity, strengthen bone in osteoporosis prevention, weight loss with low-calorie diets, prevent risk of diabetes mellitus (DM), reduce depression and anxiety as well as improve mood and sleep quality.

In general, physical activity range of 1 hour per day is correlated with good sleep duration for both low and high intensity physical fitness have positive influence on the sleep [11]. In additions, advantages of exercise including spatial learning, hippocampal cell activity and brain-derived neurotrophic factors impairment [12]. There is approximately 23.1% of boys and 14.0% of girls aged between 13 years old and 15 years old in 32 countries in North America and Europe which met the vigorous intensity physical activity (MVPA) recommendation in 2010 [13].

Meanwhile, the researcher found lack of physical fitness and exercise among students in SMA Negeri 2 Barru since the school still less interesting to apply healthy lifestyle such as physical fitness and exercise that was once a mandatory routine at beginning of 2012. The study aim was to determine the influence of physical fitness and exercise toward the SMA Negeri 2 Barru student ‘s sleep quality.

2. Methodology
This study was used pre experimental method with using pretest and posttest design which aim to determine the influence of physical fitness and exercise toward the student sleep quality. The study was conducted in 1st March 2017 until 1st of April 2017 at SMA Negeri 2 Barru. The study population was all students of SMA Negeri 2 Barru with total of 71 students. The samples were 31 students which met the inclusion criteria such as students in SMA Negeri 2 Barru, experienced sleep disorder based on PSQI and willing to be study samples.

The data was collected by using pretest questionnaire with PSQI instrument with given physical fitness and exercise of 3 times per week for four weeks. Light intensity exercises consisted warming up, core movement and cooling down for 15 minutes in the evening. After physical fitness and exercise, the respondents would fulfil the PSQI questionnaire for obtain the posttest data. The data was analysed through SPSS program by using Pair T test to determine the influence of physical fitness and exercise toward sleep quality.

3. Result and Discussion

3.1. Result
In Table 1, 20 respondents (64.5%) were female and 11 respondents (35.5%) were male. In additions, there were 19 respondents were 15 years old (61.3%) and 12 respondents (38.7%) were 16 years old.

| Variable | n  | %   |
|----------|----|-----|
| Gender   |    |     |
| Female   | 20 | 64.5|
| Male     | 11 | 35.5|
| Total    | 31 | 100 |
| Age      |    |     |
| 15 years | 19 | 61.3|
| 16 years | 12 | 38.7|
| Total    | 31 | 100 |

Meanwhile, there were 4 respondents had good quality and 27 respondents had poor of sleep quality during pretest. In posttest, there were improvement on the student sleep quality, 26 respondents had good sleep quality and only 5 respondents had poor sleep quality.
Table 2. Respondent distribution based on sleep quality of Grade X students in SMA Negeri 2 Barru.

| Sleep quality | Pre test | Post test |
|---------------|---------|-----------|
| Very good     | -       | -         |
| Good          | 4 (12.9%) | 26 (83.9%) |
| Poor          | 27 (87.1%) | 5 (16.1%) |
| Very poor     | -       | -         |

The mean of pretest was 9.55 with standard deviation of ±1.710. In additions, mean of sleep quality was 5.39 with standard deviation of ±1.874. The statistical test showed p=0.001<0.05 which showed there was significant changes before and after physical fitness and exercise toward the sleep quality of grade X student of SMA Negeri 2 Barru.

Table 3. Influence of physical fitness and exercise toward sleep quality.

| Group   | Mean±SD  | P    |
|---------|----------|------|
| Pretest | 9.55±1.710 | 0.000 |
| Posttest| 5.39±1.874 |

3.2. Discussion
The respondent characteristic in this study were all grade X students in SMA Negeri 2 Barru aged between 15 years old and 16 years old (average age is 15.39) since this study could be homogenous so that the class and age are more specific. Meanwhile, 20 female respondents and 11 male respondents had involved in this study. The selected respondents were respondents who included in the inclusion and exclusion criteria where the samples was not moderate followed the sport extracurricular, hence more female respondents were dominated in this study.

In this study, PSQI was used to measure the student sleep quality which has been tested in previous validity. Based on the statistical test showed there was significant influence between physical fitness and exercise with sleep quality. The teenagers tend to experience disruption in meet the basic need especially sleep which no research that deals with physical fitness and exercise in relationship to the teenagers sleep quality. The lack of sleep quality was correlated on using cell phone after light off. Amra et al. (2017) found cell phones use after 9.00 pm was correlated with lack of sleep quality among teenagers and those with shorter cell phone use duration and physical activity had better sleep quality [14].

Based on the pre-test result, there was no student who have excellent sleep quality since most students are living in school hostel which mixed with other students who likes to disturb student sleep quality. Besides, the weather also affected student sleep quality since the uncertain weather such as too cold due to raining or hot weather during dry season and surrounding noise.

In this study, there were four students had good sleep quality in pretest and increased to 26 students in posttest because the students routine followed physical exercise. The physical exercise helps increase endorphin hormone such as adrenaline, dopamine and serotonin. The serotonin plays role in sleep in homeostasis mechanism which Bulbar Synchronizing Region (BSR) that located in pons and medulla oblongata releases serotonin caused sleepy. The pretest also found 27 students were in poor sleep quality and decreased to 5 students in posttest.

There were students who have sleep quality of eight hours in pretest and still maintain the sleep duration since the student had followed physical exercise for 4 weeks and claimed there was changes in sleep quality but another disturbance was stress which not under the study control. The student experienced the stress caused poor sleep quality and contributed to the unchanged result in posttest.

The changes in brainwave were caused by the stimulating activity of the parasympathetic neuromuscular nervous system. The raphe nuclei is a nucleus originating from a brain stem medical and is projected to large area of the brain especially spinal column medulla radius and hypothalamus.
in which to release the serotonin hormone. The raphe nuclei is most prominent area of stimulation that cause natural sleep conditions. The parasympathetic stimulation of raphe nuclei will result in decrease of body metabolism, pulse rate, blood pressure, respiratory frequency and serotonin secretion increment.

The raphe is also projecting towards the hypothalamus and vice versa. The hypothalamus stimulation causes secretion of Corticotropic Releasing Factor (CRF). Furthermore, CRF stimulates the pituitary gland to increase the proopiomelanocortin (POMC) for encephalin production by the adrenal medulla. The pituitary glands also produce endorphins as neurotransmitters also affected the relax mood and calm feeling and facilitate for sleep.

4. Conclusion
In conclusion, there was influences between physical fitness and exercise toward student sleep quality with $p=0.001<0.05$. The suggestions is the school should provide regular physical fitness and exercise for their students to improve and maintain the sleep quality. Meanwhile, physiotherapist is expected to provide the education and advice and encourage patient with sleep problem especially insomnia patients to have physical fitness and exercise regularly to improve their sleep quality.

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