JURNAL KEDOKTERAN DIPONEGORO
(*DIPONEGORO MEDICAL JOURNAL*)
Online : http://ejournal3.undip.ac.id/index.php/medico
E-ISSN : 2540-8844
DOI : https://doi.org/10.14710/dmj.v11i5.35479
JKD (DMJ), Volume 11, Number 5, September 2022 : 263-267

THE EFFECT OF JUMP ROPE TRAINING ON MOOD AMONG SENIOR HIGH SCHOOL STUDENTS

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ABSTRACT

Background: Physical activity has protective effects against the development of depression symptoms for all age groups. Cognitive and aerobic training are lifestyle interventions that have been shown to have a positively impact health, reduce cognitive impairment, and delay the onset of dementia. Jump rope training is one type of aerobic training. In addition, aerobic training is effective in improving mood. **Objective:** This study aims to prove the effect of jump rope training on adolescents' mood as measured by the profile of mood state (POMS) score. **Methods:** This is an experimental study with two parallel groups pre-test and post-test design. The research subjects were 32 students of senior-high school 1 of Gunung Talang, Solok Regency, West Sumatra that were selected by purposive sampling and grouped into two groups. The control group without treatment (n=16), and the treatment group (n=16) were given jump rope training for six weeks. Mood scores were measured before and after the intervention using a POMS questionnaire and expressed as total mood disturbance (TMD) scores. **Results:** The research shown significant decreases in TMD scores (P<0.001) in the treatment group rather than the control group. In addition, there was a significant difference between the post-test TMD scores of the control group and the treatment group (P=0.005). **Conclusion:** Jump rope training for six weeks can improve the adolescents' mood.
Keywords: *aerobic training, jump rope training, mood, profile of mood state, total mood disturbance*

INTRODUCTION

Physical activity has protective effects against the development of depression symptoms for all age groups.[1] The results of the 2018 Basic Health Research show that depressive disorders started to occur in the teenage age range, with a prevalence of 6.2%.[2] The Lancet Global Health also in 2018 explained that 1.4 billion adults in the world lack physical activity, which can lead to the emergence of non-communicable diseases and could have a negative impact on mental health and life quality.[3]

Moderate-intensity physical training as well as high-intensity physical training can be beneficial for restoring mood. This training is based on increasing connectivity patterns of brain cortical areas involved in mood formation.[4] Mood is a widespread feeling that could be pleasant or unpleasant. The mood has a broad influence on perception, motivation and behavior.[5,6]

A previous study conducted by Kawano et al (2012), reported that oxygen consumption during jump rope training (movement skill training that is consist of floating stage and a landing stage carried out continuously and repeatedly) has reached more than 70% of the maximum oxygen consumption. This shows that jump rope training is one type of aerobic.[7,8] Studies show that aerobic training is effective in improving mood.[9]

The neurotransmitters of norepinephrine, dopamine and serotonin can affect mood. The functional deficiencies of serotonin, norepinephrine, or both play a role in depression.[10,11] Depression involves neurobiological changes that manifest in decreased neuroplasticity of the brain.[12] Decreased neuroplasticity in depression can be influenced by a brain-derived neurotrophic factor (BDNF).[13] BDNF plays a role in the process of nerve maturation, synapse formation and synaptic plasticity in the brain. BDNF is also implicated in a number of psychiatric or psychiatric disorders including schizophrenia, intellectual disability and autism, as well as mood disorders such as depression and their treatment.[14]

One method to measure mood states is the profile of mood states (POMS). POMS can be used in the fields of clinical psychology, psychotherapy, medicine, and sports science.[15] The POMS questionnaire consists of 65 items covering six different mood scales namely depression, fatigue, enthusiasm, irritability, tension, and confusion. The results of the questionnaire assessment were expressed as total mood disturbance (TMD) scores. A decrease in the TMD score indicates an increase in the mood domain in individuals.[16]

Based on this description, the researcher hypothesized that jump rope training for six weeks

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affects mood as measured using the POMS method in the adolescent.

MATERIALS AND METHODS

This experimental study has two parallel groups treated with pre-test and post-test designs. The subjects were thirty-two students of senior-high school 1 of Gunung Talang District, Solok Regency, West Sumatra. The subjects were selected by purposive sampling based on inclusion criteria, namely male, aged 15-18 years, had body mass index of 18-25 km/m2, had not implemented body training more than three times in a week, were willing to not do other sports for six weeks. There were no exclusion criteria.

Subjects were grouped into two groups; the treatment group and the control group. The treatment group was given jump rope training for six weeks with the frequency of training three times a week. As for the control group, they were asked to carry out their usual activities and were not allowed to for six weeks.

The jump rope training intervention was carried out with a schedule determined by the researcher with direct supervision. The jump rope training is carried out based on the series and provisions of the researcher. The warm-up and cool-down phases were carried out before and after training for 5 minutes. Jump rope training in weeks 1 and 2 consists of 5 sets of training, each training consists of 2 cycles. Every 1 cycle is carried out in a ratio of 1: 2, which is 30 seconds of skipping and 60 seconds of rest, so the total skipping time is 3 minutes. The jump rope training at weeks 3 and 4 was carried out with 5 sets of training consisting of 2 cycles, and each cycle was carried out in a 1:1 ratio, namely 60 seconds of skipping and 60 seconds of rest, so the total skipping time was 10 minutes. The jump rope training at weeks 5 and 6 was carried out with 5 sets of training consisting of 2 cycles, and each cycle was carried out in a 2:1 ratio, namely 60 seconds of skipping and 30 seconds of rest, so the total skipping time was 7.30 minutes.

The research subjects used a jump rope provided by the researcher, namely a standard jump rope wrapped with nylon thread. Jump rope training uses a mat with a thickness of ±8 mm to avoid injury.

Measurement of mood scores on research subjects used POMS questionnaire conducted before and after jump rope training with the control group. The results of the questionnaire assessment were expressed as TMD. A decrease in the TMD score indicates an increase in the mood domain in individuals.

Data analysis includes descriptive analysis and hypothesis testing. Hypothesis testing of each group was analyzed using unpaired t-test / Mann-Whitney. Ethical clearance was obtained from the Medical and Health Research Ethics Commission (KEPK) of the Faculty of Medicine, Diponegoro University (No. 213/EC/KEPK/FK-UNDIP/VI/2021). Before the research was carried out, informed consent was requested from the students.

RESULTS

Thirty-two male students of senior-high school 1 of Gunung Talang District participated in this study. Table 1 shows that the research subjects were divided into two groups, the control group (n=16) and the skipping treatment group (n=16). The mean age of the control group was 15.75 y.o. and the treatment group was 15.81 y.o., but the difference was not significant (*P*=0.674; Mann-Whitney). All study subjects within the control group and the treatment group were classified as not exercising regularly, having no history or currently suffering from heart disease, no history of head trauma or epilepsy. Besides, they are having no foot, lower leg, shoulder, arm or wrist injuries; not experiencing stress or depression; no history of going to a psychiatrist or taking psychiatric drugs or habit of taking sedative drugs and/or alcohol.

Table 1. Characteristics of Research Subjects

Characteristics	Groups		*P*
	Control (n=16)	Treatment (n=16)	
Age (years old)	15.75±0.447	15.81±0.403	0.674[a]
Gender			
- Male	16 (100%)	16 (100%)	
- Female	0 (0%)	0 (0%)	
Weight (kg)	53.00±4.382	53.75±4.906	0.653[b]
Height (cm)	163.94±4.106	165.25±5.41	0.579[a]
Body Mass Index (BMI) (kg/m^2)	19.71±1.32	19.66±1.19	0.912[b]

Presented as mean±SD.
Performed with [a]Mann-Whitney; [b]Independent Samples test.

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Based on table 2, there was a significant difference in TMD scores (*P*=0.005; Mann-Whitney) between the post-test control group and the treatment group.

Table 2. Total Mood Disturbance Scores

Measurements Time	TMD Scores		*P*
	Control (n=16)	Treatment (n=16)	
Pre-test	76.69±25.408; 69.00 (43-126)	87.38±18.478; 92.50 (60-113)	0.184[c]
Post-test	72.00±21.869; 61.00 (43-107)	51.75±16.842; 51.00 (24-85)	0.005[d*]
P	0.078[a]	<0.001[b*]	
Difference between pre- and post-test	4.69±9.965; 5.00 (-12-27)	35.63±22.612; 34.00 (3-71)	<0.001[c*]

Presented as mean ± SD; median (min – max). *Significantly different if *P*<0.05. Performed with [a]Wilcoxon Test; [b]Paired-Samples T test; [c]Independent Samples test; [d]Mann-Whitney

The results of measuring mood scores in the treatment group showed a significant decreases in TMD scores (*P*<0.001; Paired-Samples T test). However, in the control group there was a non-significant decreases in the TMD score (*P*=0.078; Wilcoxon test). In addition, the results of statistical tests showed a significant differences in TMD scores between the pre-test and post-test of the control group and the treatment group (*P*<0.001; Independent Samples test).

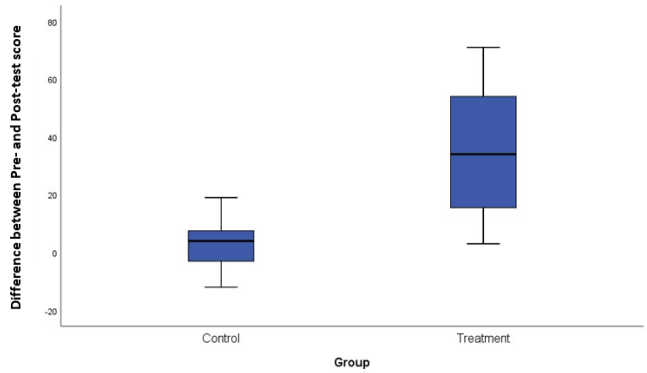

Figure 1. TMD Scores Difference between Pre-test and Post-test.

DISCUSSION

This study proved that there was a significant differences between the treatment group that was given jump rope training for six weeks and the control group that only did daily activities. TMD scores on the pre-test with post-test treatment group experienced a significant decrease, which means there is an increase in mood. Supported by research by Chase and Hutchinson (2015), stated that aerobic training effectively improves mood, whereas jump rope training is one type of aerobic training.[7,9] While the pre-test TMD scores with the control group's post-test decreased but not significantly. The decrease in the TMD score of the control group who only did daily activities although it was not significant, could happen because it was related to several factors such as sleep duration. Previous studies stated that mood was significantly related to sleep duration. The results proved that the increased sleep duration at night in school students benefits mood, reducing the prevalence of low mood in school.[17]

The mood is a low-intensity feeling, which will cause pleasant or unpleasant feelings. Usually, it lasts for hours or days where mood changes are generally influenced by body conditions, for example because of energy, fatigue, tension and calm.[18,19] The neurotransmitters norepinefrin, dopamine and serotonin can affect mood. One of the mental disorders associated with disturbances in the neurotransmitters of the limbic system is depression.[10,11]

The beneficial effects of aerobic training include changes in neurotransmitters and neurochemicals, and also changes in metabolites and neuromodulators. The brain proves that aerobic training supports the changes in synthesis and metabolism of these.[20,21] Aerobic training induces an increase in BDNF and neurotrophin-3 (NT-3) which can increase neuroplasticity, neurogenesis, and neuroprotection so that it has an impact on improving cognitive function, mood, arousal and decreasing neurodegeneration. When depression occurs, it will manifest in a decrease in brain neuroplasticity which is influenced by BDNF.[12,14] Aerobic training also triggers the hypothalamic-pituitary-adrenal axis resulting in increased catecholaminergic modulation, because the prefrontal cortex contains high levels of catecholaminergic receptors, so catecholamines can amplify the influence exerted by the prefrontal cortex on interconnected structures, especially those involved in mood.[4]

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The results showed that the treatment group that was given jump rope training with a frequency of 3 times a week in six weeks had a lower TMD score compared to the control group that only did daily activities for six weeks, indicating that there was an increase in mood in the treatment group. The statistical test showed a significant decrease in TMD scores between the post-test treatment and control groups. Thus, this confirms that jump rope training with a frequency of 3 times a week in 6 weeks has an effect on mood and is effective in improving mood as indicated by a decrease in TMD scores. Supported by research conducted by Karoni (2020) which stated that there was a significant increase in mood for individuals who were given aerobic treatment for 6 weeks. The difference with this study lies in the aerobic form that uses a shuttle run, while this study uses jump rope training.[22]

The limitation of this study is the hard part of obtaining research subjects, because school learning is carried out with a shift system due to the COVID-19 pandemic in Solok Regency, Sumatra Barat, thus requiring further coordination with the school. In addition, researchers cannot control all the daily activities of the research subjects during the study.

CONCLUSION

Jump rope training for six weeks affects mood as measured by the POMS score in the adolescent age group. This is proved by a significant increase in mood in the adolescent age group that was given jump rope training for six weeks. Further research is needed regarding populations with other age groups such as children, adults and the elderly. It is necessary to continue by involving female subjects and research subjects with mood disorders such as depression.

ACKNOWLEDGEMENT

We would like to express our appreciation to the student of senior-high school 1 of Gunung Talang, Solok Regency, West Sumatera, who agreed to participate in the study.

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