International Journal of Public Health Excellence (IJPHE)
Vol. 3, No. 1, December 2023, pp. 433~441
Journal Homepage: https://ejournal.ipinternasional.com/index.php/ijphe
ISSN: 2809-9826, DOI: 10.55299/ijphe.v3i1.732

The Effect of Sports Massage and Acupressure on Lactic Acid Levels, Physical and Psychological Fatigue, and the Effect on Nurse Performance

Fika Indah Prasetya[1*], Soetanto Hartono[2], Endang Sri Wahyuni[3], Heryanto Nur Muhammad[4], Eka Suryaning Tyas[5], Priyo Sasmito[6]

[1] Sports Sciences Doctoral Program, Sports Sciences and Health Faculty, Universitas Negeri Surabaya, Indonesia
[2] Sports Sciences and Health Department, Sports Sciences and Health Faculty, Universitas Negeri Surabaya, Indonesia
[3] Medical Department, Sports Sciences and Health Faculty, Universitas Negeri Surabaya, Indonesia
[4] Sports Sciences Department, Sports Sciences and Health Faculty, Universitas Negeri Surabaya, Indonesia
[5] Nursing Department, Sports Sciences and Health Faculty, Universitas Negeri Surabaya, Indonesia
[6] Nursing Department, Ichsan Satya University, Indonesia

Article Info

Article history:
Received December 08, 2023
Revised December 21, 2023
Accepted December 31, 2023

Corresponding Author:
Fika Indah Prasetya
Sports Sciences Doctoral Program, Sports Sciences and Health Faculty, Universitas Negeri Surabaya, Indonesia
Email : fikaindahp@gmail.com

ABSTRACT

Background: The increasing number of elderly service users in nursing homes and the small number of geriatric specialist nurses have made nurses who work in nursing homes vulnerable to burnout. Therefore, it's crucial to develop methods to anticipate and overcome burnout in geriatric nurses, particularly through non-pharmacological approaches. **Purpose:** The purpose of this study is to analyze the effect of sports massage and acupressure on lactic acid levels, physical and psychological fatigue, and nurse performance. **Method:** A quasi-experimental quantitative research was conducted among the nurses working at the Tresna Wredha Social Institution (TWSI). The sample consisted of 30 participants who were selected using a total sampling technique and divided into three groups. The collected data was analyzed using ANOVA. **Results:** The study involved 30 nurses who received an intervention in the form of either sports massage or acupressure. The sports massage group showed the lowest lactic acid levels at 2.7 mmol/L, the lowest physical fatigue with an average value of 25.0, and the highest performance score with an average value of 135.0. Statistical calculations revealed that there is a significant relationship between sports massage and acupressure with outcomes such as lactic acid levels, physical and psychological fatigue, and nurse performance, with a p-value of less than 0.05. Furthermore, the Pairwise Comparison test demonstrated that sports massage is more effective than acupressure in reducing lactic acid levels, physical fatigue, and psychological fatigue. **Conclusion:** The study shows that sports massage and acupressure significantly decrease lactic acid levels and physical/psychological fatigue, and can improve the performance of nurses. Furthermore, sports massage is more effective than acupressure in achieving these outcomes.

Keywords: Acupressure, lactic acid, nurse performance, physical and psychological fatigue, sports massages

1. INTRODUCTION

Fatigue is a natural signal from the body that emerges due to a decrease in bodily function from a good to a poor condition as a result of work. These signals can take the form of fatigue symptoms experienced by individuals, both physically and mentally [7]. Fatigue can occur in various professions, including nursing. If not addressed properly, nurse fatigue can

have adverse effects not only on nurses but also on patients. Geriatric nurses are particularly susceptible to physical strain compared to other nurses, resulting in a high incidence of physical fatigue in this profession [24]. Nurses have the responsibility of caring for patients, which is closely related to the well-being and survival of patients while maintaining their own physical and psychological stability. This underscores the need for nurses to always strive to maintain their physical and psychological well-being [6].

It has been observed that burnout and psychological inflexibility caused by stress among geriatric nurses in Spain have not been fully explored yet, unlike in other international geriatric nurse work settings [31]. Preliminary research conducted on geriatric nurses in a social institution in East Java, Indonesia showed that their work performance has declined, as indicated by a high number of absentees for short periods. These nurses often complain of fatigue due to their nursing care duties for elderly patients in semi and total-care groups. Various studies have suggested alternative methods like sports massage and acupressure to alleviate physical fatigue and reduce nurse fatigue [3].

The elderly population in Indonesia is increasing every year due to higher life expectancy [38]. This results in an increased number of elderly people who require services in nursing homes. However, there is a shortage of geriatric specialist nurses, which makes nurses who work in nursing homes vulnerable to burnout. Therefore, it is essential to develop non-pharmacological methods to overcome and prevent burnout in geriatric nurses. This study aimed to investigate the effect of exercise massage and acupressure on lactic acid levels, physical and psychological fatigue, and nurse performance.

2. METHOD

This research is quantitative research with an experimental quasi-approach. This research was conducted at the Tresna Wredha Social Institution (TWSI) Puger, Jember Regency in March 2023. The study population was nurses working in TWSI numbering 30 nurses. The sample in this study used a total sampling technique.

Respondents were divided into 3 groups, each group amounting to 10 people determined by the zigzag method. The intervention group consisted of 2 groups, namely sport massage and acupressure group. While 1 group became a control group that was not given treatment. All three groups measured lactic acid levels, physical and psychological fatigue, and performance before and after the intervention.

Lactic acid measurements were performed using Accutrend Plus. Physical and psychological fatigue variables were measured using the Fatigue Assessment Scale (FAS) (validity and reliability with Cronbach alpha 0.778) [10]. Performance variables were measured using performance questionnaires. The data obtained were then analyzed univariately and bivariately using the ANOVA.

This research was conducted with the approval of an independent ethics committee from the Ethical Committee of Medical Research Faculty of Dentistry University of Jember on June 5th, 2023 (No.2099/UN25.8/KEPK/DL/2023). Before participating in the study, all participants explained about the research and filled out an informed consent sheet. Participants who withdrew during the study did not receive any form of penalties.

3. RESULTS AND DISCUSSIONS

Results

A total of 30 nurses were involved in the study. Respondents of the massage sport group were on average 35.6 years old, most of the respondents were male, and the length of work was between 8-10 years. In the acupressure group respondents, it is known that the average respondent is 31.2 years old, mostly male respondents, with 3 years of work experience. The

control group respondents were 29.6 years old on average, mostly male, and worked for 3 years.

Based on the measurement results before treatment, the highest average lactic acid levels in the sports massage group were 12.6 mmol / L, the highest physical and psychological fatigue in the acupressure group with an average score of 62.1, and the lowest performance was the sports massage group with an average score of 88.3. After receiving the intervention, the lowest lactic acid levels were found in the sports massage group at 2.7 mmol / L, the lowest physical fatigue in the sports massage group with an average value of 25.0, and the highest performance score in the sport mass group with an average value of 135.0. The complete pretest and posttest data are presented in Table 1.

Table 1. Pretest and posttest results

Variable	Intervention group	Statistic	Pretest	Posttest
Lactic acid	Sport Massage	Mean ± SD	12.6 ± 0.8	2.7 ± 0.6
		Range	11.2 – 13.7	1.7 – 4.0
	Acupressure	Mean ± SD	10.7 ± 1.9	6.8 ± 1.5
		Range	7.3 – 12.9	4.1 – 8.9
	Control	Mean ± SD	9.9 ± 2.5	9.8 ± 2.5
		Range	4.6 – 12.2	4.7 – 12.2
physical and psychological fatigue	Sport Massage	Mean ± SD	60.1 ± 14.6	25.0 ± 8.7
		Range	43.0 – 79.0	18.0 – 42.0
	Acupressure	Mean ± SD	62.1 ± 12.3	41.2± 16.6
		Range	41.0 – 78.0	18.0 – 66.0
	Control	Mean ± SD	58.6 ± 14.6	56.4 ± 12.9
		Range	44.0 – 88.0	44.0 – 84.0
Performance	Sport Massage	Mean ± SD	88.3 ± 16.4	135.4 ± 13.6
		Range	61.0 – 111.0	120.0 – 152.0
	Acupressure	Mean ± SD	104.3 ± 33.8	128.2 ± 24.4
		Range	50.0 – 146.0	82.0 – 154.0
	Control	Mean ± SD	101.2 ± 14.6	99.7 ± 14.6
		Range	80.0 – 121.0	80.0 – 121.0

The data obtained were then carried out with further statistical tests to analyze the relationship between exercise massage and acupressure on lactic acid levels, nurses' physical and psychological fatigue, and nurses' performance. The results of statistical test analysis during the posttest for variables lactic acid levels and physical and psychological fatigue, as well as performance showed a significance value of < alpha 0.05. This means that there is a significant influence between lactic acid levels, physical fatigue, and psychology on the performance of geriatric nurses after being given sports massage and acupressure treatment. This means that there is an influence between sports massage and acupressure on lactic acid levels and physical and psychological fatigue, as well as nurse performance (Table 2).

Furthermore, researchers analyzed the partial relationship between lactic acid levels and physical and psychological fatigue on nurses' performance. It was found that lactic acid levels were not associated with nurse performance (sig. 0.777), but there was a significant relationship between physical and psychological fatigue on respondents' performance (sig. 0.001).

Table 2. Statistical analysis of interventions on dependent variables

Variable	Test	Coeff.	Sig.
Lactic acid level	Pretest	12.298	0.002
	Posttest	22.234	0.000
Physical and psychological fatigue	Pretest	0.161	0.923
	Posttest	16.073	0.000
Performance	Pretest	2.610	0.092
	Posttest	14.344	0.000

Researchers conducted a deeper statistical analysis to find out which intervention group was most effective for lowering lactic acid levels and reducing physical-psychological fatigue using the pairwise comparison test. Based on the calculation results, it was found that the sports massage group was significantly different from the acupressure and control groups in affecting lactic acid levels and physical-psychological fatigue. So it can be concluded that sports massage is the most effective treatment in reducing lactic acid levels and physical-psychological fatigue compared to acupressure and the control group (Table 3).

Table 3. Pairwise Comparison test results

Variable	Group	Test Statistic	Std. Error	Std. Test Statistic	Sig.
Lactic acid level	Sport Massage-Accupressure	-11.700	3.931	-2.976	0.003
	Sport Massage-Control	-18.300	3.931	-4.655	0.000
	Acupressure-Control	-6.600	3.931	-1.679	0.093
Physical-psychological fatigue	Sport Massage-Acupressure	-8.100	3.929	-2.062	0.039
	Sport Massage-Control	-15.750	3.929	-4.009	0.000
	Acupressure-Control	-7.650	3.929	-1.947	0.052

Discussion

Sports Massage is associated with decreased lactic acid levels

The results of this research analysis test found that sports massage significantly reduced lactate levels. The results of this study are in line with other similar studies [19];[22][23]; [29]; [40]. One indicator of fatigue is the result of an anaerobic metabolic byproduct, namely lactic acid. The increased value of lactic acid due to a high workload can affect energy formation due to the inability to supply aerobic energy sources, so meeting energy sources using anaerobic energy sources, can cause high pain and cause fatigue in the body (Widiyanto & Hartono, 2018). In addition, the buildup of lactic acid in the body will cause fatigue in the body so that it will interfere with daily activities and the body experiences a decrease in efficiency which results in reduced body capacity and resistance [31].

Nurses who have strenuous and repetitive activities will tend to experience anaerobic metabolism. Unlike aerobic metabolism which produces water and carbon dioxide, anaerobic metabolism produces lactic acid. The presence of elevated lactate levels can cause a decrease in pH and cause acidosis. In anaerobic metabolism, ATP formation is inhibited and causes muscle pain. This condition can affect the performance of nurses in carrying out nursing care activities [4]; [26]; [30].

Sports massage can be an alternative to reduce lactate levels whereas massage exercise techniques can provide simple manipulatives to reduce tension in the muscles so that it is assumed to relax muscles that can facilitate blood circulation. Sports massage with effleurage techniques is said to be more effective in reducing lactate levels compared to moderate-intensity recovery and other passive recovery [5]; [22]. In addition, massage can increase the elimination of sodium and potassium product yields. Experts report that such products can provoke fatigue. Massage can also increase reverse blood flow in veins so that it can increase oxygenation in muscle tissue and accelerate lactate elimination. With increased tissue oxygenation, the conversion of lactic acid to pyruvate is faster, to accelerate energy reserves after recovery [39].

Sports massage lowers physical and psychological fatigue

The results of the analysis in this study found that sports massage had a significant effect on reducing the physical and psychological fatigue of respondents. This result is by several other previous studies [13]; [15]; [33]. These studies reported a significant effect of sports massage on reducing physical fatigue. Sports massage can produce mechanical stress,

thought to increase the ability of muscles to flow blood back by increasing atrial pressure and increasing muscle temperature [2]; [37]. Mechanical stress on muscles is thought to increase or decrease nerve stimulation.

In addition to reducing physical fatigue, sports massage can also reduce psychological fatigue. From various studies, sports massage was found effective in providing a relaxing effect in overcoming complaints of psychological fatigue [34]. Massage can provide stimulation to the nervous system. Muscle relaxation stimulates the parasympathetic nerves to release neurotransmitters, namely endorphins, serotonin, and acetylcholine hormones that can reduce psychological stress [36].

Acupressure lowers Lactic Acid Levels

Based on the data from this analysis, it was found that acupressure significantly affected the reduction of lactic acid levels. Several previous studies have also obtained similar results. Acupressure can relax muscles and increase oxygen supply to muscles, leading to the removal of lactic acid and its metabolites to improve muscle fatigue [17]; [34].

Acupressure is a healing technique by pressing the healing point using fingers which is done gradually so that it can provide a stimulus response to the body and in the end the body can heal itself naturally [35]. Acupressure is defined as massage and stimulation techniques at points of the body. Acupressure is a massage technique from acupuncture that is done using certain tools. In their implementation, acupressure and acupuncture have similarities, but the difference is the addition of tools from the technique with finger movements done with an emphasis on certain parts according to the healing point. Acupressure has benefits in reducing symptoms of several types of diseases by reducing pain thresholds and reduce tension and reduce fatigue [26].

Acupressure reduces physical and psychological fatigue

The geriatric nursing profession requires that nurses work doing repetitive work with the same clients. This has the potential to cause physical and psychological fatigue [6]. Based on the results of the analysis in this study, it was found that acupressure reduces physical and psychological fatigue. This is due to several previous studies that reported that acupressure can reduce physical and psychological fatigue [8]-[9]; [16]; [25]. Although some studies question the effect of acupressure in reducing psychological fatigue, not a few studies report the positive effects of acupressure on psychological recovery [8]; [18]; [36.

Psychological fatigue can cause health problems that arise due to psychological fatigue, namely sleep disorders, depression, and anxiety. Nursing interventions can be done to overcome fatigue with acupressure therapy [20]-[21]; [34]. Acupressure techniques can stimulate several nerves or substances in the body system so that it has an impact on the central nervous system. One of them is the hormone serotonin which can provide signals to the brain that can stimulate relaxation and sleep. Acupressure can improve blood circulation, reduce stress, and depression, and increase body relaxation to reduce health problems due to fatigue [1].

The effectiveness of sports massage compared to acupressure

Sports massage is more effective at lowering lactic acid levels and reducing physical and psychological fatigue than acupressure. The results showed that sports massage was more effective in lowering lactate levels, reducing fatigue, and improving psychological fatigue compared to acupressure. The results of this study follow the results reported by previous studies which stated that sports massage is more effective than other methods [28]; [40] Nevertheless, these two variables have a joint influence on improving the performance of nurses in their profession.

Psychologically, maximum fatigue can cause stress levels that affect individual psychology. Physiologically, there is a buildup of lactic acid where in the opinion of some experts, lactate is an indicator of fatigue due to pain due to lactic acid buildup then an increase in lactic acid can also increase CO2 production, with an increase in CO2 causing acid so that CO2 diffuses from the blood to the lungs so that the amount of CO2 released in the lungs [27]. This condition will be even worse if oxygen levels are low because carbohydrates are broken down into energy and lactic acid. Lactic acid levels can increase in people who exercise excessively or in other conditions such as infection or sepsis, heart disease, or shock events that can reduce blood and oxygen flow throughout the body. Sports massage is proven to lower lactic acid levels in the body. This is because exercise massage is psychologically able to stimulate neurotransmitters to the nerves of the brain can reduce pain and also help relax muscles to reduce stress levels because muscles and nerves become relaxed.

The effect of lactic acid levels, physical and psychological fatigue on nurse performance

Based on the results of the analysis, it was found that there was a significant influence of lactic acid levels, physical fatigue, and psychology on nurses' performance after being given treatment both sports massage and acupressure. This is because the massage treatment of exercise and acupressure can reduce lactic acid, physical fatigue, and psychological. The decline can make nurses more active in working to improve performance [21].

Geriatric nurses are elderly nurses with a shift work system. Geriatric nurses have more workload than other nurses from a psychological point of view. The impact of boredom in facing the same elderly every day is psychologically able to cause boredom. However, this is not the only thing that underlies the importance of maintaining the impact of nurse performance due to physical and psychological fatigue.

Factors that can affect the performance of a nurse are the presence of a healthy and strong physique. This situation can change and decrease if nurses experience physical and psychological exhaustion. The impact of declining performance is a decrease in work productivity in providing nursing care. Work fatigue is also usually one of the reasons employees resign from their jobs. Performance can be achieved well by reducing the risk of work accidents where one of the causes of work accidents is work fatigue [32]. Fatigue is a condition accompanied by decreased efficiency and resilience at work [11]; [14]. Fatigue at work can also reduce performance and cause errors in work. This decrease in productivity can ultimately lead to losses for the institution if not resolved properly.

4. CONCLUSION

Sports massage and acupressure have been found to significantly reduce lactic acid levels, decrease physical and psychological fatigue, and improve the performance of geriatric nurses. In comparison, Sports massage has been observed to be more effective than acupressure in lowering lactic acid levels and reducing physical and psychological fatigue. Therefore, sports massage and acupressure can be considered as alternative methods to combat fatigue in geriatric nurses.

ACKNOWLEDGEMENTS

The author would like to express his gratitude for all the support provided until the completion of the research and publication of the article in an international journal, especially to the institutions of all authors and colleagues.

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