

The Effect of Aerobic Exercise on Stress Levels in Drug Rehabilitation Patients at the Medan Plus Foundation

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Stress is one of the main factors that can worsen the psychological condition of NAPZA (Narcotics, Psychotropics, and Addictive Substances) rehabilitation patients. One potential non-pharmacological intervention in reducing stress levels is physical activity such as aerobic exercise, which is known to increase endorphin production and improve mood. Objective: This study aims to determine the effect of aerobic exercise on stress levels in NAPZA rehabilitation patients at the Medan Plus Foundation. Method: This study used a pre-experimental one group pretest-posttest design. A total of 30 NAPZA rehabilitation patients participated in an aerobic exercise intervention for 4 weeks, each with 3 sessions per week, lasting 30 minutes per session. Stress levels were measured using the DASS questionnaire before and after the intervention. Data analysis was performed using paired Wilcoxon tests using SPSS version 26 software. Results: The results showed a significant decrease in stress levels after the intervention ($p < 0.001$). Before aerobic exercise, 66.66% of respondents were in the high stress category, and after the intervention, this figure decreased to 6.66%. Conversely, the number of patients with mild stress increased from 33.33% to 93.33% after the intervention. Conclusion: Aerobic exercise has been proven effective in reducing stress levels in drug rehabilitation patients. These findings indicate a recommendation for rehabilitation institutions to include aerobic exercise as part of their therapy program.

Keywords: aerobic exercise, stress, drugs, rehabilitation, physical activity, endorphins.

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1. Introduction

NAPZA (Narcotics, Alcohol, Psychotropics, and other Addictive Substances) is a group of substances that can affect the function of the central nervous system, thereby changing a person's consciousness, mood, thought patterns, and behavior. Based on Law Number 35 of 2009 Article 1, narcotics are substances or drugs derived from plants or non-plants, both synthetic and semi-synthetic, which can cause a decrease or change in consciousness, eliminate pain, and cause dependence if used without proper medical indications. As a psychoactive substance, NAPZA works directly on the brain, thus affecting cognitive, affective, and psychomotor functions. Unregulated use or long-term abuse can result in permanent changes in brain function, thus disrupting an individual's ability to carry out daily activities and interact with their social environment. Therefore, NAPZA abuse is a public health problem that requires comprehensive and sustainable treatment. [1][2]

Drug abuse not only causes physical dependence, but also has a major impact on the psychological, social, economic, and quality of life of sufferers. Individuals who experience dependence generally experience behavioral changes, difficulty controlling substance use, loss of motivation, and disruption of family and work functions. In addition, long-term drug use can cause various health complications, such as impaired liver, kidney, and heart function, nervous system disorders, and increase the risk of infection with infectious diseases such as HIV/AIDS and Hepatitis B and Hepatitis C due to the use of non-sterile syringes. These

conditions cause drug abuse to be one of the causes of increasing morbidity and mortality rates in productive age groups in various countries. [3][4]

The impact of drug abuse on mental health cannot be ignored. Continuous exposure to psychoactive substances can alter the balance of neurotransmitters in the brain, triggering various mental disorders, such as depression, anxiety disorders, bipolar disorder, psychosis, and even schizophrenia in individuals with certain risk factors. These psychological disorders are often exacerbated by social stigma, family rejection, and low environmental support, making the recovery process even more complex. Many patients experience severe stress during rehabilitation due to the process of adapting to life without drugs, the desire to use substances again (cravings), and pressure from their social environment. [4][5]

The risk of drug abuse is influenced by various interacting factors, both individual and environmental. Individual factors include psychological conditions, personality, emotional control, history of mental disorders, age, gender, and biological conditions such as body metabolism and sensitivity to certain substances. Meanwhile, environmental factors include peer influence, family conditions, social pressure, ease of drug access, and the economic conditions of the community. In addition, the level of danger of abuse is also influenced by the type of substance used, dosage, frequency of consumption, duration of use, and method of use. The combination of these factors causes each individual to have a different level of vulnerability to dependence and complications resulting from drug abuse. [5]

The problem of drug abuse remains a major global challenge. The United Nations Office on Drugs and Crime (UNODC) reports that approximately 271 million people worldwide, or approximately 5.5% of the working-age population, have used drugs. This figure indicates that drug abuse remains an international public health problem that requires serious attention. In addition to the increasing number of users, the death rate from overdoses and complications from drug use remains relatively high in various countries. The 2020 European Drug Report reports that several countries in the European region are still experiencing increasing drug-related deaths, particularly in Sweden and the United Kingdom. Therefore, various countries continue to strengthen prevention, rehabilitation, and social reintegration programs for drug abusers. [6][7]

In Indonesia, drug abuse remains a national priority in the health and safety sectors. The National Narcotics Agency (BNN) stated that the prevalence of drug abuse remains quite high, although it fluctuates annually. In 2019, an estimated 3.6 million Indonesians had abused drugs. This situation indicates that prevention and rehabilitation efforts still need to be continuously improved. North Sumatra Province is even among the regions with the highest number of drug abuse cases in Indonesia. In 2021, there were 2,049 cases of drug abuse recorded, requiring more effective rehabilitation strategies to support the recovery process of patients in the region. [8][9]

One of the psychological problems that drug rehabilitation patients almost always experience is stress. Stress is the body's physiological and psychological response to pressure or demands that are perceived to exceed an individual's ability to cope. When someone experiences stress, the body increases the production of the hormones adrenaline and cortisol, which trigger a "fight or flight" response, such as increased heart rate, blood pressure, respiratory rate, and alertness. If this condition persists for a long time, it will disrupt the body's physiological balance and negatively impact both physical and mental health. In drug rehabilitation patients, stress often arises from the process of stopping substance use, changes in the living environment, limitations in activities, and uncertainty about the future. [9]

Unmanaged stress can be a major cause of rehabilitation failure. High levels of stress can increase the desire to return to drug use as an escape from the psychological pressures felt. Furthermore, stress can also reduce a patient's motivation to participate in a rehabilitation program, hinder social adaptation, worsen sleep quality, increase anxiety, and even trigger aggressive behavior and depression. Therefore, stress

management is crucial to the success of a rehabilitation program, as successful recovery is determined not only by cessation of substance use but also by the patient's ability to manage their psychological state during the rehabilitation process. [9][10]

The goal of a drug rehabilitation program is to restore the physical, psychological, social, and spiritual well-being of patients so they can return to normal functioning. In addition to pharmacological therapy, various non-pharmacological interventions are also needed to help accelerate the patient's psychological recovery process. Non-pharmacological interventions have several advantages, including ease of implementation, relative safety, lower costs, and the ability to increase patient active involvement in the rehabilitation process. One form of intervention that is often recommended is physical activity or exercise, as it has been proven to provide benefits for both physical and mental health. [10]

One form of exercise considered suitable for drug rehabilitation patients is aerobic exercise. Aerobic exercise is a physical activity performed rhythmically and continuously at moderate intensity, thereby increasing the working capacity of the heart and lungs in utilizing oxygen. In addition to providing benefits for physical fitness, aerobic exercise is also known to increase blood circulation, improve sleep quality, increase endurance, reduce fatigue, and improve mood. The characteristics of the movements are easy to learn, making this exercise relatively safe and can be implemented as part of the rehabilitation program for drug patients experiencing stress or emotional disorders. [10][11]

Physiologically, aerobic exercise can stimulate the release of endorphins, serotonin, and dopamine, which act as neurotransmitters in regulating mood, reducing pain, and increasing feelings of comfort and happiness. The increase in these hormones contributes to a decrease in cortisol levels, thereby significantly reducing stress and anxiety levels. Various studies have shown that regular physical activity can improve mental health, increase quality of life, and help reduce the risk of relapse in patients undergoing rehabilitation. However, research specifically examining the effect of aerobic exercise on stress levels in drug rehabilitation patients, particularly at the Medan Plus Foundation, is still relatively limited, so further scientific evidence is needed. [11]

Based on the high rate of drug abuse, the significant psychological impact in the form of stress on rehabilitation patients, and the potential of aerobic exercise as a simple, safe, and easy-to-implement non-pharmacological intervention, research on the effect of aerobic exercise on stress levels in drug rehabilitation patients at the Medan Plus Foundation is important to conduct. The results of this study are expected to provide scientific evidence regarding the effectiveness of aerobic exercise in reducing stress levels in drug rehabilitation patients, as well as serve as a basis for the development of more comprehensive rehabilitation programs through a physical activity approach. In addition to providing benefits to rehabilitation institutions, this study is also expected to serve as a reference for health workers and future researchers in developing non-pharmacological exercise-based interventions to improve the success of drug abuse patient rehabilitation..

2. Method

This study uses a quantitative method with a pre-experimental research design using a one group pretest-posttest design approach. The quantitative method was chosen because this study aims to determine the effect of providing aerobic exercise intervention on stress levels in drug rehabilitation patients through objective data measurement using a questionnaire instrument. In this study design, there is only one research group without a control group, where stress levels are measured twice, namely before the intervention (pretest) and after the intervention (posttest). The difference in measurement results before

and after the intervention is used to determine the effectiveness of aerobic exercise in reducing stress levels in drug rehabilitation patients. [12]

The research was conducted by providing intervention in the form of aerobic exercise to drug rehabilitation patients at the Medan Plus Foundation. The aerobic exercise program was provided in a structured manner with a frequency of three times a week for four weeks, with a duration of approximately 30 minutes in each exercise session. Before the intervention was given, all respondents were first measured for stress levels using a predetermined questionnaire. After the entire series of interventions were completed, respondents were again given stress level measurements to obtain posttest data. Data obtained from both measurements were then compared to see changes in stress levels after the aerobic exercise intervention was given. [10][11]

The population in this study were all drug rehabilitation patients undergoing a recovery program at the Medan Plus Foundation. The sampling technique used the total sampling method, namely all members of the population who met the inclusion criteria and were not included in the exclusion criteria were made into research respondents. The inclusion criteria in this study included drug patients who were undergoing rehabilitation at the Medan Plus Foundation and were willing to participate in the entire series of research. Meanwhile, the exclusion criteria included patients who were undergoing treatment for certain mental disorders and respondents who did not complete the research instrument completely. [12]

The instrument used in this study was a stress level questionnaire with an ordinal measurement scale administered before and after the aerobic exercise intervention. The data obtained were then analyzed using SPSS statistical software. Data analysis was carried out through univariate analysis to describe the characteristics of respondents and the distribution of stress levels, and bivariate analysis using the Wilcoxon Signed Rank Test to determine differences in stress levels before and after the intervention. The statistical significance level was set at a p value <0.05. If the significance value obtained is less than 0.05, it can be concluded that there is a significant effect between the provision of aerobic exercise on stress levels in drug rehabilitation patients at the Medan Plus Foundation.

3. Results and Discussion

Research result

This study was conducted with the aim of assessing the impact of aerobic exercise intervention on stress levels in individuals with substance use disorders (NAPZA) undergoing a rehabilitation program at the Medan Plus Foundation. Data analysis was conducted using a univariate approach to describe the demographic characteristics and distribution of research variables, and bivariate analysis to examine the relationship between the independent variable (intervention) and the dependent variable (stress level). All stages of processing and statistical analysis were carried out using IBM SPSS for Windows version 26 software.

Respondent Profile

This study involved 30 drug rehabilitation patients at the Medan Plus Foundation. Respondents had diverse demographic characteristics, including age, occupation, and length of rehabilitation. The frequency distribution of respondent profiles is presented in Table 1 below.

Table 1. Respondent Profile

Respondent profile	Frequency (n)	Percentage (%)
Age		
≤30 years	10	33.3

Respondent profile	Frequency (n)	Percentage (%)
31-40 years	13	43.3
>40 years	7	23.3
Work		
Fisherman	2	6.7
Farmer	6	20
Doesn't work	6	20
Self-employed	15	50
Businessman	1	3.3
Rehabilitation period		
<2 months	12	40
2-3 months	13	43.3
>3 months	5	16.7

Based on the distribution of the data obtained, the majority of participants in this study were in the 31–40 age group (43.3%), indicating that the drug rehabilitation patient population at the Medan Plus Foundation is dominated by individuals in their productive age. Meanwhile, the age group ≤ 30 years also had a significant representation, namely 33.3%, and the remaining 23.3% were respondents aged >40 years.

In terms of employment status, the largest proportion came from the self-employed (50%), followed by farmers and unemployed individuals, at 20% each. Meanwhile, respondents working as fishermen and other informal workers were recorded at lower rates, at 6.7% and 3.3%, respectively.

Based on the duration of rehabilitation, 43.3% of respondents had undergone a rehabilitation program for 2 to 3 months, while another 40% had undergone rehabilitation for less than 2 months. Only 16.7% of respondents had undergone rehabilitation for more than 3 months, indicating a varied distribution of time among program participants.

Univariate Analysis

Univariate analysis was conducted to describe the distribution of stress levels in drug rehabilitation patients before and after participating in aerobic exercise at the Medan Plus Foundation. Data regarding stress levels in drug rehabilitation patients are presented in Table 2 below:

Table 1 Stress Level

Stress Level	Frequency (n)	Percentage (%)
Before aerobic exercise		
Light	10	33.33
Tall	20	66.66
After aerobics		
Light	28	93.33
Tall	2	6.66

Univariate results showed that before the aerobic exercise intervention, the majority of patients had high stress levels, namely 20 people (66.66%), while the remaining 10 people (33.33%), were in the mild category. After the aerobic exercise program was implemented, there was a significant change in patient stress levels. The number of patients with high stress levels decreased to 2 people (6.66%) and the number of patients with mild stress levels increased to 28 people (93.33%).

These changes indicate that aerobic exercise can positively contribute to reducing stress levels in drug rehabilitation patients. The majority of patients initially in the high stress category successfully reduced to the low stress category.

Bivariate Analysis

1. Normality Test

The normality test is used to evaluate whether the data distribution for each research variable follows a normal distribution pattern. The results of this test form the basis for determining the most appropriate type of statistical analysis. If the data is normally distributed, parametric statistical tests, such as the paired sample t-test, are used. However, if the data distribution deviates from normal, non-parametric statistical approaches, such as the Wilcoxon signed-rank test, are used as an alternative.

In this study, normality testing was performed using the Shapiro-Wilk method, which is considered optimal for small to medium sample sizes. The analysis process was conducted using IBM SPSS for Windows version 26 software. The test results are presented systematically in Table 3.

Table2 Normality Test

Group	P-Value	Conclusion
Pretest	< 0.001	Not Normally Distributed
Posttest	< 0.001	Not Normally Distributed

Based on the results of the normality test using the Shapiro-Wilk method, the p-value for the pretest and posttest groups was <0.001, which is below the established significance level ($\alpha = 0.05$). This finding indicates that the data does not meet the assumption of a normal distribution. Therefore, the hypothesis analysis in this study was conducted using a non-parametric statistical approach, namely the Wilcoxon Signed Rank Test, which is recommended for analyzing paired data with a non-normal distribution.

2. Hypothesis Testing

The hypothesis testing in this study aims to assess whether an aerobic exercise intervention significantly impacts stress levels in patients with substance use disorders undergoing rehabilitation at the Medan Plus Foundation. The hypothesis formulation used is as follows:

- H_0 (null hypothesis): Aerobic exercise intervention has no effect on stress levels in drug rehabilitation patients.
- H_1 (alternative hypothesis): Aerobic exercise intervention has an effect on stress levels in drug rehabilitation patients.
- The decision-making criteria are determined based on the statistical significance value (Sig. 2-tailed), with the following provisions:
- If the p value ≤ 0.05 , then H_0 rejected and H_1 accepted, which indicates a significant effect of the intervention on reducing stress levels.
- If the p value > 0.05 , then H_0 accepted and H_1 rejected, which indicates there is no significant influence.

This hypothesis test was conducted using the Wilcoxon Signed Rank Test, a non-parametric test suitable for paired data with non-normal distributions. All analyses were conducted using IBM SPSS for Windows version 26 software. The test results and their interpretation are explained in the following section:

Table 4. Hypothesis Testing

Group	Mean	P-Value	Conclusion
Pretest	22.80	< 0.001	Effective

Group	Mean	P-Value	Conclusion
Posttest	38.57		

The results of statistical analysis using the Wilcoxon Signed Rank Test show that the p-value obtained is <0.001 , which is significantly lower than the predetermined significance limit ($\alpha = 0.05$). Based on these findings, the null hypothesis (H_0) is declared rejected, while the alternative hypothesis (H_1) is accepted. This provides evidence of a statistically significant difference between stress levels before and after the implementation of the aerobic exercise intervention.

The increase in the mean score from 22.80 in the pretest to 38.57 in the posttest reflects the significant effectiveness of aerobic exercise in reducing stress levels. These findings strengthen the hypothesis that structured physical activity, such as aerobic exercise, plays a significant role in emotional regulation and psychological stress management in patients with substance use disorders (NAPZA) undergoing rehabilitation programs at the Medan Plus Foundation.

Discussion

The results of the data analysis conducted showed a decrease in stress levels in patients with drug dependence after participating in the aerobic exercise program implemented at the Medan Plus Foundation. Before the aerobic exercise program was implemented, the majority of patients had a high stress level with a percentage of 66.66%, while only 33.33% of patients showed a low stress level. However, after the implementation of the aerobic exercise program, there was a significant change, namely the percentage of patients with high stress levels decreased to 6.66%, while patients in the mild category increased to 93.33%. These data indicate that providing aerobic exercise interventions has a positive impact on reducing stress levels in drug rehabilitation patients in the process of recovering from substance dependence. [14]

The effectiveness of aerobic exercise as a non-pharmacological intervention in reducing stress levels in rehabilitation patients with substance use disorders (NAPZA) is strengthened by the results of statistical analysis using the Wilcoxon Signed Rank Test. Based on the test results, a p-value of <0.001 was obtained, which is smaller than the significance limit value of $\alpha = 0.05$. These results indicate that there is a significant difference between stress levels before and after being given aerobic exercise intervention. Thus, changes in stress levels that occur after treatment are not solely caused by chance factors, but rather indicate the therapeutic influence of aerobic exercise exercises carried out in a structured manner during the rehabilitation process of NAPZA patients. [15]

The results of this study also support the psychophysiological theory that explains that regular physical activity is related to regulating emotional responses and improving a person's mental health. Physical activity can stimulate the release of neurotransmitters such as endorphins, serotonin, and dopamine, which play a role in regulating mood, increasing feelings of well-being, and reducing symptoms of anxiety and stress. Increased activity of these neurotransmitters can help individuals manage psychological stress and improve their ability to adapt to various problems faced during the rehabilitation process. These findings are in line with Wirawan's research which states that consistent physical exercise, including aerobic exercise, contributes to reducing stress levels and increasing motivation in individuals with psychological disorders and substance dependence. [16]

Neurobiologically, physical activity such as aerobic exercise can increase the secretion of endorphins, which function to produce feelings of comfort, relaxation, and improve psychological well-being. In drug rehabilitation patients, this increase in hormones has the potential to strengthen emotional resilience and help patients cope with stress during the recovery period. Furthermore, aerobic exercise can be a positive diversion against the emergence of cravings or the desire to reuse addictive substances. Therefore,

integrating aerobic exercise activities into rehabilitation programs can be a complementary therapy strategy that supports the successful recovery process of drug patients. [17]

Aerobic exercise is known to reduce stress levels by increasing the production of hormones associated with happiness, such as endorphins and serotonin, and reducing the activity of stress hormones such as cortisol and epinephrine. This physical activity provides a relaxing effect and improves a person's physiological and psychological balance. In addition, aerobic exercise also plays a role in reducing the secretion of adrenocorticotrophic hormone (ACTH), which is related to the body's stress response. Another benefit of aerobic exercise is improved cardiovascular function and lung capacity, so that patients have better energy to participate in rehabilitation activities. Bachtiar's research also states that individuals with substance use disorders can benefit positively from regular physical activity, both for general health and the process of recovering from substance dependence. [18]

The results of this study also demonstrate the importance of patient compliance with the rehabilitation program, including regular participation in aerobic exercise. Regular participation allows patients to obtain optimal physiological and psychological benefits. The aerobic exercise program implemented at the Medan Plus Foundation also provides additional benefits by creating a social environment that supports the recovery process. Interaction between patients, instructor support, and a positive activity atmosphere can help increase motivation, improve interpersonal relationships, and reduce the tendency for social isolation that is often experienced by individuals with a history of drug abuse. [19]

The findings of this study have important implications for the development of rehabilitation programs for drug addicts. Integrating aerobic exercise into rehabilitation programs can be an effective strategy for reducing stress levels and helping prevent relapse. Regular exercise can foster positive habits, improve self-control, and help patients divert attention from negative thoughts and urges to relapse. Furthermore, physical activity is also known to be associated with improved cognitive function, thus helping patients develop a more positive mindset about the future. [20]

The Medan Plus Foundation can consider aerobic exercise as a component of a comprehensive rehabilitation approach. Implementation of this program can be improved through training instructors who understand the characteristics and specific needs of drug addicts. Furthermore, family involvement through education about the benefits of physical activity in the rehabilitation process is also an important factor in supporting successful patient recovery. Support from family and a positive social environment can strengthen patients' motivation to maintain behavioral changes and live a drug-free life. [21]

Overall, the results of this study indicate that aerobic exercise is an effective form of non-pharmacological intervention in reducing stress levels in patients with substance use disorders (DVDs) during rehabilitation programs. These findings support a bio-psycho-social approach to treating DVD patients, an approach that combines biological aspects through physical activity, psychological aspects through stress management, and social aspects through supportive rehabilitation environments. The combination of these approaches can help accelerate the recovery process and improve patients' quality of life. [22]

It is recommended that further research use a more robust research design, such as a randomized controlled trial (RCT), to obtain more objective evidence regarding the effectiveness of aerobic exercise on the stress levels of drug addicts. Furthermore, further research should also consider other factors that may influence the success of rehabilitation, such as family support, socioeconomic conditions, education level, patient motivation, and length of rehabilitation. Analysis of these factors can provide a more comprehensive picture of the determinants of the success of physical activity-based interventions in drug addict rehabilitation. [23]

This study has several limitations that need to be considered. The research design used was a one-group pretest-posttest without a control group, so the study's ability to determine the causal relationship between

aerobic exercise intervention and reduced stress levels is still limited. The absence of a comparison group raises the possibility of the influence of other external factors that cannot be fully controlled during the study. In addition, the limited sample size of 30 patients at the Medan Plus Foundation may limit the generalizability of the study results to the population of drug abuse patients in other rehabilitation centers. [24]

Another limitation of this study is the use of a self-report questionnaire as a stress measurement instrument, which could potentially lead to subjective bias or social desirability bias. Respondents may have provided answers that were perceived as consistent with environmental expectations, even though they did not fully reflect their actual psychological condition. Furthermore, the study only conducted observations over a four-week period, thus not being able to describe the long-term effects of aerobic exercise on the ongoing recovery of drug addicts. [25]

To obtain more robust research results, future studies are recommended to use experimental methods with a randomized controlled trial (RCT) design, a larger sample size, and a longer observation period. This approach can increase the statistical power of the study and provide a more in-depth understanding of the effectiveness of aerobic exercise in reducing stress levels in patients with substance use disorders. Thus, the research results can form the basis for developing more effective, measurable, and widely applicable physical activity-based rehabilitation programs.

4. Conclusion

Based on the results of research on the effect of aerobic exercise on stress levels in drug rehabilitation patients at the Medan Plus Foundation, it can be concluded that aerobic exercise intervention has a positive effect in reducing stress levels in patients undergoing the recovery process. This study involved 30 drug rehabilitation patients with the characteristics of the majority of respondents being in the age range of 31–40 years (43.3%), most of whom worked as self-employed (50%), and had undergone a rehabilitation program for 2–3 months (43.3%). Before being given aerobic exercise intervention, most patients experienced high stress levels, namely 66.66%, while 33.33% of patients were in the mild stress category. After being given a structured aerobic exercise program, there was a significant change, namely the number of patients with high stress levels decreased to 6.67%, while patients with mild stress levels increased to 93.33%.

The results of statistical analysis using the Wilcoxon Signed Rank Test showed a p-value <0.001 ($p < 0.05$), which means there is a significant difference between stress levels before and after aerobic exercise intervention. Thus, it can be concluded that aerobic exercise is effective in reducing stress levels in drug rehabilitation patients at the Medan Plus Foundation. Based on these results, aerobic exercise can be considered as one of the non-pharmacological interventions that support drug rehabilitation programs through a bio-psycho-social approach that helps improve psychological conditions, reduce emotional stress, and support the patient's overall recovery process.

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